Introduction to Psychology & Neuroscience (2nd Edition)

INTRODUCTION TO PSYCHOLOGY & NEUROSCIENCE (2ND EDITION)

EDITED BY LEANNE STEVENS

Dalhousie University Libraries Digital Editions
Halifax, NS, Canada

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ABOUT THE BOOK

About Introduction to Psychology & Neuroscience

The foundation of this book is built upon Psychology 2e from OpenStax. For a full overview of all content creators and resources, see Psychology 2e Preface.

In addition to the core content from Psychology 2e from OpenStax, this book is a combination of original material and resources, as well as selected works from Introduction to Psychology by Cummings & Sanders (University of Saskatchewan), Discovery Psychology 2.0 from Noba Project, and various upper-level Psychology courses from Lumen Learning. We've added an 'Attributions & Acknowledgements' section at the end of each chapter, to highlight the contributors of the new original material.

Tricky Topics Video Series

The Tricky Topic videos embedded throughout the text were designed and created by faculty and students at Dalhousie University. Dr. Jennifer Stamp and Dr. Leanne Stevens were

the original creators of the video series, but the fully open versions now available were created by, and with the help of, many individuals. Specifically, Dr. Jennifer Stamp, Anthony Duchesne, Dr. Dylan Deska-Gauthier, Qendresa Sahiti, Adena Cox, Ella Vermeir, Swasti Arora, Dr. Kevin LeBlanc, and Filip Kosel were all integral to the development, editing, refining, and creation of the current Tricky Topics video series. Each Tricky Topic video now has information about the creator and narrator of the recording.

Accessibility

This book was created with a focus on accessibility – the book's existence and use in our program was first and foremost to **reduce the financial barrier of textbook costs for our students**. We have also worked to:

- ensure all images contain accurate and clear alternative text
- use images with high-contrast borders and colours
- included transcripts for all of the embedded Tricky Topics videos in the Appendix, with a direct link from the video to the corresponding transcript (and a returning link from the transcript to the main text)
- reduce unnecessary text and simple language (where possible)

Diversity and Inclusion

With a focus on diversity, inclusion, and equal representation, we are continually updating, correcting, and adding to the relevant content in this book. Although the foundation of the book (OpenStax) had undergone significant review and revision with diversity, identity, representation, and inclusion in mind, we (and our students) have identified several areas that can be improved and ways in which we can add rich sources of diversity to this text.

We began this process (fall 2020) by hiring Jack Williams, a Dalhousie graduate (BA '20 Gender & Women Studies + Creative Writing), who worked with us to update much of the language used throughout the book to ensure it is as inclusive as possible. Additionally, Jack collaborated with Dr. Leanne Stevens and Dr. Jennifer Stamp to add new content and sections to several chapters of the text (e.g. Research Methods, Development, Language, Motivation & Emotion) that explore elements of inclusion/exclusion on our understanding of Psychology & Neuroscience. Although Jack's project has concluded, the process and efforts to continue to ensure inclusivity and diversity throughout the text, are ongoing. We also welcome feedback from students who have questions or concerns pertaining to these efforts.

Indigenization

In an effort to strengthen and deepen the lenses of equity, diversity, and inclusion, we have also been reviewing, editing, and most importantly adding, Indigenous knowledge throughout the text. Our hope is to weave this knowledge throughout our chapters – highlighting significant contributions, ways of knowing, and historical injustices, where appropriate.

Of important note, throughout the text we will use the term 'Indigenous' to refer to all First Nations, Métis, and Inuit. However, when referring to original source material, our policy will be to defer to the language used by the authors of the original source material (e.g., Indigenous, First Nation, Métis, Inuit, Aboriginal, Native American, Maōri, etc.).

This undertaking would not be possible without our collaborations with Jocelyn Paul (*Clinical PhD student; Membertou First Nation*), Max Dysart (*BA '20 Psychology; familial connections to the Qalipu band and to the Indian Head and Penwaaq L'nu'k First Nations*), and Aaron Prosper (*BSc '19 Neuroscience; Eskasoni First Nation*). Jocelyn, Max, and Aaron all braid their understanding of Mi'kmaw and Indigenous culture, traditions, and knowledge with their formal education in Psychology and Neuroscience. This project is ongoing (2023).

ACKNOWLEDGMENTS

Acknowledgements

The initial launch of this text (1st edition) was a large undertaking in a very short period of time. We would like to acknowledge that we see this as an ongoing project, and while we're very proud of what we have accomplished to date, we will be continuing to edit, update, and improve based on the needs of our students and program.

We would first like to thank **Dalhousie's Centre for Learning and Teaching (CLT)** and **Dal Libraries** for awarding us the first-ever Open Educational Resources (OER) grant. This small grant allowed us to hire two (fantastic) student-partners to help us get this project off the ground. We would like to acknowledge and thank (profusely), the two undergraduate students, **Alex Oprea** and **Mallory Whebby**, who were integral to moving this project forward. Both students helped us to review existing material, rework and edit content to better align with our program, highlight potential issues, embed Tricky Topics, and much more. This book would not be possible without their contributions. Also, thanks to **Geoff Brown** of Dal Libraries, who helped us in the

initial stages of setting up the Pressbooks site and working out many of the hiccups we encountered.

Thank you to **Swasti Arora**, a former BA in Psychology student, who was also hired through the OER grant and helped increase the accessibility of the 1st edition of the book by adding and editing the alternative text for all the figures, and replacing figures with some of our custom images (higher-resolution and high-contrast colours). A big thanks also goes out to **Qendresa Sahiti**, a graduate of the BSc (Honours) in Neuroscience and **Dylan Deska-Gauthier** (x-illustrations.ca), a PhD student in Medical Neurosciences at Dalhousie, who were both integral in helping us to recreate and redesign many of our Tricky Topics to ensure they met OER criteria. This allowed us to embed our Tricky Topic videos into the textbook and will allow them to be shared with all students, freely.

We'd like to highlight the amazing custom cover designed by the talented **Molly Wells** (http://www.mollywellsart.ca/scientific-illustration.html). You'll notice many of Molly's custom images throughout the book (mainly concentrated in the Biological Basis of Behaviour and Sensation & Perception) and in several of our Tricky Topics. Molly's images have been designed with accessibility in mind, ensuring high-contrast borders and distinguishable colours.

With the launch of the '2nd edition' of this textbook, it is imperative that we thank **Max Dysart** (BSc Neuroscience graduate) for his substantial contributions to this text. Max

has been, and continues to be, integral in helping to ensure the content in this book not only reflects the diversity and strengths of our student population, but that the text itself is clear, concise, and accessible. Max brings with him a wealth of wisdom and insight through his lived experiences and educational background, and has played a meaningful role in adding several outstanding sections to this text, including (but not limited to) the redesign of the Neurodiversity, PTSD, Development, and Biological Basis of Behaviour sections.

Finally, we would like to respectfully acknowledge and thank **all of the people who donated themselves – their brains, bodies, and behaviours – to science**. Without these individuals, we would not have such a deep and rich understanding of psychology and neuroscience. We owe much of what is known and written about on the following pages to these individuals who have given such an amazing gift. This gratitude also extends to the non-human animals to whom we owe an immeasurable debt. We ask that you reflect on these sacrifices and gifts as you read and learn about cellular function, anatomical structures, neuropathology, treatments, development, personality, learning, and everything else from neurons to behaviour.

ELEMENTS OF THE TEXTBOOK

This textbook contains several highlighted sections aimed at providing readers with information that will (ideally) enrich their experience with the content.

Learning Objectives

Learning Objectives are outlined at the start of each new section (with several sections per chapter). These boxes will highlight the core knowledge, skills, and understanding that is expected from engaging with the content that follows. Use these objectives to help you focus on the most important concepts from each section.

Exercises

Our 'Dig Deeper' sections aim to provide a nuanced and focused exploration of a topic. These sections aim to provide readers with additional context, understanding, and insights, relevant to the broader concepts from a particular section.

Everyday Connections | What do you think?

These sections aim to relate aspects of the content to real-world situations, experiences, and examples ('Everyday Connections'), or push you to consider

ethical, complex, and nuanced topics related to the content ('What do you think?').

Link to Learning

Our 'Link to Learning' sections provide readers with links to external resources and websites that provide additional information about some topics.

UPDATES TO 2ND EDITION

With our first edition, we relied heavily on the foundation of the 2e Psychology text from OpenStax. Since our launch in spring 2020, we've made many changes. Some of these changes were relatively minor, while others have been more substantial. Below you will find a summary of the highlights of some of the key changes we've made, as well as upcoming revisions we have in the works.

Broad Changes

- Theme has been updated to better accommodate all learners (update to fonts, formatting, etc.)
- Clearer distinction between sections/chapters
- Dozens of updates to links for figures, Links to Learning, and other hyperlinks
- Review and implementation of inclusive language (e.g., increase in gender-neutral language, inclusion of they/them in examples and vignettes, inclusive language around sex, development, and reproduction, etc.)
- Addition of Indigenous perspectives, contributions, and

historical injustices (e.g., Blackfoot and Mi'kmaw contributions and approaches to needs models, intergenerational trauma and Indian Residential Schools, memory techniques, etc.)
- Edits throughout to increase conciseness, simplify language, update to Canadian spelling, etc.
- Replacement of several images throughout text to increase diversity and improve user experience
- Last page of each chapter now includes 'Attributions & Acknowledgements' section to highlight new contributions and authors

Focused Changes

- Major updates to Psychological Research chapter, including more relevant examples, considerations for sex and gender in research and interpretation of results, and the reproducibility crisis.
- 'Dig Deeper' added to sensory motor section, exploring the mapping of the male brain and the concept of a female-based homunculus
- Tricky Topics on Drug Mechanisms, Visual Pathways, Spatial Memory, and Hippocampal Memory added
- Large update to Brain & Spinal Cord section in Biological Basis of Behaviour chapter
- Major updates to Development chapter, notably, with the introduction of the terms AFAB and AMAB

(assigned female at birth and assigned male at birth, respectively) to better describe effects of hormones on development. Addition of a more nuanced explanation and exploration of both sex and gender.

- Removal of outdated content in Motivation & Emotion chapter on sex and gender
- Removed uncritical content about Zimbardo study
- Switch from Neurodevelopmental Disorders to Neurodiversity with strengths-based and lived-experience focus
- Content about HM and Brenda Milner added, along with substantial new content on biological basis of memory, memory processes, memory strategies, and errors/forgetting
- All-new section on post-traumatic stress disorder (PTSD) with contemporary focus on health care workers, intersectionality, risk factors, and treatments
- Addition of Neurodegeneration section (Psychopathology chapter)
- Removed several examples that suggested a direct link between psychopathology and violence

CHAPTER I
INTRODUCTION TO PSYCHOLOGY

1.

INTRODUCTION TO PSYCHOLOGY

Chapter Outline

- What Is Psychology?
- History of Psychology
- Contemporary Psychology
- Careers in Psychology

Figure IP.1 Psychology is the scientific study of mind and behaviour. (credit Shutterstock)

Clive Wearing is an accomplished musician who lost his ability to form new memories when he became sick at the age of 46. While he can remember how to play the piano perfectly, he cannot remember what he ate for breakfast just an hour ago (Sacks, 2007). James Wannerton experiences a taste sensation that is associated with the sound of words. His former girlfriend's name tastes like rhubarb (Mundasad, 2013). John

Nash is a brilliant mathematician and Nobel Prize winner. However, while he was a professor at MIT, he would tell people that the *New York Times* contained coded messages from extraterrestrial beings that were intended for him. He also began to hear voices and became suspicious of the people around him. Soon thereafter, Nash was diagnosed with schizophrenia and admitted to a state-run mental institution (O'Connor & Robertson, 2002). Nash was the subject of the 2001 movie *A Beautiful Mind*. Why did these people have these experiences? How does the human brain work? And what is the connection between the brain's internal processes and people's external behaviours? This textbook will introduce you to various ways that the field of psychology has explored these questions.

2.

WHAT IS PSYCHOLOGY?

Learning Objectives

By the end of this section, you will be able to:

- Define psychology
- Understand the merits of an education in psychology

What is creativity? Why do some people become homeless? What are prejudice and discrimination? What is consciousness? The field of psychology explores questions like these. **Psychology** refers to the scientific study of the mind and behaviour. Psychologists use the scientific method to acquire knowledge. To apply the scientific method, a

researcher with a question about how or why something happens will propose a tentative explanation, called a hypothesis, to explain the phenomenon. A hypothesis should fit into the context of a scientific theory, which is a broad explanation or group of explanations for some aspect of the natural world that is consistently supported by evidence over time. A theory is the best understanding we have of that part of the natural world. The researcher then makes observations or carries out an experiment to test the validity of the hypothesis. Those results are then published or presented at research conferences so that others can replicate or build on the results.

Scientists test that which is perceivable and measurable. For example, the hypothesis that a bird sings because it is happy is not a hypothesis that can be tested since we have no way to measure the happiness of a bird. We must ask a different question, perhaps about the brain state of the bird, since this can be measured. However, we can ask individuals about whether they sing because they are happy since they are able to tell us. Thus, psychological science is empirical, based on measurable data.

In general, science deals only with matter and energy, that is, those things that can be measured, and it cannot arrive at knowledge about values and morality. This is one reason why our scientific understanding of the mind is so limited, since thoughts, at least as we experience them, are neither matter nor energy. The scientific method is also a form of empiricism;

the idea that knowledge and thoughts comes from experience. An **empirical method** for acquiring knowledge is one based on observation, including experimentation, rather than a method based only on forms of logical argument or previous authorities.

It was not until the late 1800s that psychology became accepted as its own academic discipline. Before this time, the workings of the mind were considered under the auspices of philosophy. We now consider psychology to be a core science similar to medicine, physics, and math. Given that any behaviour is, at its roots, biological, some areas of psychology take on aspects of a natural science like biology. No biological organism exists in isolation, and our behaviour is influenced by our interactions with others. Therefore, psychology is also a social science. So, unlike disciplines such as literature, history and sociology, which psychology has previously been associated with, psychology is a science.

TRICKY TOPIC: WHAT IS PSYCHOLOGY & NEUROSCIENCE?

One or more interactive elements has been excluded from this version of the text. You can view them online here: https://caul-

cbua.pressbooks.pub/
intropsychneuro/?p=376#oembed-1

If the video above does not load, click here: https://youtu.be/AcDE-sJLmWs
For a full transcript of this video, click here.

Why Study Psychology?

Often, students take their first psychology course because they are interested in helping others and want to learn more about themselves and why they act the way they do. Sometimes, students take a psychology course because it either satisfies a general education requirement or is required for a program of study such as nursing or pre-med. Many of these students develop such an interest in the area that they go on to declare psychology as their major. As a result, psychology is one of the most popular majors on college campuses across the United States (Johnson & Lubin, 2011). A number of well-known individuals were psychology majors. Just a few famous names on this list are Facebook's creator Mark Zuckerberg, television personality and political satirist Jon Stewart, actress Natalie Portman, and filmmaker Wes Craven (Halonen, 2011). About 6 percent of all bachelor degrees granted in the United States

are in the discipline of psychology (U.S. Department of Education, 2016).

An education in psychology is valuable for a number of reasons. Psychology students hone critical thinking skills and are trained in the use of the scientific method. Critical thinking is the active application of a set of skills to information for the understanding and evaluation of that information. The evaluation of information—assessing its reliability and usefulness— is an important skill in a world full of competing "facts," many of which are designed to be misleading. For example, critical thinking involves maintaining an attitude of skepticism, recognizing internal biases, making use of logical thinking, asking appropriate questions, and making observations. Psychology students also can develop better communication skills during the course of their undergraduate coursework (American Psychological Association, 2011). Together, these factors increase students' scientific literacy and prepare students to critically evaluate the various sources of information they encounter.

In addition to these broad-based skills, psychology students come to understand the complex factors that shape one's behaviour. They appreciate the interaction of our biology, our environment, and our experiences in determining who we are and how we will behave. They learn about basic principles that guide how we think and behave, and they come to recognize the tremendous diversity that exists across individuals and

across cultural boundaries (American Psychological Association, 2011).

Link to Learning

Watch a brief video about some questions to consider before deciding to major in psychology to learn more.

3.

HISTORY OF PSYCHOLOGY

Learning Objectives

By the end of this section, you will be able to:

- Understand the importance of Wundt and James in the development of psychology
- Appreciate Freud's influence on psychology
- Understand the basic tenets of Gestalt psychology
- Appreciate the important role that behaviourism played in psychology's history
- Understand basic tenets of humanism
- Understand how the cognitive revolution

shifted psychology's focus back to the mind

Psychology is a relatively young science with its experimental roots in the 19th century, compared, for example, to human physiology, which dates much earlier. As mentioned, anyone interested in exploring issues related to the mind generally did so in a philosophical context prior to the 19th century. Two 19th century scholars, Wilhelm Wundt (Germany) and William James (North America), are generally credited as being the founders of psychology as a science and academic discipline that was distinct from philosophy. This section will provide an overview of the shifts in paradigms that have influenced psychology from Wundt and James through today.

Wundt and Structuralism

Wilhelm Wundt (1832–1920) was a German scientist who was the first person to be referred to as a psychologist. His famous book entitled *Principles of Physiological Psychology* was published in 1873. Wundt viewed psychology as a scientific study of conscious experience, and he believed that the goal of psychology was to identify components of consciousness and how those components combined to result in our conscious

experience. Wundt used **introspection** (he called it "internal perception"), a process by which someone examines their own conscious experience as objectively as possible, making the human mind like any other aspect of nature that a scientist observed. He believed in the notion of voluntarism—that people have free will and should know the intentions of a psychological experiment if they were participating (Danziger, 1980). Wundt considered his version experimental introspection; he used instruments such as those that measured reaction time. He also wrote *Volkerpsychologie* in 1904 in which he suggested that psychology should include the study of culture, as it involves the study of people. Edward Titchener, one of his students, went on to develop **structuralism**. Its focus was on the contents of mental processes rather than their function (Pickren & Rutherford, 2010). Wundt established his psychology laboratory at the University at Leipzig in 1879 (Figure IP.2). In this laboratory, Wundt and his students conducted experiments on, for example, reaction times. A subject, sometimes in a room isolated from the scientist, would receive a stimulus such as a light, image, or sound. The subject's reaction to the stimulus would be to push a button, and an apparatus would record the time to reaction. Wundt could measure reaction time to one-thousandth of a second (Nicolas & Ferrand, 1999).

(a)

(b)

Figure IP.2 (a) Wilhelm Wundt is credited as one of the founders of psychology. He created the first laboratory for psychological research. (b) This photo shows him seated and surrounded by fellow researchers and equipment in his laboratory in Germany.

However, despite his efforts to train individuals in the process of introspection, this process remained highly subjective, and there was very little agreement between individuals.

James and Functionalism

William James (1842–1910) was the first American psychologist who espoused a different perspective on how psychology should operate (Figure IP.3). James was introduced to Darwin's theory of evolution by natural selection and accepted it as an explanation of an organism's characteristics. Key to that theory is the idea that **natural selection** leads to

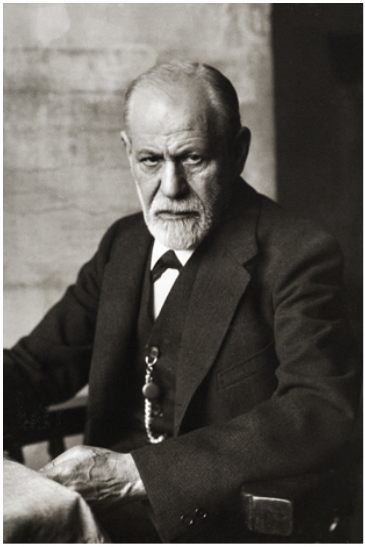
organisms that are adapted to their environment, including their behaviour. **Adaptation** means that a trait of an organism has a function for the survival and reproduction of the individual, because it has been naturally selected. As James saw it, psychology's purpose was to study the function of behaviour in the world, and as such, his perspective was known as **functionalism**. Functionalism focused on how mental activities helped an organism fit into its environment. Functionalism has a second, more subtle meaning in that functionalists were more interested in the operation of the whole mind rather than of its individual parts, which were the focus of structuralism. Like Wundt, James believed that introspection could serve as one means by which someone might study mental activities, but James also relied on more objective measures, including the use of various recording devices, and examinations of concrete products of mental activities and of anatomy and physiology (Gordon, 1995).

Figure IP.3 William James, shown here in a self-portrait, was the first American psychologist.

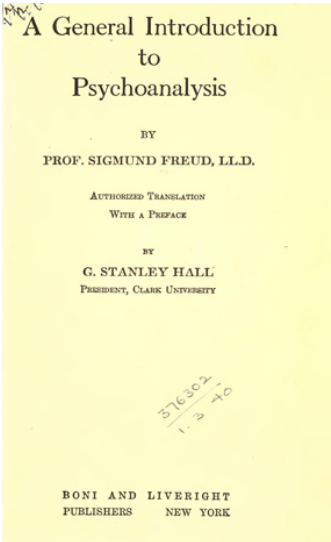
Freud and Psychoanalytic Theory

Perhaps one of the most influential and well-known figures in psychology's history was Sigmund Freud (Figure IP.4). Freud (1856–1939) was an Austrian neurologist who was fascinated by patients suffering from "hysteria" and neurosis. Hysteria was an ancient diagnosis for disorders, primarily of women

with a wide variety of symptoms, including physical symptoms and emotional disturbances, none of which had an apparent physical cause. Freud theorized that many of his patients' problems arose from the unconscious mind. In Freud's view, the unconscious mind was a repository of feelings and urges of which we have no awareness. Gaining access to the unconscious, then, was crucial to the successful resolution of the patient's problems. According to Freud, the unconscious mind could be accessed through dream analysis, by examinations of the first words that came to people's minds, and through seemingly innocent slips of the tongue. **Psychoanalytic theory** focuses on the role of a person's unconscious, as well as early childhood experiences, and this particular perspective dominated clinical psychology for several decades (Thorne & Henley, 2005).



(a)



A General Introduction
to
Psychoanalysis

BY

PROF. SIGMUND FREUD, LL.D.

AUTHORIZED TRANSLATION
WITH A PREFACE

BY

G. STANLEY HALL
PRESIDENT, CLARK UNIVERSITY

BONI AND LIVERIGHT
PUBLISHERS NEW YORK

(b)

Figure IP.4 (a) Sigmund Freud was a highly influential figure in the history of psychology. (b) One of his many books, A General Introduction to Psychoanalysis, shared his ideas about psychoanalytical therapy; it was published in 1922.

Freud's ideas were influential, and you will learn more about them when you study lifespan development, personality, and therapy. For instance, many therapists believe strongly in the unconscious and the impact of early childhood experiences on the rest of a person's life. The method of psychoanalysis, which involves the patient talking about their experiences and selves, while not invented by Freud, was certainly popularized by him and is still used today. Many of Freud's other ideas,

however, are controversial. Drew Westen (1998) argues that many of the criticisms of Freud's ideas are misplaced, in that they attack his older ideas without taking into account later writings. Westen also argues that critics fail to consider the success of the broad ideas that Freud introduced or developed, such as the importance of childhood experiences in adult motivations, the role of unconscious versus conscious motivations in driving our behaviour, the fact that motivations can cause conflicts that affect behaviour, the effects of mental representations of ourselves and others in guiding our interactions, and the development of personality over time. Westen identifies subsequent research support for all of these ideas.

More modern iterations of Freud's clinical approach have been empirically demonstrated to be effective (Knekt et al., 2008; Shedler, 2010). Some current practices in psychotherapy involve examining unconscious aspects of the self and relationships, often through the relationship between the therapist and the client. Freud's historical significance and contributions to clinical practice merit his inclusion in a discussion of the historical movements within psychology.

Wertheimer, Koffka, Köhler, and Gestalt Psychology

Max Wertheimer (1880–1943), Kurt Koffka (1886–1941),

and Wolfgang Köhler (1887–1967) were three German psychologists who immigrated to the United States in the early 20th century to escape Nazi Germany. These scholars are credited with introducing psychologists in the United States to various Gestalt principles. The word Gestalt roughly translates to "whole;" a major emphasis of Gestalt psychology deals with the fact that although a sensory experience can be broken down into individual parts, how those parts relate to each other as a whole is often what the individual responds to in perception. For example, a song may be made up of individual notes played by different instruments, but the real nature of the song is perceived in the combinations of these notes as they form the melody, rhythm, and harmony. In many ways, this particular perspective would have directly contradicted Wundt's ideas of structuralism (Thorne & Henley, 2005). Simply put, one can think of this as explaining how we perceive something in terms of the whole, rather than the individual parts comprising the whole.

Unfortunately, in moving to the United States, these scientists were forced to abandon much of their work and were unable to continue to conduct research on a large scale. These factors along with the rise of behaviourism (described next) in the United States prevented principles of Gestalt psychology from being as influential in the United States as they had been in their native Germany (Thorne & Henley, 2005). Despite these issues, several Gestalt principles are still very influential today. Considering the human individual as a whole rather

than as a sum of individually measured parts became an important foundation in humanistic theory late in the century. The ideas of Gestalt have continued to influence research on sensation and perception.

Structuralism, Freud, and the Gestalt psychologists were all concerned in one way or another with describing and understanding inner experience. But other researchers had concerns that inner experience could be a legitimate subject of scientific inquiry and chose instead to exclusively study behaviour, the objectively observable outcome of mental processes.

Pavlov, Watson, Skinner, and Behaviourism

Early work in the field of behaviour was conducted by the Russian physiologist Ivan Pavlov (1849–1936). Pavlov studied a form of learning behaviour called a conditioned reflex, in which an animal or human produced a reflex (unconscious) response to a stimulus and, over time, was conditioned to produce the response to a different stimulus that the experimenter associated with the original stimulus. The reflex Pavlov worked with was salivation in response to the presence of food. The salivation reflex could be elicited using a second stimulus, such as a specific sound, that was presented in association with the initial food stimulus several times. Once the response to the second stimulus was "learned," the food

stimulus could be omitted. Pavlov's "classical conditioning" is only one form of learning behaviour studied by behaviourists.

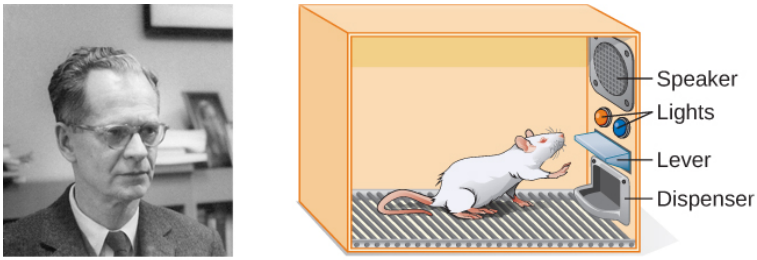
John B. Watson (1878–1958) was an influential American psychologist whose most famous work occurred during the early 20th century at Johns Hopkins University (Figure IP.5). While Wundt and James were concerned with understanding conscious experience, Watson thought that the study of consciousness was flawed. Because he believed that objective analysis of the mind was impossible, Watson preferred to focus directly on observable behaviour and try to bring that behaviour under control. Watson was a major proponent of shifting the focus of psychology from the mind to behaviour, and this approach of observing and controlling behaviour came to be known as **behaviourism**. A major object of study by behaviourists was learned behaviour and its interaction with inborn qualities of the organism. Behaviourism commonly used animals in experiments under the assumption that what was learned using animal models could, to some degree, be applied to human behaviour. Indeed, Tolman (1938) stated, "I believe that everything important in psychology (except … such matters as involve society and words) can be investigated in essence through the continued experimental and theoretical analysis of the determiners of rat behaviour at a choice-point in a maze."

Figure IP.5 John B. Watson is known as the father of behaviourism within psychology.

Behaviourism dominated experimental psychology for several decades, and its influence can still be felt today (Thorne & Henley, 2005). Behaviourism is largely responsible for establishing psychology as a scientific discipline through its objective methods and especially experimentation. In addition, it is used in behavioural and cognitive-behavioural therapy. Behaviour modification is commonly used in

classroom settings. Behaviourism has also led to research on environmental influences on human behaviour.

B. F. Skinner (1904–1990) was an American psychologist (Figure IP.6). Like Watson, Skinner was a behaviourist, and he concentrated on how behaviour was affected by its consequences. Therefore, Skinner spoke of reinforcement and punishment as major factors in driving behaviour. As a part of his research, Skinner developed a chamber that allowed the careful study of the principles of modifying behaviour through reinforcement and punishment. This device, known as an operant conditioning chamber (or more familiarly, a Skinner box), has remained a crucial resource for researchers studying behaviour (Thorne & Henley, 2005).



(a) (b)

Figure IP.6 (a) B. F. Skinner is famous for his research on operant conditioning. (b) Modified versions of the operant conditioning chamber, or Skinner box, are still widely used in research settings today. (credit a: modification of work by "Silly rabbit"/Wikimedia Commons)

The Skinner box is a chamber that isolates the subject from the external environment and has a behaviour indicator such as a lever or a button. When the animal pushes the button or lever, the box is able to deliver a positive reinforcement of the behaviour (such as food) or a punishment (such as a noise) or a token conditioner (such as a light) that is correlated with either the positive reinforcement or punishment.

Skinner's focus on positive and negative reinforcement of learned behaviours had a lasting influence in psychology that has waned somewhat since the growth of research in cognitive psychology. Despite this, conditioned learning is still used in human behavioural modification. Skinner's two widely read and controversial popular science books about the value of operant conditioning for creating happier lives remain as thought-provoking arguments for his approach (Greengrass, 2004).

Maslow, Rogers, and Humanism

During the early 20th century, American psychology was dominated by behaviourism and psychoanalysis. However, some psychologists were uncomfortable with what they viewed as limited perspectives being so influential to the field. They objected to the pessimism and determinism (all actions driven by the unconscious) of Freud. They also disliked the reductionism, or simplifying nature, of behaviourism.

Behaviourism is also deterministic at its core, because it sees human behaviour as entirely determined by a combination of genetics and environment. Some psychologists began to form their own ideas that emphasized personal control, intentionality, and a true predisposition for "good" as important for our self-concept and our behaviour. Thus, humanism emerged. **Humanism** is a perspective within psychology that emphasizes the potential for good that is innate to all humans. Two of the most well-known proponents of humanistic psychology are Abraham Maslow and Carl Rogers (O'Hara, n.d.).

Abraham Maslow (1908–1970) was an American psychologist who is best known for proposing a hierarchy of human needs in motivating behaviour (Figure IP.7). Although this concept (and the connection to the Blackfoot Nation) will be discussed in more detail in a later chapter, a brief overview will be provided here. Maslow asserted that so long as basic needs necessary for survival were met (e.g., food, water, shelter), higher-level needs (e.g., social needs) would begin to motivate behaviour. According to Maslow, the highest-level needs relate to self-actualization, a process by which we achieve our full potential. Obviously, the focus on the positive aspects of human nature that are characteristic of the humanistic perspective is evident (Thorne & Henley, 2005). Humanistic psychologists rejected, on principle, the research approach based on reductionist experimentation in the tradition of the physical and biological sciences, because it missed the "whole"

human being. Beginning with Maslow and Rogers, there was an insistence on a humanistic research program. This program has been largely qualitative (not measurement-based), but there exist a number of quantitative research strains within humanistic psychology, including research on happiness, self-concept, meditation, and the outcomes of humanistic psychotherapy (Friedman, 2008).

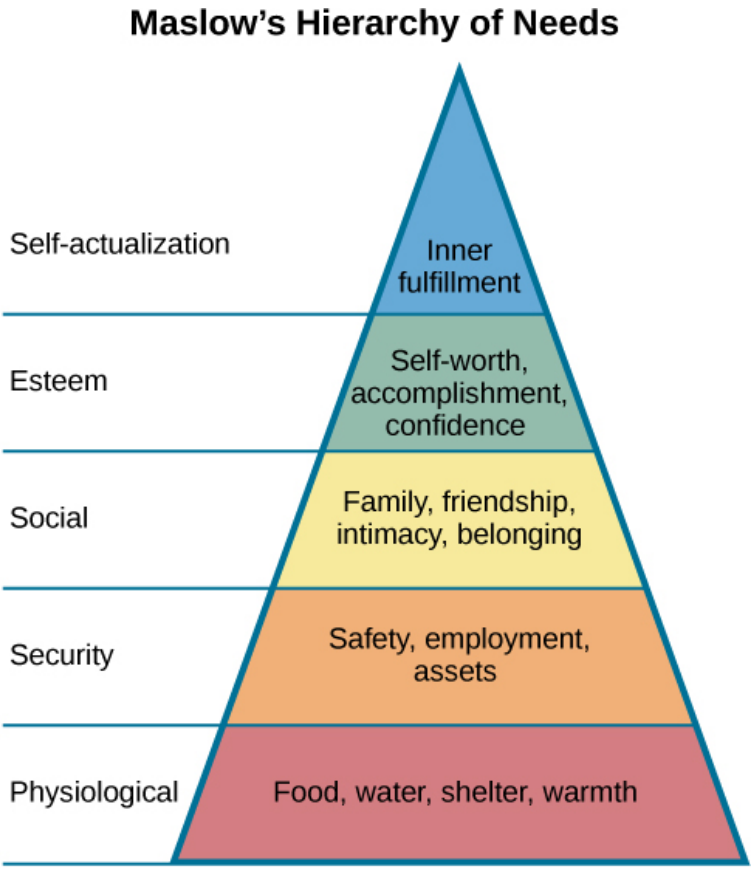


Figure IP.7 Maslow's hierarchy of needs is shown.

Carl Rogers (1902–1987) was also an American psychologist who, like Maslow, emphasized the potential for good that exists within all people (Figure IP.8). Rogers used a therapeutic technique known as client-centred therapy in helping his clients deal with problematic issues that resulted in their

seeking psychotherapy. Unlike a psychoanalytic approach in which the therapist plays an important role in interpreting what conscious behaviour reveals about the unconscious mind, client-centred therapy involves the patient taking a lead role in the therapy session. Rogers believed that a therapist needed to display three features to maximize the effectiveness of this particular approach: unconditional positive regard, genuineness, and empathy. Unconditional positive regard refers to the fact that the therapist accepts their client for who they are, no matter what he or she might say. Provided these factors, Rogers believed that people were more than capable of dealing with and working through their own issues (Thorne & Henley, 2005).

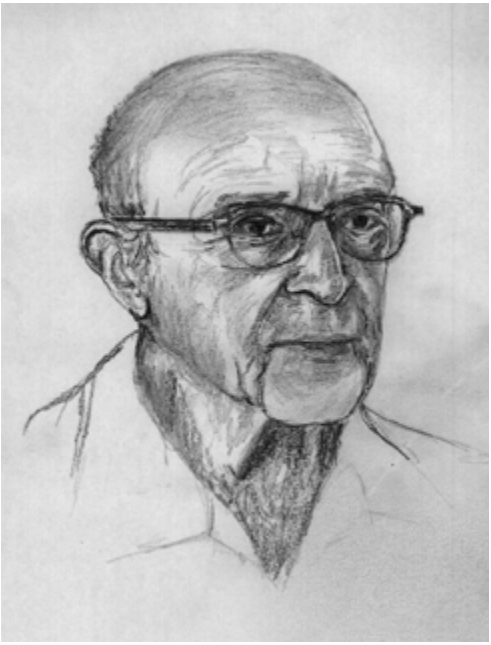


Figure IP.8 Carl Rogers, shown in this portrait, developed a client-centred therapy method that has been influential in clinical settings. (credit: "Didius"/Wikimedia Commons)

Humanism has been influential to psychology as a whole. Both Maslow and Rogers are well-known names among students of psychology (you will read more about both later in this text), and their ideas have influenced many scholars. Furthermore, Rogers' client-centred approach to therapy is still commonly used in psychotherapeutic settings today (O'Hara, n.d.)

Link to Learning

View a brief video of Carl Rogers describing his therapeutic approach to learn more.

The Cognitive Revolution

Behaviourism's emphasis on objectivity and focus on external behaviour had pulled psychologists' attention away from the mind for a prolonged period of time. The early work of the humanistic psychologists redirected attention to the individual human as a whole, and as a conscious and self-aware being. By the 1950s, new disciplinary perspectives in linguistics, neuroscience, and computer science were emerging, and these areas revived interest in the mind as a focus of scientific inquiry. This particular perspective has come to be known as the cognitive revolution (Miller, 2003). By 1967, Ulric Neisser published the first textbook entitled *Cognitive Psychology*,

which served as a core text in cognitive psychology courses around the country (Thorne & Henley, 2005).

Although no one person is entirely responsible for starting the cognitive revolution, Noam Chomsky was very influential in the early days of this movement (Figure IP.9). Chomsky (1928–), an American linguist, was dissatisfied with the influence that behaviourism had had on psychology. He believed that psychology's focus on behaviour was short-sighted and that the field had to re-incorporate mental functioning into its purview if it were to offer any meaningful contributions to understanding behaviour (Miller, 2003).

Figure IP.9 Noam Chomsky was very influential in beginning the cognitive revolution. In 2010, this mural honouring him was put up in Philadelphia, Pennsylvania. (credit: Robert Moran)

European psychology had never really been as influenced by behaviourism as had American psychology; and thus, the cognitive revolution helped reestablish lines of communication between European psychologists and their American counterparts. Furthermore, psychologists began to cooperate with scientists in other fields, like anthropology, linguistics, computer science, and neuroscience, among others. Researchers often used computer models to examine reasoning and problem solving in humans. This interdisciplinary approach often was referred to as the cognitive sciences, and the influence and prominence of this particular perspective resonates in modern-day psychology (Miller, 2003).

Dig Deeper

Feminist Psychology

The science of psychology has had an impact on human wellbeing, both positive and negative. The

dominant influence of Western, white, and male academics in the early history of psychology meant that psychology developed with the biases inherent in those individuals, which often had negative consequences for members of society who were not white or male. Women, members of ethnic minorities in both the United States and other countries, and individuals with sexual orientations other than straight had difficulties entering the field of psychology and therefore influencing its development. They also suffered from the attitudes of white male psychologists who were not immune to the nonscientific attitudes prevalent in the society in which they developed and worked. Until the 1960s, the science of psychology was largely a "womanless" psychology (Crawford & Marecek, 1989), meaning that few women were able to practice psychology, so they had little influence on what was studied. In addition, the experimental subjects of psychology were mostly men, which resulted from underlying assumptions that gender had no influence on psychology and that women were not of sufficient interest to study.

An article by Naomi Weisstein, first published in 1968 (Weisstein, 1993), stimulated a feminist revolution in psychology by presenting a critique of

psychology as a science. She also specifically criticized male psychologists for constructing the psychology of women entirely out of their own cultural biases and without careful experimental tests to verify any of their characterizations of women. Weisstein used, as examples, statements by prominent psychologists in the 1960s, such as this quote by Bruno Bettleheim: "We must start with the realization that, as much as women want to be good scientists or engineers, they want first and foremost to be womanly companions of men and to be mothers." Weisstein's critique formed the foundation for the subsequent development of a feminist psychology that attempted to be free of the influence of male cultural biases on our knowledge of the psychology of women.

Crawford & Marecek (1989) identify several feminist approaches to psychology that can be described as feminist psychology. These include re-evaluating and discovering the contributions of women to the history of psychology, studying psychological gender differences, and questioning the male bias present across the practice of the scientific approach to knowledge.

Multicultural And Cross-Cultural Psychology

Culture has important impacts on individuals and social psychology, yet the effects of culture on psychology are under-studied. There is a risk that psychological theories and data derived from white, American settings could be assumed to apply to individuals and social groups from other cultures and this is unlikely to be true (Betancourt & López, 1993). One weakness in the field of cross-cultural psychology is that in looking for differences in psychological attributes across cultures, there remains a need to go beyond simple descriptive statistics (Betancourt & López, 1993). In this sense, it has remained a descriptive science, rather than one seeking to determine cause and effect. For example, a study of characteristics of individuals seeking treatment for a binge eating disorder in Hispanic American, African American, and Caucasian American individuals found significant differences between groups (Franko et al., 2012). The study concluded that results from studying any one of the groups could not be extended to the other groups, and yet potential causes of the differences were not measured. Multicultural psychologists develop theories and conduct research with diverse populations, typically within one country. Cross-cultural psychologists compare populations across countries, such as participants from the United States compared to participants from China.

In 1920, Francis Cecil Sumner was the first African American to receive a PhD in psychology in the United States. Sumner established a psychology degree program at Howard University, leading to the education of a new generation of African American psychologists (Black, Spence, and Omari, 2004). Much of the work of early psychologists from diverse backgrounds was dedicated to challenging intelligence testing and promoting innovative educational methods for children. George I. Sanchez contested such testing with Mexican American children. As a psychologist of Mexican heritage, he pointed out that the language and cultural barriers in testing were keeping children from equal opportunities (Guthrie, 1998). By 1940, he was teaching with his doctoral degree at University of Texas at Austin and challenging segregated educational practices (Romo, 1986).

Figure IP.10 Social psychologists Dr. Mamie Phipps Clark and husband Dr. Kenneth Clark. The first African-Americans to obtain Doctorate degrees from the University of Colombia (image courtesy of the Garland County Historical Society)

Two famous African American researchers and psychologists are Mamie Phipps Clark and her husband, Kenneth Clark (Figure IP.10). They are best known for their studies

conducted on African American children and doll preference, research that was instrumental in the *Brown v. Board of Education* Supreme Court desegregation case. The Clarks applied their research to social services and opened the first child guidance centre in Harlem (American Psychological Association, 2019).

LINK TO LEARNING

Listen to a podcast about the influence of an African American's psychology research on the historic *Brown v. Board of Education* civil rights case, to learn more.

The American Psychological Association has several ethnically based organizations for professional psychologists that facilitate interactions among members. Since psychologists belonging to specific ethnic groups or cultures have the most interest in studying the psychology of their communities, these organizations provide an opportunity for the growth of research on the interplay between culture and psychology.

WOMEN IN PSYCHOLOGY

Although rarely given credit, women have been contributing to psychology since its inception as a field of study. In 1894, Margaret Floy Washburn was the first woman awarded the doctoral degree in psychology. She wrote *The Animal Mind: A Textbook of Comparative Psychology*, and it was the standard in the field for over 20 years. In the mid 1890s, Mary Whiton Calkins completed all requirements toward the PhD in psychology, but Harvard University refused to award her that degree because she was a woman. She had been taught and mentored by William James, who tried and failed to convince Harvard to award her the doctoral degree. Her memory research studied primacy and recency (Madigan & O'Hara, 1992), and she also wrote about how structuralism and functionalism both explained self-psychology (Calkins, 1906).

Another influential woman, Mary Cover Jones, conducted a study she considered to be a sequel to John B. Watson's study of Little Albert (you'll learn about this study in the chapter on Learning). Jones unconditioned fear in Little Peter, who had been afraid of rabbits (Jones, 1924).

Ethnic minority women contributing to the field of psychology include Martha Bernal and Inez Beverly Prosser; their studies were related to education. Bernal, the first Latina to earn her doctoral degree in psychology (1962) conducted much of her research with Mexican American children. Prosser was the first African American woman awarded the

PhD in 1933 at the University of Cincinnati (Benjamin, Henry, & McMahon, 2005).

4.

CONTEMPORARY PSYCHOLOGY

Learning Objectives

By the end of this section, you will be able to:

- Appreciate the diversity of interests and foci within psychology
- Understand basic interests and applications in each of the described areas of psychology
- Demonstrate familiarity with some of the major concepts or important figures in each of the described areas of psychology

Contemporary psychology is a diverse field that is influenced

by all of the historical perspectives described in the preceding section. Reflective of the discipline's diversity is the diversity seen within the American Psychological Association (APA). The APA is a professional organization representing psychologists in the United States. The APA is the largest organization of psychologists in the world, and its mission is to advance and disseminate psychological knowledge for the betterment of people. There are 56 divisions within the APA, representing a wide variety of specialties that range from Societies for the Psychology of Religion and Spirituality to Exercise and Sport Psychology to Behavioural Neuroscience and Comparative Psychology. Reflecting the diversity of the field of psychology itself, members, affiliate members, and associate members span the spectrum from students to doctoral-level psychologists, and come from a variety of places including educational settings, criminal justice, hospitals, the armed forces, and industry (American Psychological Association, 2014). G. Stanley Hall was the first president of the APA. Before he earned his doctoral degree, he was an adjunct instructor at Wilberforce University, a historically black college/university (HBCU), while serving as faculty at Antioch College. Hall went on to work under William James, earning his PhD. Eventually, he became the first president of Clark University in Massachusetts when it was founded (Pickren & Rutherford, 2010).

The Association for Psychological Science (APS) was founded in 1988 and seeks to advance the scientific orientation

of psychology. Its founding resulted from disagreements between members of the scientific and clinical branches of psychology within the APA. The APS publishes five research journals and engages in education and advocacy with funding agencies. A significant proportion of its members are international, although the majority is located in the United States. Other organizations provide networking and collaboration opportunities for professionals of several ethnic or racial groups working in psychology, such as the National Latina/o Psychological Association (NLPA), the Asian American Psychological Association (AAPA), the Association of Black Psychologists (ABPsi), and the Society of Indian Psychologists (SIP). Most of these groups are also dedicated to studying psychological and social issues within their specific communities.

This section will provide an overview of the major subdivisions within psychology today in the order in which they are introduced throughout the remainder of this textbook. This is not meant to be an exhaustive listing, but it will provide insight into the major areas of research and practice of modern-day psychologists.

Link to Learning

View these student resources also provided by the Canadian Psychological Association (CPA).

Biopsychology and Evolutionary Psychology

As the name suggests, **biopsychology** explores how our biology influences our behaviour. While biological psychology is a broad field, many biological psychologists want to understand how the structure and function of the nervous system is related to behaviour (Figure IP.11). As such, they often combine the research strategies of both psychologists and physiologists to accomplish this goal (as discussed in Carlson, 2013).

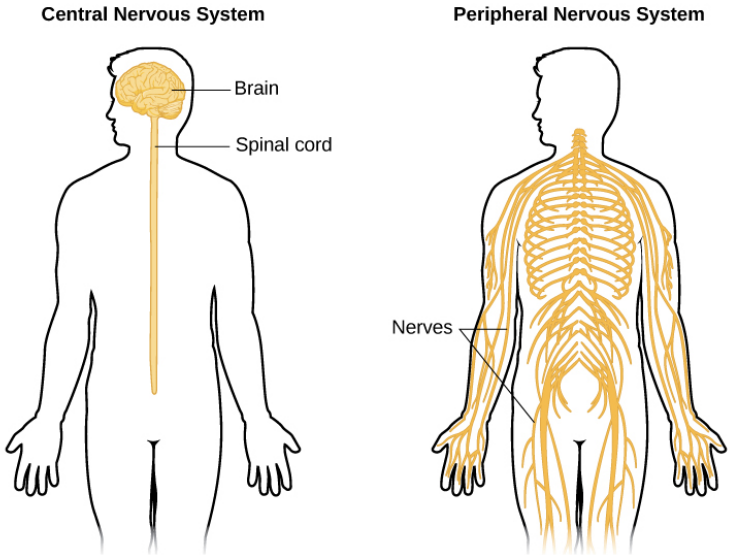


Figure IP.11 Biological psychologists study how the structure and function of the nervous system generate behaviour.

The research interests of biological psychologists span a number of domains, including but not limited to, sensory and motor systems, sleep, drug use and abuse, ingestive behaviour, reproductive behaviour, neurodevelopment, plasticity of the nervous system, and biological correlates of psychological disorders. Given the broad areas of interest falling under the purview of biological psychology, it will probably come as no surprise that individuals from all sorts of backgrounds are involved in this research, including biologists, medical professionals, physiologists, and chemists. This interdisciplinary approach is often referred to as neuroscience,

of which biological psychology is a component (Carlson, 2013).

While biopsychology typically focuses on the immediate causes of behaviour based in the physiology of a human or other animal, **evolutionary psychology** seeks to study the ultimate biological causes of behaviour. To the extent that a behaviour is impacted by genetics, a behaviour, like any anatomical characteristic of a human or animal, will demonstrate adaption to its surroundings. These surroundings include the physical environment and, since interactions between organisms can be important to survival and reproduction, the social environment. The study of behaviour in the context of evolution has its origins with Charles Darwin, the co-discoverer of the theory of evolution by natural selection. Darwin was well aware that behaviours should be adaptive and wrote books titled, *The Descent of Man* (1871) and *The Expression of the Emotions in Man and Animals* (1872), to explore this field.

Evolutionary psychology, and specifically, the evolutionary psychology of humans, has enjoyed a resurgence in recent decades. To be subject to evolution by natural selection, a behaviour must have a significant genetic cause. In general, we expect all human cultures to express a behaviour if it is caused genetically, since the genetic differences among human groups are small. The approach taken by most evolutionary psychologists is to predict the outcome of a behaviour in a

particular situation based on evolutionary theory and then to make observations, or conduct experiments, to determine whether the results match the theory. It is important to recognize that these types of studies are not strong evidence that a behaviour is adaptive, since they lack information that the behaviour is in some part genetic and not entirely cultural (Endler, 1986). Demonstrating that a trait, especially in humans, is naturally selected is extraordinarily difficult; perhaps for this reason, some evolutionary psychologists are content to assume the behaviours they study have genetic determinants (Confer et al., 2010).

One other drawback of evolutionary psychology is that the traits that we possess now evolved under environmental and social conditions far back in human history, and we have a poor understanding of what these conditions were. This makes predictions about what is adaptive for a behaviour difficult. Behavioural traits need not be adaptive under current conditions, only under the conditions of the past when they evolved, about which we can only hypothesize.

There are many areas of human behaviour for which evolution can make predictions. Examples include memory, mate choice, relationships between kin, friendship and cooperation, parenting, social organization, and status (Confer et al., 2010).

Evolutionary psychologists have had success in finding experimental correspondence between observations and expectations. In one example, in a study of mate preference

differences between men and women that spanned 37 cultures, Buss (1989) found that women valued earning potential factors greater than men, and men valued potential reproductive factors (youth and attractiveness) greater than women in their prospective mates. In general, the predictions were in line with the predictions of evolution, although there were deviations in some cultures.

Sensation and Perception

Scientists interested in both physiological aspects of sensory systems as well as in the psychological experience of sensory information work within the area of sensation and perception (Figure IP.12). As such, sensation and perception research is also quite interdisciplinary. Imagine walking between buildings as you move from one class to another. You are inundated with sights, sounds, touch sensations, and smells. You also experience the temperature of the air around you and maintain your balance as you make your way. These are all factors of interest to someone working in the domain of sensation and perception.

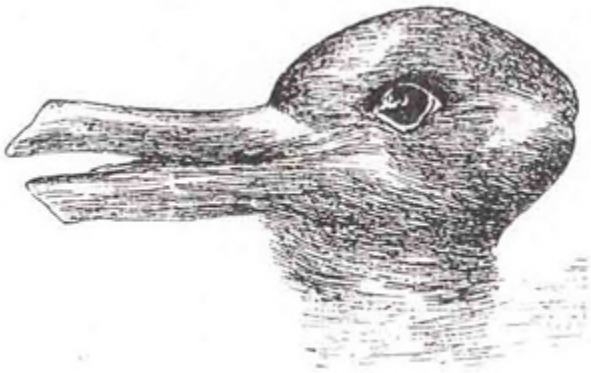


Figure IP.12 When you look at this image, you may see a duck or a rabbit. The sensory information remains the same, but your perception can vary dramatically.

As described in a later chapter that focuses on the results of studies in sensation and perception, our experience of our world is not as simple as the sum total of all of the sensory information (or sensations) together. Rather, our experience (or perception) is complex and is influenced by where we focus our attention, our previous experiences, and even our cultural backgrounds.

Cognitive Psychology

As mentioned in the previous section, the cognitive revolution created an impetus for psychologists to focus their attention on better understanding the mind and mental processes that

underlie behaviour. Thus, **cognitive psychology** is the area of psychology that focuses on studying cognitions, or thoughts, and their relationship to our experiences and our actions. Like biological psychology, cognitive psychology is broad in its scope and often involves collaborations among people from a diverse range of disciplinary backgrounds. This has led some to coin the term cognitive science to describe the interdisciplinary nature of this area of research (Miller, 2003).

Cognitive psychologists have research interests that span a spectrum of topics, ranging from attention to problem solving to language to memory. The approaches used in studying these topics are equally diverse. Given such diversity, cognitive psychology is not captured in one chapter of this text per se; rather, various concepts related to cognitive psychology will be covered in relevant portions of the chapters in this text on sensation and perception, thinking and intelligence, memory, lifespan development, social psychology, and therapy.

Developmental Psychology

Developmental psychology is the scientific study of development across a lifespan. Developmental psychologists are interested in processes related to physical maturation. However, their focus is not limited to the physical changes associated with aging, as they also focus on changes in cognitive skills, moral reasoning, social behaviour, and other psychological attributes.

Early developmental psychologists focused primarily on changes that occurred through reaching adulthood, providing enormous insight into the differences in physical, cognitive, and social capacities that exist between very young children and adults. For instance, research by Jean Piaget (Figure IP.13) demonstrated that very young children do not demonstrate object permanence. Object permanence refers to the understanding that physical things continue to exist, even if they are hidden from us. If you were to show an adult a toy, and then hide it behind a curtain, the adult knows that the toy still exists. However, very young infants act as if a hidden object no longer exists. The age at which object permanence is achieved is somewhat controversial (Munakata, McClelland, Johnson, and Siegler, 1997).

Figure IP.13 Jean Piaget is famous for his theories regarding changes in cognitive ability that occur as we move from infancy to adulthood.

While Piaget was focused on cognitive changes during infancy and childhood as we move to adulthood, there is an increasing interest in extending research into the changes that occur much later in life. This may be reflective of changing population demographics of developed nations as a whole.

As more and more people live longer lives, the number of people of advanced age will continue to increase. Indeed, it is estimated that there were just over 40 million people aged 65 or older living in the United States in 2010. However, by 2020, this number is expected to increase to about 55 million. By the year 2050, it is estimated that nearly 90 million people in this country will be 65 or older (Department of Health and Human Services, n.d.).

Personality Psychology

Personality psychology focuses on patterns of thoughts and behaviours that make each individual unique. Several individuals (e.g., Freud and Maslow) that we have already discussed in our historical overview of psychology, and the American psychologist Gordon Allport, contributed to early theories of personality. These early theorists attempted to explain how an individual's personality develops from their given perspective. For example, Freud proposed that personality arose as conflicts between the conscious and unconscious parts of the mind were carried out over the lifespan. Specifically, Freud theorized that an individual went through various psychosexual stages of development. According to Freud, adult personality would result from the resolution of various conflicts that centred on the migration of erogenous (or sexual pleasure-producing) zones from the oral (mouth) to the anus to the phallus to the genitals. Like many

of Freud's theories, this particular idea was controversial and did not lend itself to experimental tests (Person, 1980).

More recently, the study of personality has taken on a more quantitative approach. Rather than explaining how personality arises, research is focused on identifying personality traits, measuring these traits, and determining how these traits interact in a particular context to determine how a person will behave in any given situation. **Personality traits** are relatively consistent patterns of thought and behaviour, and many have proposed that five trait dimensions are sufficient to capture the variations in personality seen across individuals. These five dimensions are known as the "Big Five" or the Five Factor model, and include dimensions of conscientiousness, agreeableness, neuroticism, openness, and extraversion (Figure IP.14). Each of these traits has been demonstrated to be relatively stable over the lifespan (e.g., Rantanen, Metsäpelto, Feldt, Pulkinnen, and Kokko, 2007; Soldz & Vaillant, 1999; McCrae & Costa, 2008) and is influenced by genetics (e.g., Jang, Livesly, and Vernon, 1996).

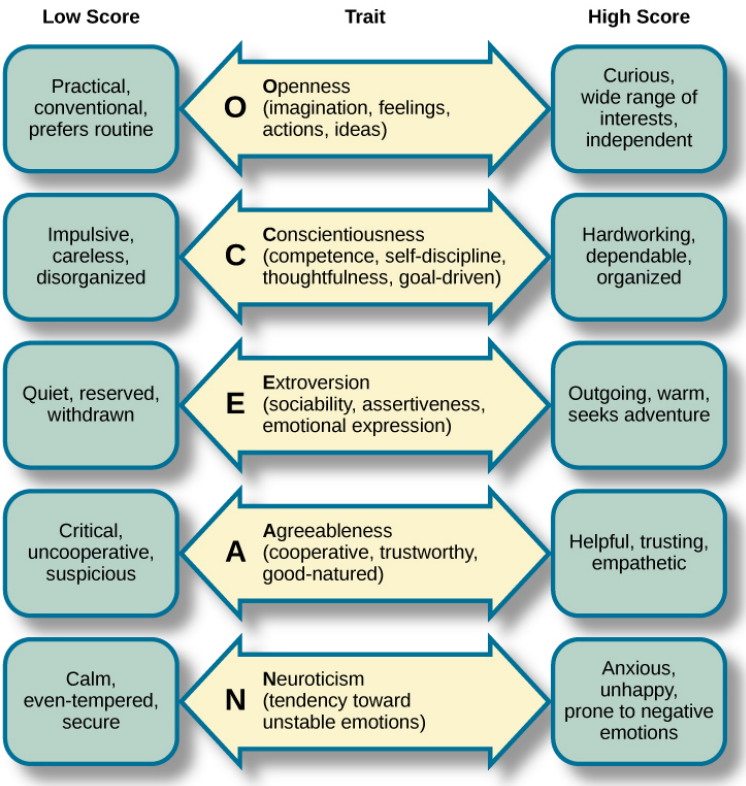


Figure IP.14 Each of the dimensions of the Five Factor model is shown in this figure. The provided description would describe someone who scored highly on that given dimension. Someone with a lower score on a given dimension could be described in opposite terms.

Social Psychology

Social psychology focuses on how we interact with and relate to others. Social psychologists conduct research on a wide variety of topics that include differences in how we explain

our own behaviour versus how we explain the behaviours of others, prejudice, and attraction, and how we resolve interpersonal conflicts. Social psychologists have also sought to determine how being among other people changes our own behaviour and patterns of thinking.

There are many interesting examples of social psychological research, and you will read about many of these in a later chapter of this textbook. Until then, you will be introduced to one of the most controversial psychological studies ever conducted. Stanley Milgram was an American social psychologist who is most famous for research that he conducted on obedience. After the holocaust, in 1961, a Nazi war criminal, Adolf Eichmann, who was accused of committing mass atrocities, was put on trial. Many people wondered how German soldiers were capable of torturing prisoners in concentration camps, and they were unsatisfied with the excuses given by soldiers that they were simply following orders. At the time, most psychologists agreed that few people would be willing to inflict such extraordinary pain and suffering, simply because they were obeying orders. Milgram decided to conduct research to determine whether or not this was true (Figure IP.15). As you will read later in the text, Milgram found that nearly two-thirds of his participants were willing to deliver what they believed to be lethal shocks to another person, simply because they were instructed to do so by an authority figure (in this case, a man dressed in a lab coat). This was in spite of the fact that participants received payment

for simply showing up for the research study and could have chosen not to inflict pain or more serious consequences on another person by withdrawing from the study. No one was actually hurt or harmed in any way, Milgram's experiment was a clever ruse that took advantage of research confederates, those who pretend to be participants in a research study who are actually working for the researcher and have clear, specific directions on how to behave during the research study (Hock, 2009). Milgram's and others' studies that involved deception and potential emotional harm to study participants catalyzed the development of ethical guidelines for conducting psychological research that discourage the use of deception of research subjects, unless it can be argued not to cause harm and, in general, requiring informed consent of participants.

Public Announcement

WE WILL PAY YOU $4.00 FOR ONE HOUR OF YOUR TIME

Persons Needed for a Study of Memory

*We will pay five hundred New Haven men to help us complete a scientific study of memory and learning. The study is being done at Yale University.

*Each person who participates will be paid $4.00 (plus 50c carfare) for approximately 1 hour's time. We need you for only one hour: there are no further obligations. You may choose the time you would like to come (evenings, weekdays, or weekends).

***No special training, education, or experience is needed. We want:**

Factory workers	**Businessmen**	**Construction workers**
City employees	**Clerks**	**Salespeople**
Laborers	**Professional people**	**White-collar workers**
Barbers	**Telephone workers**	**Others**

All persons must be between the ages of 20 and 50. High school and college students cannot be used.

*If you meet these qualifications, fill out the coupon below and mail it now to Professor Stanley Milgram, Department of Psychology, Yale University, New Haven. You will be notified later of the specific time and place of the study. We reserve the right to decline any application.

*You will be paid $4.00 (plus 50c carfare) as soon as you arrive at the laboratory.

TO:
PROF. STANLEY MILGRAM, DEPARTMENT OF PSYCHOLOGY, YALE UNIVERSITY, NEW HAVEN, CONN. I want to take part in this study of memory and learning. I am between the ages of 20 and 50. I will be paid $4.00 (plus 50c carfare) if I participate.

NAME (Please Print). . . . . .

ADDRESS . . . . . .

TELEPHONE NO. . . . . Best time to call you . . . . . .

AGE . . . . . OCCUPATION . . . . . SEX . . . . . .
CAN YOU COME:

WEEKDAYS . . . . . EVENINGS . . . . . WEEKENDS . . . . . .

Figure IP.15 Stanley Milgram's research demonstrated just how far people will go in obeying orders from an authority figure. This advertisement was used to recruit subjects for

his research.

Industrial-Organizational Psychology

Industrial-Organizational psychology (I-O psychology) is a subfield of psychology that applies psychological theories, principles, and research findings in industrial and organizational settings. I-O psychologists are often involved in issues related to personnel management, organizational structure, and workplace environment. Businesses often seek the aid of I-O psychologists to make the best hiring decisions as well as to create an environment that results in high levels of employee productivity and efficiency. In addition to its applied nature, I-O psychology also involves conducting scientific research on behaviour within I-O settings (Riggio, 2013).

Health Psychology

Health psychology focuses on how health is affected by the interaction of biological, psychological, and sociocultural factors. This particular approach is known as the **biopsychosocial model** (Figure IP.16). Health psychologists are interested in helping individuals achieve better health through public policy, education, intervention, and research. Health psychologists might conduct research that explores the relationship between one's genetic makeup, patterns of behaviour, relationships, psychological stress, and

health. They may research effective ways to motivate people to address patterns of behaviour that contribute to poorer health (MacDonald, 2013).

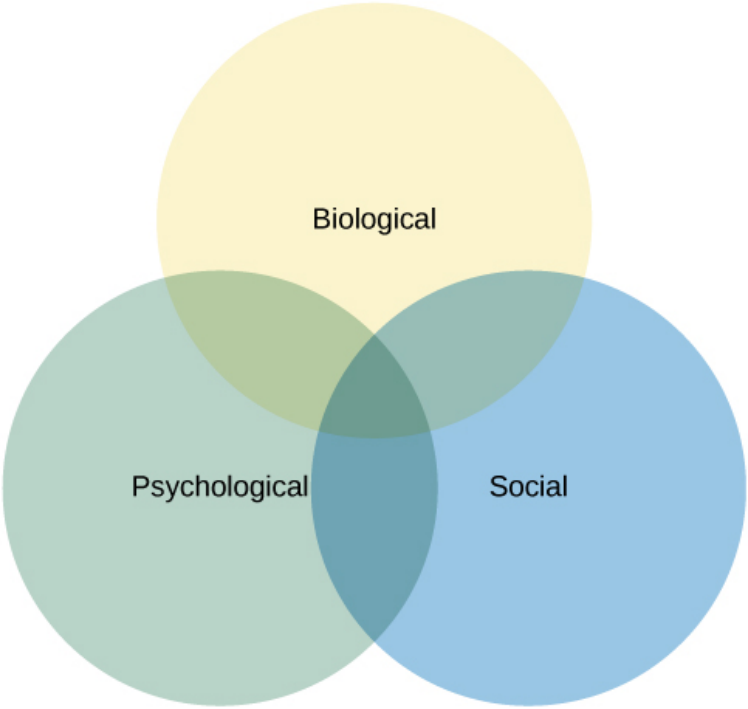


Figure IP.16 The biopsychosocial model suggests that health/illness is determined by an interaction of these three factors.

Sport and Exercise Psychology

Researchers in **sport and exercise psychology** study the psychological aspects of sport performance, including motivation and performance anxiety, and the effects of sport on mental and emotional wellbeing. Research is also

conducted on similar topics as they relate to physical exercise in general. The discipline also includes topics that are broader than sport and exercise but that are related to interactions between mental and physical performance under demanding conditions, such as fire fighting, military operations, artistic performance, and surgery.

Clinical Psychology

Clinical psychology is the area of psychology that focuses on the diagnosis and treatment of psychological disorders and other problematic patterns of behaviour. As such, it is generally considered to be a more applied area within psychology; however, some clinicians are also actively engaged in scientific research. **Counselling psychology** is a similar discipline that focuses on emotional, social, vocational, and health-related outcomes in individuals who are considered psychologically healthy.

As mentioned earlier, both Freud and Rogers provided perspectives that have been influential in shaping how clinicians interact with people seeking psychotherapy. While aspects of the psychoanalytic theory are still found among some of today's therapists who are trained from a psychodynamic perspective, Roger's ideas about client-centred therapy have been especially influential in shaping how many clinicians operate. Furthermore, both behaviourism and the cognitive revolution have shaped clinical

practice in the forms of behavioural therapy, cognitive therapy, and cognitive-behavioural therapy (Figure IP.17). Issues related to the diagnosis and treatment of psychological disorders and problematic patterns of behaviour will be discussed in detail in later chapters of this textbook.

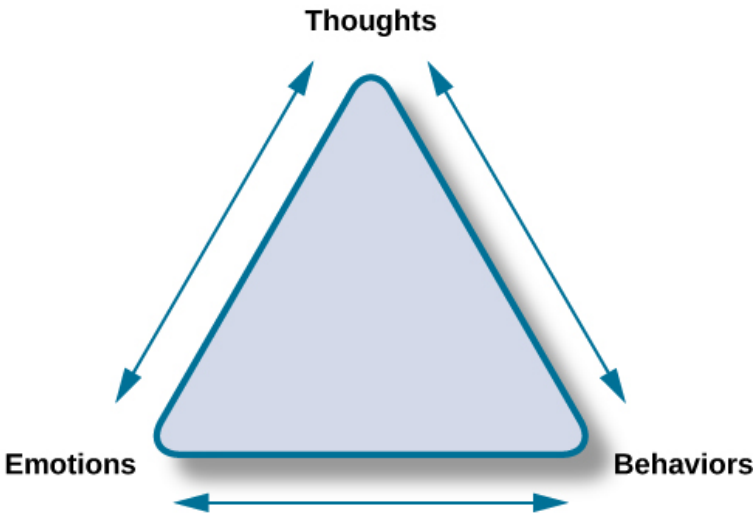


Figure IP.17 Cognitive-behavioural therapists take cognitive processes and behaviours into account when providing psychotherapy. This is one of several strategies that may be used by practicing clinical psychologists.

By far, this is the area of psychology that receives the most attention in popular media, and many people mistakenly assume that all psychology is clinical psychology.

Forensic Psychology

Forensic psychology is a branch of psychology that deals questions of psychology as they arise in the context of the justice system. For example, forensic psychologists (and forensic psychiatrists) will assess a person's competency to stand trial, assess the state of mind of a defendant, act as consultants on child custody cases, consult on sentencing and treatment recommendations, and advise on issues such as eyewitness testimony and children's testimony (American Board of Forensic Psychology, 2014). In these capacities, they will typically act as expert witnesses, called by either side in a court case to provide their research- or experience-based opinions. As expert witnesses, forensic psychologists must have a good understanding of the law and provide information in the context of the legal system rather than just within the realm of psychology. Forensic psychologists are also used in the jury selection process and witness preparation. They may also be involved in providing psychological treatment within the criminal justice system. Criminal profilers are a relatively small proportion of psychologists that act as consultants to law enforcement.

5.

CAREERS IN PSYCHOLOGY

Learning Objectives

By the end of this section, you will be able to:

- Understand educational requirements for careers in academic settings
- Understand the demands of a career in an academic setting
- Understand career options outside of academic settings

Psychologists can work in many different places doing many different things. In general, anyone wishing to continue a

career in psychology at a 4-year institution of higher education will have to earn a doctoral degree in psychology for some specialties and at least a master's degree for others. In most areas of psychology, this means earning a PhD in a relevant area of psychology. Literally, PhD refers to a doctor of philosophy degree, but here, philosophy does not refer to the field of philosophy per se. Rather, philosophy in this context refers to many different disciplinary perspectives that would be housed in a traditional college of liberal arts and sciences.

The requirements to earn a PhD vary from country to country and even from school to school, but usually, individuals earning this degree must complete a dissertation. A dissertation is essentially a long research paper or bundled published articles describing research that was conducted as a part of the candidate's doctoral training. In the United States, a dissertation generally has to be defended before a committee of expert reviewers before the degree is conferred (Figure IP.18).

Figure IP.18 Doctoral degrees are generally conferred in formal ceremonies involving special attire and rites. (credit: Public Affairs Office Fort Wainwright)

Once someone earns a PhD, they may seek a faculty appointment at a college or university. Being on the faculty of a college or university often involves dividing time between teaching, research, and service to the institution and profession. The amount of time spent on each of these primary responsibilities varies dramatically from school to school, and it is not uncommon for faculty to move from place to place in search of the best personal fit among various academic environments. The previous section detailed some of the major areas that are commonly represented in psychology departments around the country; thus, depending on the training received, an individual could be anything from a biological psychologist to a clinical psychologist in an academic setting (Figure IP.19).

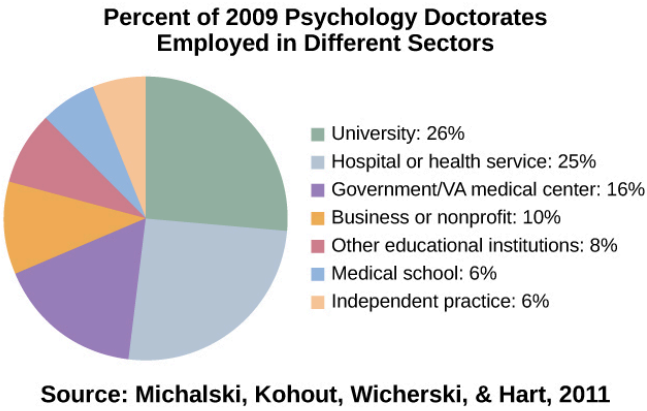


Figure IP.19 Individuals earning a PhD in psychology have a range of employment options.

Link to Learning

Use this set of interactive tools designed by the Government of Canada, to explore different careers in psychology based on degree levels.

Other Careers in Academic Settings

Often times, schools offer more courses in psychology than their full-time faculty can teach. In these cases, it is not uncommon to bring in an adjunct faculty member or instructor. Adjunct faculty members and instructors usually have an advanced degree in psychology, but they often have primary careers outside of academia and serve in this role as a secondary job. Alternatively, they may not hold the doctoral degree required by most 4-year institutions and use these opportunities to gain experience in teaching. Furthermore, many 2-year colleges and schools need faculty to teach their courses in psychology. In general, many of the people who pursue careers at these institutions have master's degrees in psychology, although some PhDs make careers at these institutions as well.

Some people earning PhDs may enjoy research in an academic setting. However, they may not be interested in teaching. These individuals might take on faculty positions that are exclusively devoted to conducting research. This type of position would be more likely an option at large, research-focused universities.

In some areas in psychology, it is common for individuals who have recently earned their PhD to seek out positions in postdoctoral training programs that are available before going on to serve as faculty. In most cases, young scientists will complete one or two postdoctoral programs before applying

for a full-time faculty position. Postdoctoral training programs allow young scientists to further develop their research programs and broaden their research skills under the supervision of other professionals in the field.

Career Options Outside of Academic Settings

Individuals who wish to become practicing clinical psychologists have another option for earning a doctoral degree, which is known as a PsyD. A PsyD is a doctor of psychology degree that is increasingly popular among individuals interested in pursuing careers in clinical psychology. PsyD programs generally place less emphasis on research-oriented skills and focus more on application of psychological principles in the clinical context (Norcorss & Castle, 2002).

Regardless of whether earning a PhD or PsyD, in most states, an individual wishing to practice as a licensed clinical or counselling psychologist may complete postdoctoral work under the supervision of a licensed psychologist. Within the last few years, however, several states have begun to remove this requirement, which would allow people to get an earlier start in their careers (Munsey, 2009). After an individual has met the state requirements, their credentials are evaluated to determine whether they can sit for the licensure exam. Only individuals that pass this exam can call themselves licensed

clinical or counselling psychologists (Norcross, n.d.). Licensed clinical or counselling psychologists can then work in a number of settings, ranging from private clinical practice to hospital settings. It should be noted that clinical psychologists and psychiatrists do different things and receive different types of education. While both can conduct therapy and counselling, clinical psychologists have a PhD or a PsyD, whereas psychiatrists have a doctor of medicine degree (MD). As such, licensed clinical psychologists can administer and interpret psychological tests, while psychiatrists can prescribe medications.

Individuals earning a PhD can work in a variety of settings, depending on their areas of specialization. For example, someone trained as a biopsychologist might work in a pharmaceutical company to help test the efficacy of a new drug. Someone with a clinical background might become a forensic psychologist and work within the legal system to make recommendations during criminal trials and parole hearings, or serve as an expert in a court case.

While earning a doctoral degree in psychology is a lengthy process, usually taking between 5–6 years of graduate study (DeAngelis, 2010), there are a number of careers that can be attained with a master's degree in psychology. People who wish to provide psychotherapy can become licensed to serve as various types of professional counsellors (Hoffman, 2012). Relevant master's degrees are also sufficient for individuals seeking careers as school psychologists (National Association

of School Psychologists, n.d.), in some capacities related to sport psychology (American Psychological Association, 2014), or as consultants in various industrial settings (Landers, 2011, June 14). Undergraduate coursework in psychology may be applicable to other careers such as psychiatric social work or psychiatric nursing, where assessments and therapy may be a part of the job.

As mentioned in the opening section of this chapter, an undergraduate education in psychology is associated with a knowledge base and skill set that many employers find quite attractive. It should come as no surprise, then, that individuals earning bachelor's degrees in psychology find themselves in a number of different careers, as shown in Table IP.1. Examples of a few such careers can involve serving as case managers, working in sales, working in human resource departments, and teaching in high schools. The rapidly growing realm of healthcare professions is another field in which an education in psychology is helpful and sometimes required. For example, the Medical College Admission Test (MCAT) exam that people must take to be admitted to medical school now includes a section on the psychological foundations of behaviour.

Table IP.1 Top Occupations Employing Graduates with a BA in Psychology (Fogg, Harrington, Harrington, & Shatkin, 2012)

Ranking	Occupation
1	Mid- and top-level management (executive, administrator)
2	Sales
3	Social work
4	Other management positions
5	Human resources (personnel, training)
6	Other administrative positions
7	Insurance, real estate, business
8	Marketing and sales
9	Healthcare (nurse, pharmacist, therapist)
10	Finance (accountant, auditor)

6.

KEY TERMS FOR INTRODUCTION TO PSYCHOLOGY

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adaptation
: of an organism has a function for the survival and reproduction of the individual

American Psychological Association (APA)
: professional organization representing psychologists in the United States

behaviourism
: focus on observing and controlling behaviour

biopsychology
: study of how biology influences behaviour

biopsychosocial model
: perspective that asserts that biology, psychology, and social factors interact to determine an individual's health

clinical psychology
: area of psychology that focuses on the diagnosis and treatment of psychological disorders and other problematic patterns of behaviour

cognitive psychology

study of cognitions, or thoughts, and their relationship to experiences and actions

counselling psychology

area of psychology that focuses on improving emotional, social, vocational, and other aspects of the lives of psychologically healthy individuals

developmental psychology

scientific study of development across a lifespan

dissertation

long research paper about research that was conducted as a part of the candidate's doctoral training

empirical method

method for acquiring knowledge based on observation, including experimentation, rather than a method based only on forms of logical argument or previous authorities

forensic psychology

area of psychology that applies the science and practice of psychology to issues within and related to the justice system

functionalism

focused on how mental activities helped an organism adapt to its environment

humanism

perspective within psychology that emphasizes the potential for good that is innate to all humans

introspection

process by which someone examines their own conscious experience in an attempt to break it into its component parts

natural selection

the process by which differences in an organisms characteristics arise leading to better adaptation to their environment

-ology suffix that denotes "scientific study of"

personality psychology

study of patterns of thoughts and behaviours that make each individual unique

personality trait

consistent pattern of thought and behaviour

PhD

(doctor of philosophy) doctoral degree conferred in many disciplinary perspectives housed in a traditional college of liberal arts and sciences

postdoctoral training program

allows programs and broaden their research skills under the supervision of other professionals in the field

psychoanalytic theory

focus on the role of the unconscious in affecting conscious behaviour

psychology

scientific study of the mind and behaviour

PsyD

(doctor of psychology) doctoral degree that places less emphasis on research-oriented skills and focuses more on application of psychological principles in the clinical context

sport and exercise psychology

area of psychology that focuses on the interactions between mental and emotional factors and physical performance in sports, exercise, and other activities

structuralism

understanding the conscious experience through introspection

7.

SUMMARY OF INTRODUCTION TO PSYCHOLOGY

IP.1 What Is Psychology?

Psychology is defined as the scientific study of mind and behaviour. Students of psychology develop critical thinking skills, become familiar with the scientific method, and recognize the complexity of behaviour.

IP.2 History of Psychology

Before the time of Wundt and James, questions about the mind were considered by philosophers. However, both Wundt and James helped create psychology as a distinct scientific discipline. Wundt was a structuralist, which meant he believed that our cognitive experience was best understood by breaking that experience into its component parts. He thought this was best accomplished by introspection.

William James was the first American psychologist, and he

was a proponent of functionalism. This particular perspective focused on how mental activities served as adaptive responses to an organism's environment. Like Wundt, James also relied on introspection; however, his research approach also incorporated more objective measures as well.

Sigmund Freud believed that understanding the unconscious mind was absolutely critical to understand conscious behaviour. This was especially true for individuals that he saw who suffered from various hysterias and neuroses. Freud relied on dream analysis, slips of the tongue, and free association as means to access the unconscious. Psychoanalytic theory remained a dominant force in clinical psychology for several decades.

Gestalt psychology was very influential in Europe. Gestalt psychology takes a holistic view of an individual and his experiences. As the Nazis came to power in Germany, Wertheimer, Koffka, and Köhler immigrated to the United States. Although they left their laboratories and their research behind, they did introduce America to Gestalt ideas. Some of the principles of Gestalt psychology are still very influential in the study of sensation and perception.

One of the most influential schools of thought within psychology's history was behaviourism. Behaviourism focused on making psychology an objective science by studying overt behaviour and deemphasizing the importance of unobservable mental processes. John Watson is often considered the father of behaviourism, and B. F. Skinner's contributions to our

understanding of principles of operant conditioning cannot be underestimated.

As behaviourism and psychoanalytic theory took hold of so many aspects of psychology, some began to become dissatisfied with psychology's picture of human nature. Thus, a humanistic movement within psychology began to take hold. Humanism focuses on the potential of all people for good. Both Maslow and Rogers were influential in shaping humanistic psychology.

During the 1950s, the landscape of psychology began to change. A science of behaviour began to shift back to its roots of focus on mental processes. The emergence of neuroscience and computer science aided this transition. Ultimately, the cognitive revolution took hold, and people came to realize that cognition was crucial to a true appreciation and understanding of behaviour.

IP.3 Contemporary Psychology

Psychology is a diverse discipline that is made up of several major subdivisions with unique perspectives. Biological psychology involves the study of the biological bases of behaviour. Sensation and perception refer to the area of psychology that is focused on how information from our sensory modalities is received, and how this information is transformed into our perceptual experiences of the world around us. Cognitive psychology is concerned with the

relationship that exists between thought and behaviour, and developmental psychologists study the physical and cognitive changes that occur throughout one's lifespan. Personality psychology focuses on individuals' unique patterns of behaviour, thought, and emotion. Industrial and organizational psychology, health psychology, sport and exercise psychology, forensic psychology, and clinical psychology are all considered applied areas of psychology. Industrial and organizational psychologists apply psychological concepts to I-O settings. Health psychologists look for ways to help people live healthier lives, and clinical psychology involves the diagnosis and treatment of psychological disorders and other problematic behavioural patterns. Sport and exercise psychologists study the interactions between thoughts, emotions, and physical performance in sports, exercise, and other activities. Forensic psychologists carry out activities related to psychology in association with the justice system.

IP.4 Careers in Psychology

Generally, academic careers in psychology require doctoral degrees. However, there are a number of nonacademic career options for people who have master's degrees in psychology. While people with bachelor's degrees in psychology have more limited psychology-related career options, the skills acquired as

a function of an undergraduate education in psychology are useful in a variety of work contexts.

8.

REVIEW QUESTIONS FOR INTRODUCTION TO PSYCHOLOGY

Click here for Answer Key

Multiple Choice Questions

1. Which of the following was mentioned as a skill to which psychology students would be exposed?

a. critical thinking
b. use of the scientific method
c. critical evaluation of sources of information
d. all of the above

2. Before psychology became a recognized academic discipline, matters of the mind were undertaken by those in _____.

a. biology
b. chemistry
c. philosophy
d. physics

3. In the scientific method, a hypothesis is a(n) _____.

a. observation
b. measurement
c. test
d. proposed explanation

4. Based on your reading, which theorist would have been most likely to agree with this statement: Perceptual phenomena are best understood as a combination of their components.

a. William James
b. Max Wertheimer
c. Carl Rogers
d. Noam Chomsky

5. _____ is most well-known for proposing his hierarchy of needs.

a. Noam Chomsky
b. Carl Rogers
c. Abraham Maslow
d. Sigmund Freud

6. Rogers believed that providing genuineness, empathy, and

_____ in the therapeutic environment for his clients was critical to their being able to deal with their problems.

a. structuralism
b. functionalism
c. Gestalt
d. unconditional positive regard

7. The operant conditioning chamber (aka _____ box) is a device used to study the principles of operant conditioning.

a. Skinner
b. Watson
c. James
d. Koffka

8. A researcher interested in how changes in the cells of the hippocampus (a structure in the brain related to learning and memory) are related to memory formation would be most likely to identify as a(n) _____ psychologist.

a. biological
b. health
c. clinical
d. social

9. An individual's consistent pattern of thought and behaviour is known as a(n) _____.

a. psychosexual stage
b. object permanence
c. personality
d. perception

10. In Milgram's controversial study on obedience, nearly _____ of the participants were willing to administer what appeared to be lethal electrical shocks to another person because they were told to do so by an authority figure.

a. 1/3
b. 2/3
c. 3/4
d. 4/5

11. A researcher interested in what factors make an employee best suited for a given job would most likely identify as a(n) _____ psychologist.

a. personality
b. clinical
c. social
d. I-O

12. If someone wanted to become a psychology professor at a 4-year college, they would probably need a _____ degree in psychology.

a. bachelor of science
b. bachelor of art
c. master's
d. PhD

13. The _____ places less emphasis on research and more emphasis on application of therapeutic skills.

a. PhD
b. PsyD
c. postdoctoral training program
d. dissertation

14. Which of the following degrees would be the minimum required to teach psychology courses in high school?

a. PhD
b. PsyD
c. master's degree
d. bachelor's degree

15. One would need at least a(n) _____ degree to serve as a school psychologist.

a. associate's
b. bachelor's
c. master's
d. doctoral

Critical Thinking Questions

16. Why do you think psychology courses like this one are often requirements of so many different programs of study?
17. Why do you think many people might be skeptical about psychology being a science?
18. How did the object of study in psychology change over the history of the field since the 19th century?
19. In part, what aspect of psychology was the behaviourist approach to psychology a reaction to?
20. Given the incredible diversity among the various areas of psychology that were described in this section, how do they all fit together?
21. What are the potential ethical concerns associated with Milgram's research on obedience?
22. Why is an undergraduate education in psychology so helpful in a number of different lines of work?

23. Other than a potentially greater salary, what would be the reasons an individual would continue on to get a graduate degree in psychology?

Personal Application Questions

24. Why are you taking this course? What do you hope to

learn about during this course?

25. Freud is probably one of the most well-known historical figures in psychology. Where have you encountered references to Freud or his ideas about the role that the unconscious mind plays in determining conscious behaviour?

26. Now that you've been briefly introduced to some of the major areas within psychology, which are you most interested in learning more about? Why?

27. Which of the career options in the field of psychology is most appealing to you?

9.

ACKNOWLEDGEMENTS & ATTRIBUTIONS

CHAPTER II
PSYCHOLOGICAL RESEARCH

10.

INTRODUCTION TO PSYCHOLOGICAL RESEARCH

Chapter Outline

- Why Is Research Important?
- Approaches to Research
- Analyzing Findings
- Ethics

Figure PR.1 How does television content impact children's behaviour? (credit: modification of work by "antisocialtory"/Flickr)

Have you ever wondered whether the violence you see on television affects your behaviour? Are you more likely to behave aggressively in real life after watching people behave violently in dramatic situations on the screen? Or, could seeing fictional violence actually get aggression out of your system, causing you to be more peaceful? How are children influenced by the media they are exposed to? A psychologist interested in the relationship between behaviour and exposure to violent images might ask these very questions.

Since ancient times, humans have been concerned about the effects of new technologies on our behaviours and thinking processes. The Greek philosopher Socrates, for example, worried that writing—a new technology at that time—would diminish people's ability to remember because they could rely on written records rather than committing information to

memory. In our world of rapidly changing technologies, questions about their effects on our daily lives and their resulting long-term impacts continue to emerge. In addition to the impact of screen time (on smartphones, tablets, computers, and gaming), technology is emerging in our vehicles (such as GPS and smart cars) and residences (with devices like Alexa or Google Home and doorbell cameras). As these technologies become integrated into our lives, we are faced with questions about their positive and negative impacts. Many of us find ourselves with a strong opinion on these issues, only to find the person next to us bristling with the opposite view.

How can we go about finding answers that are supported not by mere opinion, but by evidence that we can all agree on? The findings of psychological research can help us navigate issues like this.

11.

WHY IS RESEARCH IMPORTANT?

Learning Objectives

By the end of this section, you will be able to:

- Explain how scientific research addresses questions about behaviour
- Discuss how scientific research guides public policy
- Appreciate how scientific research can be important in making personal decisions

Scientific research is a critical tool for successfully navigating our complex world. Without it, we would be forced to rely solely on intuition, other people's authority, and blind luck. While many of us feel confident in our abilities to decipher and interact with the world around us, history is filled with examples of how very wrong we can be when we fail to recognize the need for evidence in supporting claims. At various times in history, we would have been certain that the sun revolved around a flat earth, that the earth's continents did not move, and that mental illness was caused by possession (Figure PR.2). It is through systematic scientific research that we divest ourselves of our preconceived notions and superstitions and gain an objective understanding of ourselves and our world.

Figure PR.2 Some of our ancestors, across the world and over the centuries, believed that trephination—the practice of making a hole in the skull, as shown here—allowed evil spirits to leave the body, thus curing mental illness and other disorders. (credit: "taiproject"/Flickr)

The goal of all scientists is to better understand the world around them. Psychologists focus their attention on understanding behaviour, as well as the cognitive (mental) and physiological (body) processes that underlie behaviour. In contrast to other methods that people use to understand the behaviour of others, such as intuition and personal experience, the hallmark of scientific research is that there is evidence to

support a claim. Scientific knowledge is empirical: it is grounded in objective, tangible evidence that can be observed time and time again, regardless of who is observing.

While behaviour is observable, the mind is not. If someone is crying, we can see behaviour. However, the reason for the behaviour is more difficult to determine. Is the person crying due to being sad, in pain, or happy? Sometimes we can learn the reason for someone's behaviour by simply asking a question, like "Why are you crying?" However, there are situations in which an individual is either uncomfortable or unwilling to answer the question honestly, or is incapable of answering. For example, infants would not be able to explain why they are crying. In such circumstances, the psychologist must be creative in finding ways to better understand behaviour. This chapter explores how scientific knowledge is generated, and how important that knowledge is in forming decisions in our personal lives and in the public domain.

Use of Research Information

Trying to determine which theories are and are not accepted by the scientific community can be difficult, especially in an area of research as broad as psychology. More than ever before, we have an incredible amount of information at our fingertips, and a simple internet search on any given research topic might result in a number of contradictory studies. In these cases,

we are witnessing the scientific community going through the process of reaching a consensus, and it could be quite some time before a consensus emerges. For example, the explosion in our use of technology has led researchers to question whether this ultimately helps or hinders us. The use and implementation of technology in educational settings has become widespread over the last few decades. Researchers are coming to different conclusions regarding the use of technology. To illustrate this point, a study investigating a smartphone app targeting surgery residents (graduate students in surgery training) found that the use of this app can increase student engagement and raise test scores (Shaw & Tan, 2015). Conversely, another study found that the use of technology in undergraduate student populations had negative impacts on sleep, communication, and time management skills (Massimini & Peterson, 2009). Until sufficient amounts of research have been conducted, there will be no clear consensus on the effects that technology has on a student's acquisition of knowledge, study skills, and mental health.

In the meantime, we should strive to think critically about the information we encounter by exercising a degree of healthy skepticism. When someone makes a claim, we should examine the claim from a number of different perspectives: what is the expertise of the person making the claim, what might they gain if the claim is valid, does the claim seem justified given the evidence, and what do other researchers think of the claim? This is especially important when we consider how much

information in advertising campaigns and on the internet claims to be based on "scientific evidence" when in actuality it is a belief or perspective of just a few individuals trying to sell a product or draw attention to their perspectives.

We should be informed consumers of the information made available to us because decisions based on this information have significant consequences. One such consequence can be seen in politics and public policy. Imagine that you have been elected as the Premier of your province. One of your responsibilities is to manage the provincial budget and determine how to best spend your constituents' tax dollars. As the new Premier, you need to decide whether to continue funding early intervention programs. These programs are designed to help children who come from low-income backgrounds, have special needs, or face other disadvantages. These programs may involve providing a wide variety of services to maximize the children's development and position them for optimal levels of success in school and later in life (Blann, 2005). While such programs sound appealing, you would want to be sure that they also proved effective before investing additional money in these programs. Fortunately, psychologists and other scientists have conducted vast amounts of research on such programs and, in general, the programs are found to be effective (Neil & Christensen, 2009; Peters-Scheffer, Didden, Korzilius, & Sturmey, 2011). While not all programs are equally effective, and the short-term effects of many such programs are more pronounced, there is

reason to believe that many of these programs produce long-term benefits for participants (Barnett, 2011). If you are committed to being a good steward of taxpayer money, you would want to look at research. Which programs are most effective? What characteristics of these programs make them effective? Which programs promote the best outcomes? After examining the research, you would be best equipped to make decisions about which programs to fund.

Ultimately, it is not just politicians who can benefit from using research in guiding their decisions. We all might look to research from time to time when making decisions in our lives. Imagine you just found out that a close friend has breast cancer or that one of your young relatives has recently been diagnosed with autism. In either case, you want to know which treatment options are most successful with the fewest side effects. How would you find that out? You would probably talk with your doctor and personally review the research that has been done on various treatment options—always with a critical eye to ensure that you are as informed as possible.

In the end, research is what makes the difference between facts and opinions. **Facts** are observable realities, and **opinions** are personal judgments, conclusions, or attitudes that may or may not be accurate. In the scientific community, facts can be established only using evidence collected through empirical research.

The Process of Scientific Research

Scientific knowledge is advanced through a process known as the scientific method. Basically, ideas (in the form of theories and hypotheses) are tested against the real world (in the form of empirical observations), and those empirical observations lead to more ideas that are tested against the real world, and so on. In this sense, the scientific process is circular. The types of reasoning within the circle are called deductive and inductive. In **deductive reasoning**, ideas are tested in the real world; in **inductive reasoning**, real-world observations lead to new ideas (Figure PR.3). These processes are inseparable, like inhaling and exhaling, but different research approaches place different emphasis on the deductive and inductive aspects.

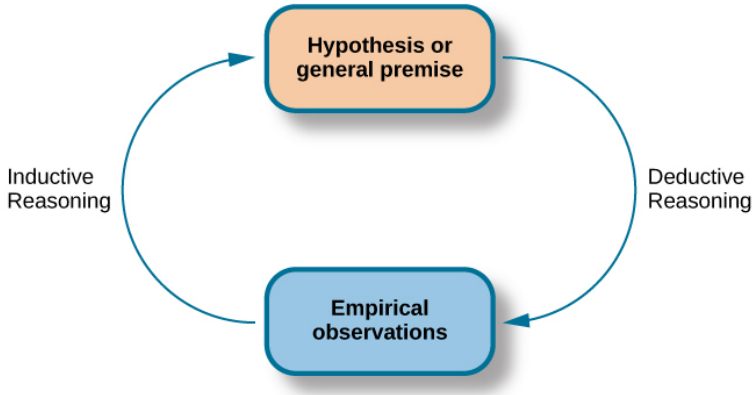


Figure PR.3 Psychological research relies on both inductive and deductive reasoning.

In the scientific context, deductive reasoning begins with a generalization—one hypothesis—that is then used to reach logical conclusions about the real world. If the hypothesis is supported, then the logical conclusions reached through deductive reasoning should also be correct. A deductive reasoning argument might go something like this: All living things require energy to survive (this would be your hypothesis). Ducks are living things. Therefore, ducks require energy to survive (logical conclusion). In this example, the hypothesis is correct; therefore, the conclusion is correct as well. Sometimes, however, an incorrect hypothesis may lead to a logical but incorrect conclusion. Consider this argument: all ducks are born with the ability to see. Quackers is a duck. Therefore, Quackers was born with the ability to see. Scientists use deductive reasoning to empirically test their hypotheses. Returning to the example of the ducks, researchers might design a study to test the hypothesis that if all living things require energy to survive, then ducks will be found to require energy to survive.

Deductive reasoning starts with a generalization that is tested against real-world observations; however, inductive reasoning moves in the opposite direction. Inductive reasoning uses empirical observations to construct broad generalizations. Unlike deductive reasoning, conclusions drawn from inductive reasoning may or may not be correct, regardless of the observations on which they are based. For instance, you may notice that your favourite fruits—apples, bananas, and

oranges—all grow on trees; therefore, you assume that all fruit must grow on trees. This would be an example of inductive reasoning, and, clearly, the existence of strawberries, blueberries, and kiwi demonstrate that this generalization is not correct despite it being based on a number of direct observations. Scientists use inductive reasoning to formulate theories, which in turn generate hypotheses that are tested with deductive reasoning. In the end, science involves both deductive and inductive processes.

For example, case studies, which you will read about in the next section, are heavily weighted on the side of empirical observations. Thus, case studies are closely associated with inductive processes as researchers gather massive amounts of observations and seek interesting patterns (new ideas) in the data. Experimental research, on the other hand, puts great emphasis on deductive reasoning.

We've stated that theories and hypotheses are ideas, but what sort of ideas are they, exactly? A **theory** is a well-developed set of ideas that propose an explanation for observed phenomena. Theories are repeatedly checked against the world, but they tend to be too complex to be tested all at once; instead, researchers create hypotheses to test specific aspects of a theory.

A **hypothesis** is a testable prediction about how the world will behave if our idea is correct, and it is often worded as an if-then statement (e.g., if I study all night, I will get a passing grade on the test). The hypothesis is extremely important

because it bridges the gap between the realm of ideas and the real world. As specific hypotheses are tested, theories are modified and refined to reflect and incorporate the result of these tests Figure PR.4.

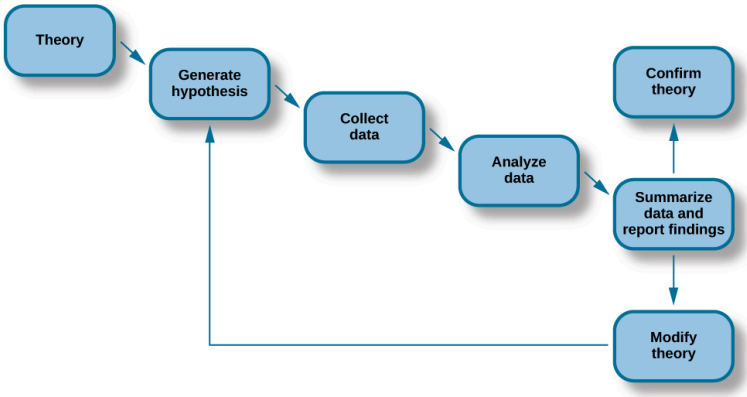
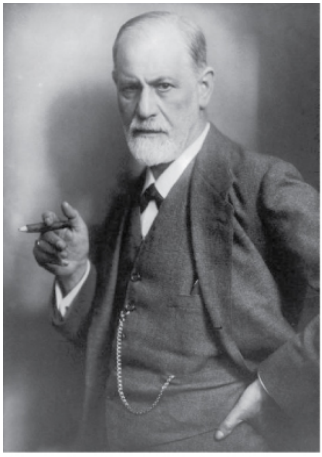


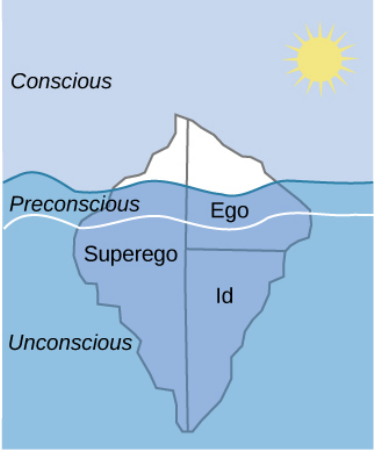
Figure PR.4 The scientific method involves deriving hypotheses from theories and then testing those hypotheses. If the results are consistent with the theory, then the theory is supported. If the results are not consistent, then the theory should be modified and new hypotheses will be generated.

A scientific hypothesis is also **falsifiable**, or capable of being shown to be incorrect. Recall from the introductory chapter that Sigmund Freud had lots of interesting ideas to explain various human behaviours (Figure PR.5). However, a major criticism of Freud's theories is that many of his ideas are not falsifiable; for example, it is impossible to imagine empirical observations that would disprove the existence of the id, the

ego, and the superego—the three elements of personality described in Freud's theories. Despite this, Freud's theories are widely taught in introductory psychology texts because of their historical significance for personality psychology and psychotherapy, and these remain the root of all modern forms of therapy.



(a)



(b)

Figure PR.5 Many of the specifics of (a) Freud's theories, such as (b) his division of the mind into id, ego, and superego, have fallen out of favour in recent decades because they are not falsifiable. In broader strokes, his views set the stage for much of psychological thinking today, such as the unconscious nature of the majority of psychological processes.

Scientific research's dependence on falsifiability allows for great confidence in the information that it produces. Typically, by the time information is accepted by the scientific

community, it has been tested repeatedly.

12.

APPROACHES TO RESEARCH DESIGN

Learning Objectives

By the end of this section, you will be able to:

- Describe the different research methods used by psychologists
- Discuss the strengths and weaknesses of case studies, naturalistic observation, surveys, and archival research
- Compare longitudinal and cross-sectional approaches to research
- Compare and contrast correlation and causation

TRICKY TOPIC: INTRODUCTION TO RESEARCH

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There are many research methods available to psychologists in their efforts to understand, describe, and explain behaviour and the cognitive and biological processes that underlie it. Some methods rely on observational techniques. Other approaches involve interactions between the researcher and the individuals who are being studied—ranging from a series of

simple questions to extensive, in-depth interviews—to well-controlled experiments.

Each of these research methods has unique strengths and weaknesses, and each method may only be appropriate for certain types of research questions. For example, studies that rely primarily on observation produce incredible amounts of information, but the ability to apply this information to the larger population is somewhat limited because of small sample sizes. Survey research, on the other hand, allows researchers to easily collect data from relatively large samples. While this allows for results to be generalized to the larger population more easily, the information that can be collected on any given survey is somewhat limited and subject to problems associated with any type of self-reported data. Some researchers conduct archival research by using existing records. While this can be a fairly inexpensive way to collect data that can provide insight into a number of research questions, researchers using this approach have no control on how or what kind of data was collected. All of the methods described thus far are correlational in nature. This means that researchers can speak to important relationships that might exist between two or more variables of interest. However, correlational data cannot be used to make claims about cause-and-effect relationships.

Correlational research can find a relationship between two variables, but the only way a researcher can claim that the relationship between the variables is cause and effect is to perform an experiment. In experimental research, which will

be discussed later in this chapter, there is a tremendous amount of control over variables of interest. While this is a powerful approach, experiments are often conducted in very artificial settings. This calls into question the validity of experimental findings with regard to how they would apply in real-world settings. In addition, many of the questions that psychologists would like to answer cannot be pursued through experimental research because of ethical concerns.

TRICKY TOPIC: DESCRIPTIVE RESEARCH DESIGN

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Clinical or Case Studies

In 2011, the *New York Times* published a feature story on Krista and Tatiana Hogan, Canadian twins. These particular twins are unique because Krista and Tatiana are conjoined twins, connected at the head. There is evidence that the two girls are connected in a part of the brain called the thalamus, which is a major sensory relay centre. Most incoming sensory information is sent through the thalamus before reaching higher regions of the cerebral cortex for processing.

Link to Learning

Watch this CBC video about Krista's and Tatiana's lives to learn more.

The implications of this potential connection mean that it might be possible for one twin to experience the sensations of the other twin. For instance, if Krista is watching a particularly funny television program, Tatiana might smile or laugh even

if she is not watching the program. This particular possibility has piqued the interest of many neuroscientists who seek to understand how the brain uses sensory information.

These twins represent an enormous resource in the study of the brain, and since their condition is very rare, it is likely that as long as their family agrees, scientists will follow these girls very closely throughout their lives to gain as much information as possible (Dominus, 2011).

Over time, it has become clear that while Krista and Tatiana share some sensory experiences and motor control, they remain two distinct individuals, which provides tremendous insight into researchers interested in the mind and the brain (Egnor, 2017).

In observational research, scientists are conducting a **clinical** or **case study** when they focus on one person or just a few individuals. Indeed, some scientists spend their entire careers studying just 10–20 individuals. Why would they do this? Obviously, when they focus their attention on a very small number of people, they can gain a tremendous amount of insight into those cases. The richness of information that is collected in clinical or case studies is unmatched by any other single research method. This allows the researcher to have a very deep understanding of the individuals and the particular phenomenon being studied.

If clinical or case studies provide so much information, why are they not more frequent among researchers? As it turns out, the major benefit of this particular approach is also a

weakness. As mentioned earlier, this approach is often used when studying individuals who are interesting to researchers because they have a rare characteristic. Therefore, the individuals who serve as the focus of case studies are not like most other people. If scientists ultimately want to explain all behaviour, focusing attention on such a special group of people can make it difficult to generalize any observations to the larger population as a whole. **Generalizing** refers to the ability to apply the findings of a particular research project to larger segments of society. Again, case studies provide enormous amounts of information, but since the cases are so specific, the potential to apply what's learned to the average person may be very limited.

Naturalistic Observation

If you want to understand how behaviour occurs, one of the best ways to gain information is to simply observe the behaviour in its natural context. However, people might change their behaviour in unexpected ways if they know they are being observed. How do researchers obtain accurate information when people tend to hide their natural behaviour? As an example, imagine that your professor asks everyone in your class to raise their hand if they always wash their hands after using the restroom. Chances are that almost everyone in the classroom will raise their hand, but do you

think hand washing after every trip to the restroom is really that universal?

This is very similar to the phenomenon mentioned earlier in this chapter: many individuals do not feel comfortable answering a question honestly. But if we are committed to finding out the facts about hand washing, we have other options available to us.

Suppose we send a classmate into the restroom to actually watch whether everyone washes their hands after using the restroom. Will our observer blend into the restroom environment by wearing a white lab coat, sitting with a clipboard, and staring at the sinks? We want our researcher to be inconspicuous—perhaps standing at one of the sinks pretending to put in contact lenses while secretly recording the relevant information. This type of observational study is called **naturalistic observation**: observing behaviour in its natural setting. To better understand peer exclusion, Suzanne Fanger collaborated with colleagues at the University of Texas to observe the behaviour of preschool children on a playground. How did the observers remain inconspicuous over the duration of the study? They equipped a few of the children with wireless microphones (which the children quickly forgot about) and observed while taking notes from a distance. Also, the children in that particular preschool (a "laboratory preschool") were accustomed to having observers on the playground (Fanger, Frankel, & Hazen, 2012).

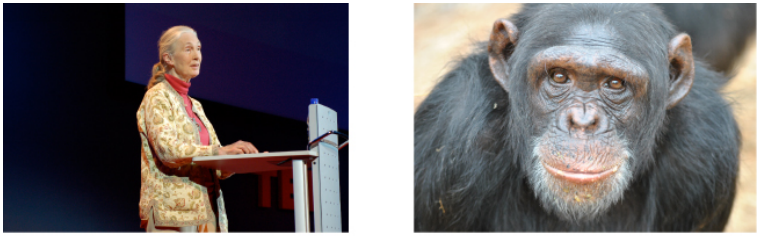
It is critical that the observer be as unobtrusive and as

inconspicuous as possible: when people know they are being watched, they are less likely to behave naturally. If you have any doubt about this, ask yourself how your driving behaviour might differ in two situations: In the first situation, you are driving down a deserted highway during the middle of the day; in the second situation, you are being followed by a police car down the same deserted highway (Figure PR.6).

Figure PR.6 Seeing a police car behind you would probably affect your driving behaviour. (credit: Michael Gil)

It should be pointed out that naturalistic observation is not limited to research involving humans. Indeed, some of the best-known examples of naturalistic observation involve researchers going into the field to observe various kinds of animals in their own environments. As with human studies,

the researchers maintain their distance and avoid interfering with the animal subjects so as not to influence their natural behaviours. Scientists have used this technique to study social hierarchies and interactions among animals ranging from ground squirrels to gorillas. The information provided by these studies is invaluable in understanding how those animals organize socially and communicate with one another. The anthropologist Jane Goodall, for example, spent nearly five decades observing the behaviour of chimpanzees in Africa (Figure PR.7). As an illustration of the types of concerns that a researcher might encounter in naturalistic observation, some scientists criticized Goodall for giving the chimps names instead of referring to them by numbers—using names was thought to undermine the emotional detachment required for the objectivity of the study (McKie, 2010).



(a) (b)

Figure PR.7 (a) Jane Goodall made a career of conducting naturalistic observations of (b) chimpanzee behaviour. (credit "Jane Goodall": modification of work by Erik Hersman; "chimpanzee": modification of work by "Afrika Force"/Flickr.com)

The greatest benefit of naturalistic observation is the validity, or accuracy, of information collected unobtrusively in a natural setting. Having individuals behave as they normally would in a given situation means that we have a higher degree of ecological validity, or realism, than we might achieve with other research approaches. Therefore, our ability to generalize the findings of the research to real-world situations is enhanced. If done correctly, we need not worry about people or animals modifying their behaviour simply because they are being observed. Sometimes, people may assume that reality programs give us a glimpse into authentic human behaviour. However, the principle of inconspicuous observation is violated as reality stars are followed by camera crews and are interviewed on camera for personal confessionals. Given that environment, we must doubt how natural and realistic their behaviours are.

The major downside of naturalistic observation is that they are often difficult to set up and control. In our restroom study, what if you stood in the restroom all day prepared to record people's hand washing behaviour and no one came in? Or, what if you have been closely observing a troop of gorillas for weeks only to find that they migrated to a new place while you were sleeping in your tent? The benefit of realistic data comes at a cost. As a researcher you have no control of when (or if) you have behaviour to observe. In addition, this type of observational research often requires significant investments of time, money, and a good dose of luck.

Sometimes studies involve structured observation. In these cases, people are observed while engaging in set, specific tasks. An excellent example of structured observation comes from Strange Situation by Mary Ainsworth (you will read more about this in the chapter on lifespan development). The Strange Situation is a procedure used to evaluate attachment styles that exist between an infant and caregiver. In this scenario, caregivers bring their infants into a room filled with toys. The Strange Situation involves a number of phases, including a stranger coming into the room, the caregiver leaving the room, and the caregiver's return to the room. The infant's behaviour is closely monitored at each phase, but it is the behaviour of the infant upon being reunited with the caregiver that is most telling in terms of characterizing the infant's attachment style with the caregiver.

Another potential problem in observational research is **observer bias**. Generally, people who act as observers are closely involved in the research project and may unconsciously skew their observations to fit their research goals or expectations. To protect against this type of bias, researchers should have clear criteria established for the types of behaviours recorded and how those behaviours should be classified. In addition, researchers often compare observations of the same event by multiple observers, in order to test inter-rater reliability: a measure of reliability that assesses the consistency of observations by different observers.

Surveys

Often, psychologists develop surveys as a means of gathering data. **Surveys** are lists of questions to be answered by research participants, and can be delivered as paper-and-pencil questionnaires, administered electronically, or conducted verbally (Figure PR.8). Generally, the survey itself can be completed in a short time, and the ease of administering a survey makes it easy to collect data from a large number of people.

Surveys allow researchers to gather data from larger samples than may be afforded by other research methods**.** A **sample** is a subset of individuals selected from a **population**, which is the overall group of individuals that the researchers are interested in. Researchers study the sample and seek to generalize their findings to the population. Generally, researchers will begin this process by calculating various measures of central tendency from the data they have collected. These measures provide an overall summary of what a typical response looks like. There are three measures of central tendency: mode, median, and mean. The mode is the most frequently occurring response, the median lies at the middle of a given data set, and the mean is the arithmetic average of all data points. Means tend to be most useful in conducting additional analyses like those described below; however, means are very sensitive to the effects of outliers, and so one must be aware of those effects

when making assessments of what measures of central tendency tell us about a data set in question.

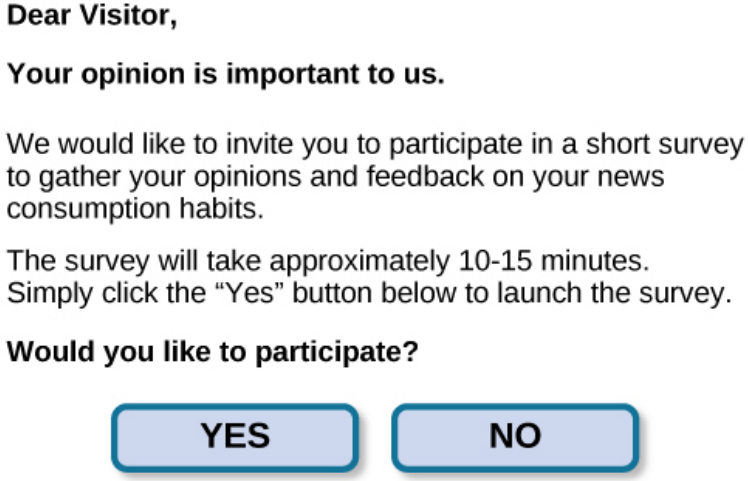


Figure PR.8 Surveys can be administered in a number of ways, including electronically administered research, like the survey shown here. (credit: Robert Nyman)

There is both strength and weakness of the survey in comparison to case studies. By using surveys, we can collect information from a larger sample of people. A larger sample is better able to reflect the actual diversity of the population, thus allowing better generalizability. Therefore, if our sample is sufficiently large and diverse, we can assume that the data we collect from the survey can be generalized to the larger population with more certainty than the information collected through a case study. However, given the greater number of people involved, we are not able to collect the same depth of

information on each person that would be collected in a case study.

Another potential weakness of surveys is something we touched on earlier in this chapter: People don't always give accurate responses. They may lie, misremember, or answer questions in a way that they think makes them look good. For example, people may report drinking less alcohol than is actually the case.

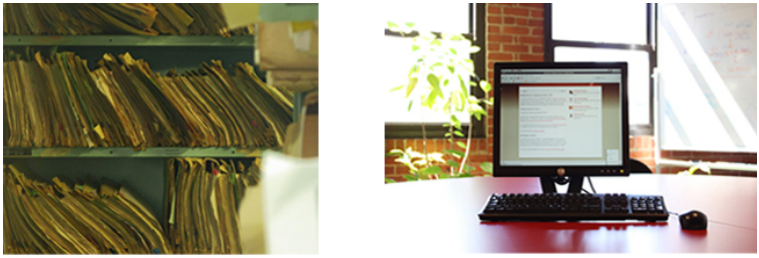
Any number of research questions can be answered through the use of surveys. One real-world example is the research conducted by Jenkins, Ruppel, Kizer, Yehl, and Griffin (2012) about the backlash against the US Arab-American community following the terrorist attacks of September 11, 2001. Jenkins and colleagues wanted to determine to what extent these negative attitudes toward Arab-Americans still existed nearly a decade after the attacks occurred. In one study, 140 research participants filled out a survey with 10 questions, including questions asking directly about the participant's overt prejudicial attitudes toward people of various ethnicities. The survey also asked indirect questions about how likely the participant would be to interact with a person of a given ethnicity in a variety of settings (such as, "How likely do you think it is that you would introduce yourself to a person of Arab-American descent?"). The results of the research suggested that participants were unwilling to report prejudicial attitudes toward any ethnic group. However, there were significant differences between their pattern of responses to

questions about social interaction with Arab-Americans compared to other ethnic groups: they indicated less willingness for social interaction with Arab-Americans compared to the other ethnic groups. This suggested that the participants harboured subtle forms of prejudice against Arab-Americans, despite their assertions that this was not the case (Jenkins et al., 2012).

Archival Research

Some researchers gain access to large amounts of data without interacting with a single research participant. Instead, they use existing records to answer various research questions. This type of research approach is known as **archival research**. Archival research relies on looking at past records or data sets to look for interesting patterns or relationships.

For example, a researcher might access the academic records of all individuals who enrolled in college within the past ten years and calculate how long it took them to complete their degrees, as well as course loads, grades, and extracurricular involvement. Archival research could provide important information about who is most likely to complete their education, and it could help identify important risk factors for struggling students (Figure PR.9).



(a) (b)

Figure PR.9 A researcher doing archival research examines records, whether archived as a (a) hardcopy or (b) electronically. (credit "paper files": modification of work by "Newtown graffiti"/Flickr; "computer": modification of work by INPIVIC Family/Flickr)

In comparing archival research to other research methods, there are several important distinctions. For one, the researcher employing archival research never directly interacts with research participants. Therefore, the investment of time and money to collect data is considerably less with archival research. Additionally, researchers have no control over what information was originally collected. Therefore, research questions have to be tailored so they can be answered within the structure of the existing data sets. There is also no guarantee of consistency between the records from one source to another, which might make comparing and contrasting different data sets problematic.

Longitudinal and Cross-Sectional Research

Sometimes we want to see how people change over time, as in studies of human development and lifespan. When we test the same group of individuals repeatedly over an extended period of time, we are conducting longitudinal research. **Longitudinal research** is a research design in which data-gathering is administered repeatedly over an extended period of time. For example, we may survey a group of individuals about their dietary habits at age 20, retest them a decade later at age 30, and then again at age 40.

Another approach is cross-sectional research. In **cross-sectional research**, a researcher compares multiple segments of the population at the same time. Using the dietary habits example above, the researcher might directly compare different groups of people by age. Instead of studying a group of people for 20 years to see how their dietary habits changed from decade to decade, the researcher would study a group of 20-year-old individuals and compare them to a group of 30-year-old individuals and a group of 40-year-old individuals. While cross-sectional research requires a shorter-term investment, it is also limited by differences that exist between the different generations (or cohorts) that have nothing to do with age per se, but rather reflect the social and cultural experiences of different generations of individuals make them different from one another.

To illustrate this concept, consider the following survey findings. In recent years there has been significant growth in the popular support of same-sex marriage. Many studies on this topic break down survey participants into different age groups. In general, younger people are more supportive of same-sex marriage than are those who are older (Jones, 2013). Does this mean that as we age we become less open to the idea of same-sex marriage, or does this mean that older individuals have different perspectives because of the social climates in which they grew up? Longitudinal research is a powerful approach because the same individuals are involved in the research project over time, which means that the researchers need to be less concerned with differences among cohorts affecting the results of their study.

Often longitudinal studies are employed when researching various diseases in an effort to understand particular risk factors. Such studies often involve tens of thousands of individuals who are followed for several decades. Given the enormous number of people involved in these studies, researchers can feel confident that their findings can be generalized to the larger population. The Cancer Prevention Study-3 (CPS-3) is one of a series of longitudinal studies sponsored by the American Cancer Society aimed at determining predictive risk factors associated with cancer. When participants enter the study, they complete a survey about their lives and family histories, providing information on factors that might cause or prevent the development of

cancer. Then every few years the participants receive additional surveys to complete. In the end, hundreds of thousands of participants will be tracked over 20 years to determine which of them develop cancer and which do not.

Clearly, this type of research is important and potentially very informative. For instance, earlier longitudinal studies sponsored by the American Cancer Society provided some of the first scientific demonstrations of the now well-established links between increased rates of cancer and smoking (American Cancer Society, n.d.) (Figure PR.10).

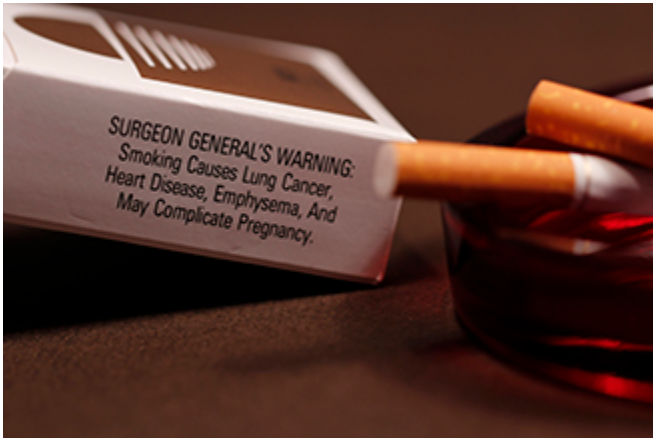


Figure PR.10 Longitudinal research like the CPS-3 help us to better understand how smoking is associated with cancer and other diseases. (credit: CDC/Debora Cartagena)

As with any research strategy, longitudinal research is not without limitations. For one, these studies require an incredible time investment by the researcher and research

participants. Given that some longitudinal studies take years, if not decades, to complete, the results will not be known for a considerable period of time. In addition to the time demands, these studies also require a substantial financial investment. Many researchers are unable to commit the resources necessary to see a longitudinal project through to the end.

Research participants must also be willing to continue their participation for an extended period of time, and this can be problematic. People move, get married and take new names, get ill, and eventually die. Even without significant life changes, some people may simply choose to discontinue their participation in the project. As a result, the **attrition rates,** or reduction in the number of research participants due to dropouts, in longitudinal studies are quite high and increases over the course of a project. For this reason, researchers using this approach typically recruit many participants fully expecting that a substantial number will drop out before the end. As the study progresses, they continually check whether the sample still represents the larger population, and make adjustments as necessary.

TRICKY TOPICS: MEASURING BEHAVIOUR

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13.

ANALYZING FINDINGS

Learning Objectives

By the end of this section, you will be able to:

- Explain what a correlation coefficient tells us about the relationship between variables
- Recognize that correlation does not indicate a cause-and-effect relationship between variables
- Discuss our tendency to look for relationships between variables that do not really exist
- Explain random sampling and assignment of participants into experimental and control groups
- Discuss how experimenter or participant bias

could affect the results of an experiment
- Identify independent and dependent variables

Did you know that as sales in ice cream increase, so does the overall rate of crime? Is it possible that indulging in your favourite flavour of ice cream could send you on a crime spree? Or, after committing crime do you think you might decide to treat yourself to a cone? There is no question that a relationship exists between ice cream and crime (e.g., Harper, 2013), but it would be pretty foolish to decide that one thing actually caused the other to occur.

It is much more likely that both ice cream sales and crime rates are related to the temperature outside. When the temperature is warm, there are lots of people out of their houses, interacting with each other, getting annoyed with one another, and sometimes committing crimes. Also, when it is warm outside, we are more likely to seek a cool treat like ice cream. How do we determine if there is indeed a relationship between two things? And when there is a relationship, how can we discern whether it is attributable to coincidence or causation?

Correlational Research

Correlation means that there is a relationship between two or more variables (such as ice cream consumption and crime), but this relationship does not necessarily imply cause and effect. When two variables are correlated, it simply means that as one variable changes, so does the other. We can measure correlation by calculating a statistic known as a correlation coefficient. A **correlation coefficient** is a number from -1 to +1 that indicates the strength and direction of the relationship between variables. The correlation coefficient is usually represented by the letter *r*.

The number portion of the correlation coefficient indicates the strength of the relationship. The closer the number is to 1 (be it negative or positive), the more strongly related the variables are, and the more predictable changes in one variable will be as the other variable changes. The closer the number is to zero, the weaker the relationship, and the less predictable the relationships between the variables becomes. For instance, a correlation coefficient of 0.9 indicates a far stronger relationship than a correlation coefficient of 0.3. If the variables are not related to one another at all, the correlation coefficient is 0. The example above about ice cream and crime is an example of two variables that we might expect to have no relationship to each other.

The sign—positive or negative—of the correlation coefficient indicates the direction of the relationship (Figure

PR.11). A **positive correlation** means that the variables move in the same direction. Put another way, it means that as one variable increases so does the other, and conversely, when one variable decreases so does the other. A **negative correlation** means that the variables move in opposite directions. If two variables are negatively correlated, a decrease in one variable is associated with an increase in the other and vice versa.

The example of ice cream and crime rates is a positive correlation because both variables increase when temperatures are warmer. Other examples of positive correlations are the relationship between an individual's height and weight or the relationship between a person's age and number of wrinkles. One might expect a negative correlation to exist between someone's tiredness during the day and the number of hours they slept the previous night: the amount of sleep decreases as the feelings of tiredness increase. In a real-world example of negative correlation, student researchers at the University of Minnesota found a weak negative correlation ($r = -0.29$) between the average number of days per week that students got fewer than 5 hours of sleep and their GPA (Lowry, Dean, & Manders, 2010). Keep in mind that a negative correlation is not the same as no correlation. For example, we would probably find no correlation between hours of sleep and shoe size.

As mentioned earlier, correlations have predictive value. Imagine that you are on the admissions committee of a major university. You are faced with a huge number of applications,

but you are able to accommodate only a small percentage of the applicant pool. How might you decide who should be admitted? You might try to correlate your current students' college GPA with their scores on standardized tests like the SAT or ACT. By observing which correlations were strongest for your current students, you could use this information to predict relative success of those students who have applied for admission into the university.

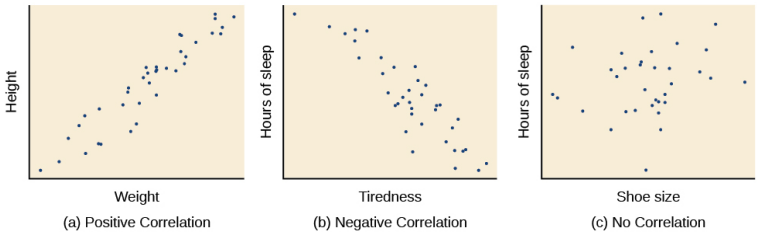

Figure PR.11 Scatterplots are a graphical view of the strength and direction of correlations. The stronger the correlation, the closer the data points are to a straight line. In these examples, we see that there is (a) a positive correlation between weight and height, (b) a negative correlation between tiredness and hours of sleep, and (c) no correlation between shoe size and hours of sleep.

TRICKY TOPIC: CORRELATIONAL RESEARCH

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LINK TO LEARNING

Manipulate this interactive scatterplot to practice your understanding of positive and negative correlation.

Correlation Does Not Indicate Causation

Correlational research is useful because it allows us to discover the strength and direction of relationships that exist between

two variables. However, correlation is limited because establishing the existence of a relationship tells us little about **cause and effect**. While variables are sometimes correlated because one does cause the other, it could also be that some other factor, a **confounding variable**, is actually causing the systematic movement in our variables of interest. In the ice cream/crime rate example mentioned earlier, temperature is a confounding variable that could account for the relationship between the two variables.

Even when we cannot point to clear confounding variables, we should not assume that a correlation between two variables implies that one variable causes changes in another. This can be frustrating when a cause-and-effect relationship seems clear and intuitive. Think back to our discussion of the research done by the American Cancer Society and how their research projects were some of the first demonstrations of the link between smoking and cancer. It seems reasonable to assume that smoking causes cancer, but if we were limited to correlational research, we would be overstepping our bounds by making this assumption.

Unfortunately, people mistakenly make claims of causation as a function of correlations all the time. Such claims are especially common in advertisements and news stories. For example, recent research found that people who eat cereal on a regular basis achieve healthier weights than those who rarely eat cereal (Frantzen, Treviño, Echon, Garcia-Dominic, & DiMarco, 2013; Barton et al., 2005). Guess how the cereal

companies report this finding. Does eating cereal really cause an individual to maintain a healthy weight, or are there other possible explanations, such as, someone at a healthy weight is more likely to regularly eat a healthy breakfast than someone who is obese or someone who avoids meals in an attempt to diet (Figure PR.12)? While correlational research is invaluable in identifying relationships among variables, a major limitation is the inability to establish causality. Psychologists want to make statements about cause and effect, but the only way to do that is to conduct an experiment to answer a research question. The next section describes how scientific experiments incorporate methods that eliminate, or control for, alternative explanations, which allow researchers to explore how changes in one variable cause changes in another variable.

Figure PR.12 Does eating cereal really cause someone to be a healthy weight? (credit: Tim Skillern)

Illusory Correlations

The temptation to make erroneous cause-and-effect statements based on correlational research is not the only way we tend to misinterpret data. We also tend to make the mistake of **illusory correlations**, especially with unsystematic observations. Illusory correlations, or false correlations, occur when people believe that relationships exist between two things when no such relationship exists. One well-known illusory correlation is the supposed effect that the moon's phases have on human behaviour. Many people passionately assert that human behaviour is affected by the phase of the moon, and specifically, that people act strangely when the moon is full (Figure PR.13).

Figure PR.13 Many people believe that a full moon makes people behave oddly. (credit: Cory Zanker)

There is no denying that the moon exerts a powerful influence

on our planet. The ebb and flow of the ocean's tides are tightly tied to the gravitational forces of the moon. Many people believe, therefore, that it is logical that we are affected by the moon as well. After all, our bodies are largely made up of water. A meta-analysis of nearly 40 studies consistently demonstrated, however, that the relationship between the moon and our behaviour does not exist (Rotton & Kelly, 1985). While we may pay more attention to odd behaviour during the full phase of the moon, the rates of odd behaviour remain constant throughout the lunar cycle.

Why are we so apt to believe in illusory correlations like this? Often we read or hear about them and simply accept the information as valid. Or, we have a hunch about how something works and then look for evidence to support that hunch, ignoring evidence that would tell us our hunch is false; this is known as confirmation bias. Other times, we find illusory correlations based on the information that comes most easily to mind, even if that information is severely limited. And while we may feel confident that we can use these relationships to better understand and predict the world around us, illusory correlations can have significant drawbacks. For example, research suggests that illusory correlations—in which certain behaviours are inaccurately attributed to certain groups—are involved in the formation of prejudicial attitudes that can ultimately lead to discriminatory behaviour (Fiedler, 2004).

Causality: Conducting Experiments and Using the Data

As you've learned, the only way to establish that there is a cause-and-effect relationship between two variables is to conduct a scientific experiment. Experiment has a different meaning in the scientific context than in everyday life. In everyday conversation, we often use it to describe trying something for the first time, such as experimenting with a new hair style or a new food. However, in the scientific context, an experiment has precise requirements for design and implementation.

TRICKY TOPIC: EXPERIMENTAL RESEARCH

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If the video above does not load, click here: https://www.youtube.com/watch?v=9YTYuQa8p-

U&feature=youtu.be

For a full transcript of this video, click here

The Experimental Hypothesis

In order to conduct an experiment, a researcher must have a specific hypothesis to be tested. As you've learned, hypotheses can be formulated either through direct observation of the real world or after careful review of previous research. If you've ever spent time with a young child in a car you may have seen them mimicking the actions of the adult driving, pretending to turn the steering wheel or honk the horn. You may have also seen this kind of imitation in less neutral contexts, like a child repeating offensive language that they clearly don't understand. Based on this observation, it would be reasonable to think that children have a tendency to imitate behaviour they observe from others. You might make further observations from here, for example you might notice that children more often imitate behaviours performed by adults rather than other children, or that this tendency for imitation could facilitate the development of aggressive behaviours in children.

Figure PR.14 Do children imitate the adults they observe? (credit: Unsplash)

These sorts of personal observations are what often lead us to formulate a specific hypothesis, but we cannot use limited personal observations and anecdotal evidence to rigorously test our hypothesis. Instead, to find out if real-world data supports our hypothesis, we have to conduct an experiment.

Designing an Experiment

The most basic experimental design involves two groups: the experimental group and the control group. The two groups are designed to be the same except for one difference—experimental manipulation. The **experimental group** gets

the experimental manipulation—that is, the treatment or variable being tested (in this case, the use of technology)—and the **control group** does not. Since experimental manipulation is the only difference between the experimental and control groups, we can be sure that any differences between the two are due to experimental manipulation rather than chance.

To investigate the relationship between observed aggression and imitated aggressive behaviour in children, our experimental manipulation will be to allow children to observe an adult modeling aggressive behaviour. We might have the children in our experimental group play in a room where they are able to observe adults playing aggressively with toys, hitting, pushing and yelling at them. The study we are describing here is actually a simplified version of the famous 1961 Bobo doll study performed by Albert Bandura, Dorothea Ross, and Sheila A. Ross, named as such because the toy used to demonstrate aggression was an inflatable clown doll called Bobo. We will touch more on work done by Bandura in greater detail in section 57 on observational learning.

Figure PR. 15 The Bobo doll, a bowling pin shaped inflatable toy with a clown printed on it. The toy is heavier at the base than it is at the top, so it rocks back and forth without falling over when pushed or struck.

We've decided our experimental condition will involve allowing children to observe adults modelling aggressive behaviour, we now need to design a control group that differs only by a lack of exposure to aggressive adult models. The original version of the Bobo doll study had a control group that did not observe any behaviour at all. Knowing what you now know about experimental design, would you design your control group in the same way? If a control group is meant to differ from an experimental group only in terms of the experimental manipulation, you might argue that a group

exposed to nothing differs in several ways. For example, the experience of being made to sit in a room with a strange adult could theoretically provoke acts of aggression in young children. It might seem far-fetched, but we cannot infer that observation of aggression was the cause of our participant's behaviour if we don't rule out the possibility that other features of our manipulation could have contributed. The researchers used a second experimental group to rule out this possibility, but for the purposes of our hypothetical replication we have an experimental group who observe adults behaving aggressively with toys, and a control group who observe adults behaving non-aggressively with the same toys.

One of the most important parts of a scientific study is having a clear description of how each variable is measured, known as an **operational definition**.Some variables, like age and height, are easy to define, but psychologists are often interested in measuring abstract variables like thought, emotion, and behaviour which can be challenging. For example, can you operationally define helpfulness? People vary in how helpful they are, so there must be some way to measure this. This could be measured by looking at charitable donations on annual tax returns, but that's only one type of helpfulness and is biased towards wealthier individuals. What about number of hours per week volunteering? This operational definition also has its limitations in capturing helping behaviour.In our Bobo doll study, we will have to define aggression, which could be described in a variety of

ways. For example, one might define aggression as hostile, injurious, or destructive behaviour caused by frustration. However, this definition would require us to also measure frustration, as this feature is not externally observable. Researchers often create different operational definitions of the same variable, so providing a clear, measurable description is important in interpreting research findings.

While it is possible to measure frustration through self-report, our study is interested in imitative aggression, and we do not know that imitative aggression is caused by frustration. So for the purposes of our hypothetical experiment, we could define aggressive behaviour as physical or verbal acts that have the potential to cause harm to an object or another human. We could then describe specific, observable aggressive behaviours like kicking the doll, throwing it, or saying things like "stupid doll". Our adult models could perform these specific behaviours, and we could measure the rate at which participants imitate those acts when given an opportunity to play with the same doll later. The imitation of those previously described acts would be considered imitative aggression. Having defined our variables like this, we are able to communicate specifically what we have measured, which makes it easier for other researchers to replicate our experiment and check our results.

We've operationalized our variables, so now we can decide how our experiment will run. In this case, we could allow our

participants to play in a room with an adult model who would perform a set of specifically defined behaviours (either aggressive or non-aggressive) to a doll. We could then move our participants to a different room with the same set of toys and count how many of those specifically defined behaviours they reproduce.

Ideally, the people who count imitated behaviours are unaware of who was assigned to the experimental or control group, in order to control for experimenter bias. **Experimenter bias** refers to the possibility that a researcher's expectations might skew the results of the study. Remember, conducting an experiment requires a lot of planning, and the people involved in the research project have a vested interest in supporting their hypotheses. If the observers knew which child was in which group, it might influence how they interpret ambiguous responses, such as squeezing the doll. By being blind to which child is in which group, we protect against those biases. This situation is a **single-blind study**, meaning that one of the groups (participants) are unaware as to which group they are in (experiment or control group) while the researcher who developed the experiment knows which participants are in each group.

In a **double-blind study**, both the researchers and the participants are blind to group assignments, which allows us to control for both experimenter and participant expectations. A well-known example of this is the **placebo**

effect, which occurs when people's expectations or beliefs influence or determine their experience in a given situation. In other words, simply expecting something to happen can actually make it happen.

To illustrate, imagine that you have bad allergies and are taking part in a study testing a new allergy medication. You go to a university or hospital setting to take part in the experiment, speaking to people in lab coats with medical authority who do a number of tests on you and then give you a pill. Whether the pill contains actual medication or not, the experience of taking part and receiving the pill may give the treatment a sense of legitimacy. You may feel hopeful and proactive about your bad allergies, and as a result you may notice an actual improvement in symptoms even if you only took a sugar pill.

As we know, we can only say that our experimental manipulation (in this case the medication) is the cause of our results if it is the only difference between the experimental and control groups. As a result, we might use a placebo control, where the only difference between the two groups would be the contents of the pill- medicine or something inert. To ensure that all other conditions are the same, participants must not know whether they have received the drug- if they knew, we wouldn't be able to tell whether the effects were due to expectations about drug efficacy or to the actual drug. Similarly, if the researchers know which drug participants are

receiving they might treat participants differently, which could alter the way participants respond (Figure PR.15).

Figure PR.15 Providing the control group with a placebo treatment protects against bias caused by expectancy. (credit: Elaine and Arthur Shapiro)

Independent and Dependent Variables

In a research experiment, we strive to study whether changes in one thing cause changes in another. To achieve this, we must pay attention to two important variables, or things that can be changed, in any experimental study: the independent variable and the dependent variable. An **independent variable** is manipulated or controlled by the experimenter. In a well-designed experimental study, the independent variable

is the only important difference between the experimental and control groups. In our example of how the observation of aggressive behaviour affects later behaviour, the independent variable is the type of behaviour observed by the participants. (Figure PR.16). A **dependent variable** is what the researcher measures to see how much effect the independent variable had.In our example, the dependent variable is the number of modelled aggressive behaviours our participants imitate.

Figure PR.16 In an experiment, manipulations of the independent variable are expected to result in changes in the dependent variable. (source: wikimedia commons)

We expect that the dependent variable will change as a function of the independent variable. In other words, the dependent variable *depends* on the independent variable. A good way to think about the relationship between the

independent and dependent variables is with this question: What effect does the independent variable have on the dependent variable?In our example of how the observation of aggressive behaviour affects later behaviour, the independent variable is the type of behaviour observed by the participants.

Selecting and Assigning Experimental Participants

Now that our study is designed, we need to obtain a sample of individuals to include in our experiment. Our study involves human participants so we need to determine who to include. **Participants** are the subjects of psychological research, and as the name implies, individuals who are involved in psychological research actively participate in the process. Often, psychological research projects rely on college students to serve as participants. In fact, the vast majority of research in psychology subfields has historically involved students as research participants (Sears, 1986; Arnett, 2008). But are college students truly representative of the general population? College students tend to be younger, more educated, more liberal, and less diverse than the general population. Although using students as test subjects is an accepted practice, relying on such a limited pool of research participants can be problematic because it is difficult to generalize findings to the larger population.

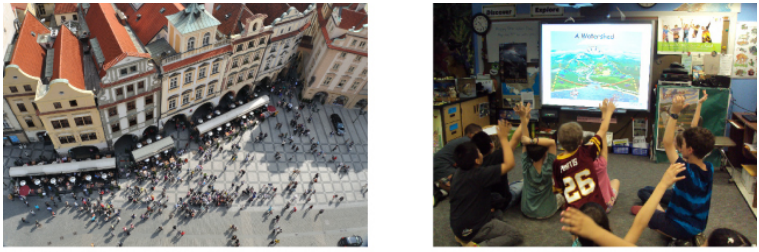
Our hypothetical experiment involves preschool aged children, so we need to generate a sample from that

population. Samples are used because populations are usually too large to reasonably involve every member in our particular experiment (Figure PR.17). If possible, we should use a random sample (there are other types of samples, but for the purposes of this chapter, we will focus on random samples). A **random sample**is a subset of a larger population in which every member of the population has an equal chance of being selected. Random samples are preferred because if the sample is large enough we can be reasonably sure that the participating individuals are representative of the larger population. This means that the percentages of characteristics in the sample—sex, ethnicity, socioeconomic level, and any other characteristics that might affect the results—are close to those percentages in the larger population. Additionally, random sampling ensures that differences in characteristics are relatively balanced between groups.

In our example, we're interested in pre-school aged children, but we can't possibly include all pre-school aged children in our study so we need to be more specific; instead we might say our population of interest is all pre-school aged children in a particular city. We should include children from various income brackets, family situations, races, ethnicities, religions, and geographic areas of town. With this more manageable population, we can work with local preschools to select a random sample of around 200 children who we want to participate in our experiment.

In summary, because we cannot test all of the pre-school

aged children in a city, we want to find a group of about 200 that reflects the composition of that city. With a representative group, we can generalize our findings to the larger population without fear of our sample being biased in some way. In the original version of this study, the sample was composed of 72 children from the Stanford University Nursery School. Can you think of some ways in which a sample drawn exclusively from a wealthy universities' nursery school might be biased?



(a) (b)

Figure PR.17 Researchers may work with (a) a large population or (b) a sample group that is a subset of the larger population. (credit "crowd": modification of work by James Cridland; credit "students": modification of work by Laurie Sullivan)

Now that we have a sample, the next step of the experimental process is to split the participants into experimental and control groups through **random assignment**. With random assignment, all participants have an equal chance of being assigned to either group. There is statistical software that will randomly assign each of the children in the sample to either the experimental or the control group.

Random assignment is critical for sound experimental design. With sufficiently large samples, random assignment makes it unlikely that there are systematic differences between the groups. So, for instance, it would be very unlikely that we would get one group composed entirely of males, a given ethnic identity, or a given religious ideology. This is important because if the groups were systematically different before the experiment began, we would not know the origin of any differences we find between the groups: Were the differences preexisting, or were they caused by manipulation of the independent variable? Even using random assignment it is possible to have groups that differ significantly from each other, so it is important to monitor any variable we think might impact our results. If we do find that a variable of interest differs significantly between groups, we can match them on that variable. **Matching**is a practice where participants in the experimental group are paired with participants in the control group that have similar scores on a variable of interest. For example, In the Bobo doll study participants were scored on their baseline levels of aggression. If their experimental group was found to be significantly more aggressive than their control group prior to any experimental manipulation, then they would not have been able to infer that the results were due to their manipulation. To avoid this outcome the researchers matched children in different groups with similar levels of baseline aggression, so that the groups would be roughly equivalent on that variable. Random

assignment, monitoring variables, and matching allow us to assume that any differences observed between experimental and control groups result from the manipulation of the independent variable.

Link to Learning

Use this online random number generator to learn more about random sampling and assignments.

Issues to Consider

While experiments allow scientists to make cause-and-effect claims, they are not without problems. True experiments require the experimenter to manipulate an independent variable, and that can complicate many questions that psychologists might want to address. For instance, imagine that you want to know what effect sex (the independent variable) has on spatial memory (the dependent variable). Although you can certainly look for differences between people with different biological sexes on a task that taps into spatial memory, you cannot directly control a person's sex. We

categorize this type of research approach as quasi-experimental and recognize that we cannot make cause-and-effect claims in these circumstances.

Experimenters are also limited by ethical constraints. For instance, you would not be able to conduct an experiment designed to determine if experiencing abuse as a child leads to lower levels of self-esteem among adults. To conduct such an experiment, you would need to randomly assign some experimental participants to a group that receives abuse, and that experiment would be unethical.

Interpreting Experimental Findings

Once data is collected from both the experimental and the control groups, a **statistical analysis** is conducted to find out if there are meaningful differences between the two groups. A statistical analysis determines how likely any difference found is due to chance (and thus not meaningful). For example, if an experiment is done on the effectiveness of a nutritional supplement, and those taking a placebo pill (and not the supplement) have the same result as those taking the supplement, then the experiment has shown that the nutritional supplement is not effective. Generally, psychologists consider differences to be statistically significant if there is less than a five percent chance of observing them if the groups did not actually differ from one another. Stated another way, psychologists want to limit the chances of making "false positive" claims to five percent or less.

The greatest strength of experiments is the ability to assert that any significant differences in the findings are caused by the independent variable. This occurs because random selection, random assignment, and a design that limits the effects of both experimenter bias and participant expectancy should create groups that are similar in composition and treatment. Therefore, any difference between the groups is attributable to the independent variable, and now we can finally make a causal statement. If we find that observing aggressive behaviour results in more imitated aggression than observing non-aggressive behaviour, we can safely say that exposure to aggressive behaviour causes an increase in imitated aggression.

TRICKY TOPIC: STATISTICAL MEASURES

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If the video above does not load, click here: https://youtu.be/uV87qt1iRkA
For a full transcript of this video, click here

Reporting Research

When psychologists complete a research project, they generally want to share their findings with other scientists. The American Psychological Association (APA) publishes a manual detailing how to write a paper for submission to scientific journals. Unlike an article that might be published in a magazine like *Psychology Today*, which targets a general audience with an interest in psychology, scientific journals generally publish **peer-reviewed journal articles** aimed at an audience of professionals and scholars who are actively involved in research themselves.

Link to Learning

The Online Writing Lab (OWL) at Purdue University can walk you through the APA writing guidelines.

A peer-reviewed journal article is read by several other scientists (generally anonymously) with expertise in the subject matter. These peer reviewers provide feedback—to both the author and the journal editor—regarding the quality of the

draft. Peer reviewers look for a strong rationale for the research being described, a clear description of how the research was conducted, and evidence that the research was conducted in an ethical manner. They also look for flaws in the study's design, methods, and statistical analyses. They check that the conclusions drawn by the authors seem reasonable given the observations made during the research. Peer reviewers also comment on how valuable the research is in advancing the discipline's knowledge. This helps prevent unnecessary duplication of research findings in the scientific literature and, to some extent, ensures that each research article provides new information. Ultimately, the journal editor will compile all of the peer reviewer feedback and determine whether the article will be published in its current state (a rare occurrence), published with revisions, or not accepted for publication.

Peer review provides some degree of quality control for psychological research. Poorly conceived or executed studies can be weeded out, well-designed research can be improved, and ideally, studies can be described clearly enough to allow other scientists to **replicate**them, which helps to determine reliability.

So why would we want to replicate a study? Imagine that our version of the Bobo doll study is done exactly the same as the original, only using a different set of participants and researchers. We use the same operational definitions, manipulations, measurements, and procedures, and our groups are equivalent in terms of their baseline levels of

aggression. In our replication however, we receive completely different results and the children do not imitate aggressive behaviours any more than they would at the level of chance. If our experimental manipulation is exactly the same, then the difference in results must be attributable to something else that is different between our study and the original, which might include the researchers, participants, and location. If on the other hand, we were able to replicate the results of the original experiment using different researchers and participants at a different location, then this would provide support for the idea that the results were due to the manipulation and not to any of these other variables. The more we can replicate a result with different samples, the more reliable it is.

In recent years, there has been increasing concern about a "replication crisis" that has affected a number of scientific fields, including psychology. One study found that only about 62% of social science studies reviewed were replicable, and even then their effect sizes were reduced by half (Cramerer et. al, 2018). In fact, even a famous Nobel Prize-winning scientist has recently retracted a published paper because she had difficulty replicating her results (Nobel Prize-winning scientist Frances Arnold retracts paper, 2020 January 3). These kinds of outcomes have prompted some scientists to begin to work together and more openly, and some would argue that the current "crisis" is actually improving the ways in which science is conducted and in how its results are shared with others (Aschwanden, 2018). One example of this more collaborative

approach is the Psychological Science Accelerator, a network of over 500 laboratories, representing 82 countries. This network allows researchers to pre-register their study designs, which minimizes any cherry-picking that might happen along the way to boost results. The network also facilitates data collection across multiple labs, allowing for the use of large, diverse samples and more wide-spread sharing of results. Hopefully with a more collaborative approach, we can develop a better process for replicating and quality checking research.

Link to Learning

If you'd like to learn more about the Psychological Sciences Accelerator, you can check out their website here: https://psysciacc.org/

Dig Deeper

The Vaccine-Autism Myth and Retraction of Published Studies

Some scientists have claimed that routine childhood vaccines cause some children to develop autism, and, in fact, several peer-reviewed publications published research making these claims. Since the initial reports, large-scale epidemiological research has suggested that vaccinations are not responsible for causing autism and that it is much safer to have your child vaccinated than not. Furthermore, several of the original studies making this claim have since been retracted.

A published piece of work can be rescinded when data is called into question because of falsification, fabrication, or serious research design problems. Once rescinded, the scientific community is informed that there are serious problems with the original publication. Retractions can be initiated by the researcher who led the study, by research

collaborators, by the institution that employed the researcher, or by the editorial board of the journal in which the article was originally published. In the vaccine-autism case, the retraction was made because of a significant conflict of interest in which the leading researcher had a financial interest in establishing a link between childhood vaccines and autism (Offit, 2008). Unfortunately, the initial studies received so much media attention that many parents around the world became hesitant to have their children vaccinated (Figure PR.18). Continued reliance on such debunked studies has significant consequences. For instance, between January and October of 2019, there were 22 measles outbreaks across the United States and more than a thousand cases of individuals contracting measles (Patel et al., 2019). This is likely due to the anti-vaccination movements that have risen from the debunked research. For more information about how the vaccine/autism story unfolded, as well as the repercussions of this story, take a look at Paul Offit's book, *Autism's False Prophets: Bad Science, Risky Medicine, and the Search for a Cure.*

Figure PR.18 Some people still think vaccinations cause autism. (credit: modification of work by UNICEF Sverige)

Reliability and Validity

Reliability and validity are two important considerations that must be made with any type of data collection. **Reliability** refers to the ability to consistently produce a given result. In the context of psychological research, this would mean that any instruments or tools used to collect data do so in consistent, reproducible ways. There are a number of different types of reliability. Some of these include *inter-rater reliability* (the degree to which two or more different observers agree on what has been observed), *internal consistency* (the degree to which different items on a survey that measure the same thing correlate with one another), and *test-retest reliability* (the degree to which the outcomes of a particular measure remain consistent over multiple administrations).

Unfortunately, being consistent in measurement does not necessarily mean that you have measured something correctly. To illustrate this concept, consider a kitchen scale that would be used to measure the weight of cereal that you eat in the morning. If the scale is not properly calibrated, it may consistently under- or overestimate the amount of cereal that's being measured. While the scale is highly reliable in producing consistent results (e.g., the same amount of cereal poured onto the scale produces the same reading each time), those results are incorrect. This is where validity comes into play. **Validity** refers to the extent to which a given instrument

or tool accurately measures what it's supposed to measure, and once again, there are a number of ways in which validity can be expressed. *Ecological validity* (the degree to which research results generalize to real-world applications), *construct validity* (the degree to which a given variable actually captures or measures what it is intended to measure), and *face validity* (the degree to which a given variable seems valid on the surface) are just a few types that researchers consider. While any valid measure is by necessity reliable, the reverse is not necessarily true. Researchers strive to use instruments that are both highly reliable and valid.

To illustrate how complicated it can be to determine the validity of a measure, let's look again at the original Bobo doll study. Bandura and colleagues were not only interested in whether children would imitate aggressive behaviours, they also wanted to know if observing same-sex adults would have a greater impact on children's behaviour than observing adults of a different sex. So how did they define sex? The children involved in the study were nursery school aged, so it's likely that the researchers simply did a visual assessment or asked their parents. Generally we now use 'sex' to refer to the different biological categories people might fit into, while 'gender' refers to the socially constructed characteristics we assign to those categories, and is something an individual must define for themselves. In this case, the researchers were really

categorizing their participants based on assumed sex, rather than actual biological sex.

A visual assessment of biological sex might seem to have clear face validity to many people, but as a measurement it is low in construct validity. That is, while it is often assumed that sex can be determined by looking at an individual's appearance, that approach has little ability to accurately measure biological sex. The assumption that biological sex is both binary and visually obvious results in a lack of research in populations of people who exist outside of those assumptions. This in turn means that the measure has little ecological validity, as these people do exist in real-world populations. To illustrate further, let's consider some of the ways biological sex has been traditionally assessed:

- Visual assessment: In this approach, researchers would record 'sex' based on their visual assessment of the clothed participant. This might work for many individuals, but it's based on an assumption about the individual's reproductive biology, which is not reliably assessed by external appearance. There are female humans with beards, male humans without Adam's apples, and of course, transgender, non-binary, and intersex people whose bodies may not fit these assumed categories
- Medical records or birth certificates: In medical research, data is routinely collected about patient's demographics,

so sex may be assessed simply by looking at a participants' medical record. However, given that biological sex assignment of infants at birth is based a visual assessment of the infant's external genitalia, which is used to categorize the infant as "male" or "female." While visually assessing the genitals of an individual may appear to be enough to determine their biological sex, this is unreliable for the reasons outlined above (visual assessment). A larger problem is this method of sex assignment at birth has been incredibly harmful to intersex people.

- Self-report: To avoid the issues described above, it may seem reasonable to ask participants to self-identify. This can present two issues: (1) most people's understanding of their own biological sex is based on their medical record or birth certificate, and not further testing (thus their beliefs about their biological sex may not be congruent with their actual biology). This may seem unlikely but remember birth certificates and the determination of biological sex of an infant at birth is not a foolproof way of getting this information. And, (2) as with all self-report measures, it's reliant upon the researchers providing appropriate categories (i.e., has intersex been included as an option) and the participant being truthful. Participants may not readily volunteer this information for reasons of privacy, safety, or simply because it makes navigating the world easier for them.

While it may seem like something that ought to be easy, truly determining the biological sex of an individual can be difficult. The biological sex of an individual is determined by more than their external genitals, or whether they have a penis/vagina. Some other determinants of biological sex include the internal gonads (ovaries or testes), predominant hormones (testosterone or estrogen), and chromosomal DNA (e.g., XX, XY). It is often assumed that the chromosomal DNA of a person is the truest indicator of their biological sex, however this does not always "match" gonadal, hormonal, or genital sex. Intersex is a general term applied to a variety of conditions which result in a person being born with anatomy that defies traditional male-female categorization. This could result in a person having atypical external genitalia, genitals that don't align with internal reproductive organs, or atypical chromosomal structures (despite typical anatomy). For instance, a person could be born with mosaic genetics, with both XX and XY chromosomes. These conditions may be present at birth, but often a person has no reason to suspect they are intersex until they reach puberty. In some cases, the condition may not even be discovered until post-mortem during a medical autopsy.

It's not impossible to determine an individual's biological sex, but sex should be operationally defined and data should be collected accordingly. As you go learn more about the scientific process and research, it's important to critically evaluate

methods and findings. Participants are frequently divided into male-female categories and it's worth exploring the details of the methods to understand how scientists have actually measured biological sex and whether their approach may impact the validity of their conclusions.

Link to Learning

Researchers (or lab volunteers or those participating in research) who want to learn more about gender and sex considerations when conducting research and completing analyses, can check out the toolkits created by the University of British Columbia's (UBC) Centre for Gender & Sexual Health Equity.

Now that we understand the complexity of measuring biological sex, let's consider how it was it was assessed in the original Bobo doll study. There is no mention of biological measures being taken so we can assume that sex categorization was based on visual assessment or by report from the children's parents. We know now that this is not an accurate way to measure biological sex, so we should consider why sex was

included in the experiment. Given that children were found to perceive their parents as having preferences for them to behave in 'sex appropriate' ways (eg. Girls playing with dolls and boys playing with trucks), the researchers hypothesized their participants would be more likely to imitate the behaviour of a same-sex model than a model of a different sex. They were interested in the effect that socially reinforced gender roles would have on imitated behaviour so the assumed sex of the children was all that mattered, as this would determine what behaviours would be discouraged or reinforced by adults. It's ok that no biological measures were taken for this study because biological sex wasn't actually relevant, but terms like sex and gender have often used interchangeably in research so it's important to think critically about how constructs are being operationally defined and measured. If Bandura and colleagues were to replicate this study today, we should hope that they would be more accurate and specific with their terminology and use something like 'assumed sex/gender' rather than 'sex' to refer to the variable they were interested in. After all, this kind of specificity in language allows for more accurate understanding and replication, which can increase our confidence in their original conclusion. As you move forward in your degree and engage in research more directly, consider carefully what variables you are interested in, and do your best to choose language that is both specific and accurate.

Link to Learning

For more information on intersex conditions, check out the FAQ for interACT, an advocacy group for intersex youth: https://interactadvocates.org/faq/

14.

ETHICS

Learning Objectives

By the end of this section, you will be able to:

- Discuss how research involving human subjects is regulated
- Summarize the processes of informed consent and debriefing
- Explain how research involving animal subjects is regulated

Today, scientists agree that good research is ethical in nature and is guided by a basic respect for human dignity and safety. However, as you will read in the feature box, this has not always been the case. Modern researchers must demonstrate

that the research they perform is ethically sound. This section presents how ethical considerations affect the design and implementation of research conducted today.

Research Involving Human Participants

Any experiment involving the participation of human subjects is governed by extensive, strict guidelines designed to ensure that the experiment does not result in harm. Any research institution that receives federal support for research involving human participants must have access to an **institutional review board (IRB)**. The IRB is a committee of individuals often made up of members of the institution's administration, scientists, and community members (Figure PR.19). The purpose of the IRB is to review proposals for research that involves human participants. The IRB reviews these proposals with the principles mentioned above in mind, and generally, approval from the IRB is required in order for the experiment to proceed.

Figure PR.19 An institution's IRB meets regularly to review experimental proposals that involve human participants. (credit: International Hydropower Association/Flickr)

An institution's IRB requires several components in any experiment it approves. For one, each participant must sign an **informed consent** form before they can participate in the experiment. An informed consent form provides a written description of what participants can expect during the experiment, including potential risks and implications of the research. It also lets participants know that their involvement is completely voluntary and can be discontinued without penalty at any time. Furthermore, the informed consent guarantees that any data collected in the experiment will remain completely confidential. In cases where research

participants are under the age of 18, the parents or legal guardians are required to sign the informed consent form.

Link to Learning

Check out these examples of consent forms from Dalhousie University's Office of Research Services.

While the informed consent form should be as honest as possible in describing exactly what participants will be doing, sometimes deception is necessary to prevent participants' knowledge of the exact research question from affecting the results of the study. **Deception** involves purposely misleading experiment participants in order to maintain the integrity of the experiment, but not to the point where the deception could be considered harmful. For example, if we are interested in how our opinion of someone is affected by their attire, we might use deception in describing the experiment to prevent that knowledge from affecting participants' responses. In cases where deception is involved, participants must receive a full **debriefing** upon conclusion of the study—complete, honest information about the purpose of the experiment, how the data collected will be used, the reasons why deception was

necessary, and information about how to obtain additional information about the study.

Dig Deeper

Ethics and the Tuskegee Syphilis Study

Unfortunately, the ethical guidelines that exist for research today were not always applied in the past. In 1932, poor, rural, black, male sharecroppers from Tuskegee, Alabama, were recruited to participate in an experiment conducted by the U.S. Public Health Service, with the aim of studying syphilis in black men (Figure PR.20). In exchange for free medical care, meals, and burial insurance, 600 men agreed to participate in the study. A little more than half of the men tested positive for syphilis, and they served as the experimental group (given that the researchers could not randomly assign participants to groups, this represents a quasi-experiment). The remaining syphilis-free individuals served as the control group. However, those individuals that tested positive for

syphilis were never informed that they had the disease.

While there was no treatment for syphilis when the study began, by 1947 penicillin was recognized as an effective treatment for the disease. Despite this, no penicillin was administered to the participants in this study, and the participants were not allowed to seek treatment at any other facilities if they continued in the study. Over the course of 40 years, many of the participants unknowingly spread syphilis to their wives (and subsequently their children born from their wives) and eventually died because they never received treatment for the disease. This study was discontinued in 1972 when the experiment was discovered by the national press (Tuskegee University, n.d.). The resulting outrage over the experiment led directly to the National Research Act of 1974 and the strict ethical guidelines for research on humans described in this chapter. Why is this study unethical? How were the men who participated and their families harmed as a function of this research?

Figure PR.20 A participant in the Tuskegee Syphilis Study receives an injection.

Link to Learning

Visit the CDC's Tuskegee Timeline to learn more.

Research Involving Animal Subjects

Many psychologists conduct research involving animal subjects. Often, these researchers use rodents (Figure PR.21) or birds as the subjects of their experiments—the APA estimates that 90% of all animal research in psychology uses these species (American Psychological Association, n.d.). Because many basic processes in animals are sufficiently similar to those in humans, these animals are acceptable substitutes for research that would be considered unethical in human participants.

Figure PR.21 Rats, like the one shown here, often serve as the subjects of animal research.

This does not mean that animal researchers are immune to ethical concerns. Indeed, the humane and ethical treatment of animal research subjects is a critical aspect of this type of

research. Researchers must design their experiments to minimize any pain or distress experienced by animals serving as research subjects.

Whereas IRBs review research proposals that involve human participants, animal experimental proposals are reviewed by an **Institutional Animal Care and Use Committee (IACUC)**. An IACUC consists of institutional administrators, scientists, veterinarians, and community members. This committee is charged with ensuring that all experimental proposals require the humane treatment of animal research subjects. It also conducts semi-annual inspections of all animal facilities to ensure that the research protocols are being followed. No animal research project can proceed without the committee's approval.

15.

KEY TERMS FOR PSYCHOLOGICAL RESEARCH

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archival research

method of research using past records or data sets to answer various research questions, or to search for interesting patterns or relationships

attrition

reduction in number of research participants as some drop out of the study over time

cause-and-effect relationship

changes in one variable cause the changes in the other variable; can be determined only through an experimental research design

clinical or case study

observational research study focusing on one or a few people

confirmation bias

tendency to ignore evidence that disproves ideas or beliefs

confounding variable

unanticipated outside factor that affects both variables of interest, often giving the false impression that changes in one variable causes changes in the other variable, when, in actuality, the outside factor causes changes in both variables

control group

serves as a basis for comparison and controls for chance factors that might influence the results of the study—by holding such factors constant across groups so that the experimental manipulation is the only difference between groups

correlation

relationship between two or more variables; when two variables are correlated, one variable changes as the other does

correlation coefficient

number from -1 to +1, indicating the strength and direction of the relationship between variables, and usually represented by *r*

cross-sectional research

compares multiple segments of a population at a single time

debriefing

when an experiment involved deception, participants are told complete and truthful information about the experiment at its conclusion

deception

purposely misleading experiment participants in order to maintain the integrity of the experiment

deductive reasoning

results are predicted based on a general premise

dependent variable

variable that the researcher measures to see how much effect the independent variable had

double-blind study

experiment in which both the researchers and the participants are blind to group assignments

empirical

grounded in objective, tangible evidence that can be observed time and time again, regardless of who is observing

experimental group

group designed to answer the research question; experimental manipulation is the only difference between the experimental and control groups, so any differences between the two are due to experimental manipulation rather than chance

experimenter bias

researcher expectations skew the results of the study

fact

objective and verifiable observation, established using evidence collected through empirical research

falsifiable

able to be disproven by experimental results

generalize

inferring that the results for a sample apply to the larger population

hypothesis

(plural: hypotheses) tentative and testable statement about the relationship between two or more variables

illusory correlation

seeing relationships between two things when in reality no such relationship exists

independent variable

variable that is influenced or controlled by the experimenter; in a sound experimental study, the independent variable is the only important difference between the experimental and control group

inductive reasoning

conclusions are drawn from observations

informed consent

process of informing a research participant about what to expect during an experiment, any risks involved, and the implications of the research, and then obtaining the person's consent to participate

Institutional Animal Care and Use Committee (IACUC)

committee of administrators, scientists, veterinarians, and community members that reviews proposals for research involving non-human animals

Institutional Review Board (IRB)

committee of administrators, scientists, and community members that reviews proposals for research involving human participants

inter-rater reliability

measure of agreement among observers on how they record and classify a particular event

longitudinal research

studies in which the same group of individuals is surveyed or measured repeatedly over an extended period of time

naturalistic observation

observation of behaviour in its natural setting

negative correlation

two variables change in different directions, with one becoming larger as the other becomes smaller; a negative correlation is not the same thing as no correlation

observer bias

when observations may be skewed to align with observer expectations

operational definition

description of what actions and operations will be used to measure the dependent variables and manipulate the independent variables

opinion

personal judgments, conclusions, or attitudes that may or may not be accurate

participants

subjects of psychological research

peer-reviewed journal article

article read by several other scientists (usually anonymously) with expertise in the subject matter, who provide feedback regarding the quality of the manuscript before it is accepted for publication

placebo effect

people's expectations or beliefs influencing or determining their experience in a given situation

population

overall group of individuals that the researchers are interested in

positive correlation

two variables change in the same direction, both becoming either larger or smaller

random assignment

method of experimental group assignment in which all participants have an equal chance of being assigned to either group

random sample

subset of a larger population in which every member of the population has an equal chance of being selected

reliability

consistency and reproducibility of a given result

replicate

repeating an experiment using different samples to

determine the research's reliability

sample

subset of individuals selected from the larger population

single-blind study

experiment in which the researcher knows which participants are in the experimental group and which are in the control group

statistical analysis

determines how likely any difference between experimental groups is due to chance

survey

list of questions to be answered by research participants—given as paper-and-pencil questionnaires, administered electronically, or conducted verbally—allowing researchers to collect data from a large number of people

theory

well-developed set of ideas that propose an explanation for observed phenomena

validity

accuracy of a given result in measuring what it is designed to measure

16.

SUMMARY OF PSYCHOLOGICAL RESEARCH

PR.1 Why Is Research Important?

Scientists are engaged in explaining and understanding how the world around them works, and they are able to do so by coming up with theories that generate hypotheses that are testable and falsifiable. Theories that stand up to their tests are retained and refined, while those that do not are discarded or modified. In this way, research enables scientists to separate fact from simple opinion. Having good information generated from research aids in making wise decisions both in public policy and in our personal lives.

PR.2 Approaches to Research

The clinical or case study involves studying just a few individuals for an extended period of time. While this approach provides an incredible depth of information, the

ability to generalize these observations to the larger population is problematic. Naturalistic observation involves observing behaviour in a natural setting and allows for the collection of valid, true-to-life information from realistic situations. However, naturalistic observation does not allow for much control and often requires quite a bit of time and money to perform. Researchers strive to ensure that their tools for collecting data are both reliable (consistent and replicable) and valid (accurate).

Surveys can be administered in a number of ways and make it possible to collect large amounts of data quickly. However, the depth of information that can be collected through surveys is somewhat limited compared to a clinical or case study.

Archival research involves studying existing data sets to answer research questions.

Longitudinal research has been incredibly helpful to researchers who need to collect data on how people change over time. Cross-sectional research compares multiple segments of a population at a single time.

PR.3 Analyzing Findings

A correlation is described with a correlation coefficient, *r*, which ranges from -1 to 1. The correlation coefficient tells us about the nature (positive or negative) and the strength of the relationship between two or more variables. Correlations do not tell us anything about causation—regardless of how

strong the relationship is between variables. In fact, the only way to demonstrate causation is by conducting an experiment. People often make the mistake of claiming that correlations exist when they really do not.

Researchers can test cause-and-effect hypotheses by conducting experiments. Ideally, experimental participants are randomly selected from the population of interest. Then, the participants are randomly assigned to their respective groups. Sometimes, the researcher and the participants are blind to group membership to prevent their expectations from influencing the results.

In ideal experimental design, the only difference between the experimental and control groups is whether participants are exposed to the experimental manipulation. Each group goes through all phases of the experiment, but each group will experience a different level of the independent variable: the experimental group is exposed to the experimental manipulation, and the control group is not exposed to the experimental manipulation. The researcher then measures the changes that are produced in the dependent variable in each group. Once data is collected from both groups, it is analyzed statistically to determine if there are meaningful differences between the groups.

Psychologists report their research findings in peer-reviewed journal articles. Research published in this format is checked by several other psychologists who serve as a filter separating ideas that are supported by evidence from ideas that are not.

Replication has an important role in ensuring the legitimacy of published research. In the long run, only those findings that are capable of being replicated consistently will achieve consensus in the scientific community.

PR.4 Ethics

Ethics in research is an evolving field, and some practices that were accepted or tolerated in the past would be considered unethical today. Researchers are expected to adhere to basic ethical guidelines when conducting experiments that involve human participants. Any experiment involving human participants must be approved by an IRB. Participation in experiments is voluntary and requires informed consent of the participants. If any deception is involved in the experiment, each participant must be fully debriefed upon the conclusion of the study.

Animal research is also held to a high ethical standard. Researchers who use animals as experimental subjects must design their projects so that pain and distress are minimized. Animal research requires the approval of an IACUC, and all animal facilities are subject to regular inspections to ensure that animals are being treated humanely.

17.

REVIEW QUESTIONS FOR PSYCHOLOGICAL RESEARCH

Click here for Answer Key

Multiple Choice Questions

1. Scientific hypotheses are _____ and falsifiable.

a. observable
b. original
c. provable
d. testable

2. _____ are defined as observable realities.

a. behaviours
b. facts
c. opinions
d. theories

3. Scientific knowledge is _____.

a. intuitive
b. empirical
c. permanent
d. subjective

4. A major criticism of Freud's early theories involves the fact that his theories _____.

a. were too limited in scope
b. were too outrageous
c. were too broad
d. were not testable

5. Sigmund Freud developed his theory of human personality by conducting in-depth interviews over an extended period of time with a few clients. This type of research approach is known as a(n): _____.

a. archival research
b. case study
c. naturalistic observation
d. survey

6. _____ involves observing behaviour in individuals in their natural environments.

a. archival research
b. case study
c. naturalistic observation
d. survey

7. The major limitation of case studies is _____.

a. the superficial nature of the information collected in this approach
b. the lack of control that the researcher has in this approach
c. the inability to generalize the findings from this approach to the larger population
d. the absence of inter-rater reliability

8. The benefit of naturalistic observation studies is _____.

a. the honesty of the data that is collected in a realistic setting
b. how quick and easy these studies are to perform
c. the researcher's capacity to make sure that data is collected as efficiently as possible
d. the ability to determine cause and effect in this particular approach

9. Using existing records to try to answer a research question is known as _____.

a. naturalistic observation
b. survey research
c. longitudinal research
d. archival research

10. _____ involves following a group of research participants for an extended period of time.

a. archival research
b. longitudinal research
c. naturalistic observation
d. cross-sectional research

11. A(n) _____ is a list of questions developed by a researcher that can be administered in paper form.

a. archive
b. case study
c. naturalistic observation
d. survey

12. Longitudinal research is complicated by high rates of _____.

a. deception
b. observation
c. attrition

d. generalization

13. Height and weight are positively correlated. This means that:

a. There is no relationship between height and weight.
b. Usually, the taller someone is, the thinner they are.
c. Usually, the shorter someone is, the heavier they are.
d. As height increases, typically weight increases.

14. Which of the following correlation coefficients indicates the strongest relationship between two variables?

a. –.90
b. –.50
c. +.80
d. +.25

15. Which statement best illustrates a negative correlation between the number of hours spent watching TV the week before an exam and the grade on that exam?

a. Watching too much television leads to poor exam performance.
b. Smart students watch less television.
c. Viewing television interferes with a student's ability to prepare for the upcoming exam.

d. Students who watch more television perform more poorly on their exams.

16. The correlation coefficient indicates the weakest relationship when _____.

a. it is closest to 0
b. it is closest to -1
c. it is positive
d. it is negative

17. _____ means that everyone in the population has the same likelihood of being asked to participate in the study.

a. operationalizing
b. placebo effect
c. random assignment
d. random sampling

18. The _____ is controlled by the experimenter, while the _____ represents the information collected and statistically analyzed by the experimenter.

a. dependent variable; independent variable
b. independent variable; dependent variable
c. placebo effect; experimenter bias
d. experiment bias; placebo effect

19. Researchers must _____ important concepts in their studies so others would have a clear understanding of exactly how those concepts were defined.

a. randomly assign
b. randomly select
c. operationalize
d. generalize

20. Sometimes, researchers will administer a(n) _____ to participants in the control group to control for the effects that participant expectation might have on the experiment.

a. dependent variable
b. independent variable
c. statistical analysis
d. placebo

21. _____ is to animal research as _____ is to human research.

a. informed consent; deception
b. IACUC; IRB
c. IRB; IACUC
d. deception; debriefing

22. Researchers might use _____ when providing

participants with the full details of the experiment could skew their responses.

a. informed consent
b. deception
c. ethics
d. debriefing

23. A person's participation in a research project must be _____.

a. random
b. rewarded
c. voluntary
d. public

24. Before participating in an experiment, individuals should read and sign the _____ form.

a. informed consent
b. debriefing
c. IRB
d. ethics

Critical Thinking Questions

25. In this section, the D.A.R.E. program was described as an

incredibly popular program in schools across the United States despite the fact that research consistently suggests that this program is largely ineffective. How might one explain this discrepancy?

26. The scientific method is often described as self-correcting and cyclical. Briefly describe your understanding of the scientific method with regard to these concepts.

27. In this section, conjoined twins, Krista and Tatiana, were described as being potential participants in a case study. In what other circumstances would you think that this particular research approach would be especially helpful and why?

28. Presumably, reality television programs aim to provide a realistic portrayal of the behaviour displayed by the characters featured in such programs. This section pointed out why this is not really the case. What changes could be made in the way that these programs are produced that would result in more honest portrayals of realistic behaviour?

29. Which of the research methods discussed in this section would be best suited to research the effectiveness of the D.A.R.E. program in preventing the use of alcohol and other drugs? Why?

30. Aside from biomedical research, what other areas of research could greatly benefit by both longitudinal and archival research?

31. Earlier in this section, we read about research suggesting that there is a correlation between eating cereal and weight. Cereal companies that present this information in their

advertisements could lead someone to believe that eating more cereal causes healthy weight. Why would they make such a claim and what arguments could you make to counter this cause-and-effect claim?

32. Recently a study was published in the journal, *Nutrition and Cancer*, which established a negative correlation between coffee consumption and breast cancer. Specifically, it was found that women consuming more than 5 cups of coffee a day were less likely to develop breast cancer than women who never consumed coffee (Lowcock, Cotterchio, Anderson, Boucher, & El-Sohemy, 2013). Imagine you see a newspaper story about this research that says, "Coffee Protects Against Cancer." Why is this headline misleading and why would a more accurate headline draw less interest?

33. Sometimes, true random sampling can be very difficult to obtain. Many researchers make use of convenience samples as an alternative. For example, one popular convenience sample would involve students enrolled in Introduction to Psychology courses. What are the implications of using this sampling technique?

34. Peer review is an important part of publishing research findings in many scientific disciplines. This process is normally conducted anonymously; in other words, the author of the article being reviewed does not know who is reviewing the article, and the reviewers are unaware of the author's identity. Why would this be an important part of this process?

35. Some argue that animal research is inherently flawed in

terms of being ethical because unlike human participants, animals do not consent to be involved in research. Do you agree with this perspective? Given that animals do not consent to be involved in research projects, what sorts of extra precautions should be taken to ensure that they receive the most humane treatment possible?

36. At the end of the last section, you were asked to design a basic experiment to answer some question of interest. What ethical considerations should be made with the study you proposed to ensure that your experiment would conform to the scientific community's expectations of ethical research?

Personal Application Questions

37. Healthcare professionals cite an enormous number of health problems related to obesity, and many people have an understandable desire to attain a healthy weight. There are many diet programs, services, and products on the market to aid those who wish to lose weight. If a close friend was considering purchasing or participating in one of these products, programs, or services, how would you make sure your friend was fully aware of the potential consequences of this decision? What sort of information would you want to review before making such an investment or lifestyle change yourself?

38. A friend of yours is working part-time in a local pet store. Your friend has become increasingly interested in how dogs

normally communicate and interact with each other, and is thinking of visiting a local veterinary clinic to see how dogs interact in the waiting room. After reading this section, do you think this is the best way to better understand such interactions? Do you have any suggestions that might result in more valid data?

39. As a college student, you are no doubt concerned about the grades that you earn while completing your coursework. If you wanted to know how overall GPA is related to success in life after college, how would you choose to approach this question and what kind of resources would you need to conduct this research?

40. We all have a tendency to make illusory correlations from time to time. Try to think of an illusory correlation that is held by you, a family member, or a close friend. How do you think this illusory correlation came about and what can be done in the future to combat them?

41. Are there any questions about human or animal behaviour that you would really like to answer? Generate a hypothesis and briefly describe how you would conduct an experiment to answer your question.

42. Take a few minutes to think about all of the advancements that our society has achieved as a function of research involving animal subjects. How have you, a friend, or a family member benefited directly from this kind of research?

18.

ACKNOWLEDGEMENTS & ATTRIBUTIONS

Approaches to Research Design

In May 2022, Drs **Erin Mazerolle**, **Erin Austen**, and **Jesse Husk** (StFX University; with funding from Atlantic OER) organized an 'OER Sprint Hackathon' event in which students from across the Atlantic provinces reviewed portions of this textbook with Equity, Diversity, Inclusivity, and Accessibility in mind. Students provided comments, suggestions, concerns, and recommendations about ways to improve content. We'd like to specifically acknowledge the following students who contributed to the revisions of the Approaches to Research Design section:

- Sophie Landry
- Mila Veljanovska

Analyzing Findings

Jack Williams wrote significant portions of the Analyzing

Findings section, with a particular focus on operational definitions and the complex and ethical considerations of sex and gender research.

Max Dysart helped to edit, revise, and write portions of this section, including weaving the Bobo doll example through the section.

CHAPTER III
BIOLOGICAL BASIS OF BEHAVIOUR

19.

INTRODUCTION TO BIOLOGICAL BASIS OF BEHAVIOUR

Chapter Outline

- Cells of the Nervous System
- Parts of the Nervous System
- The Brain and Spinal Cord

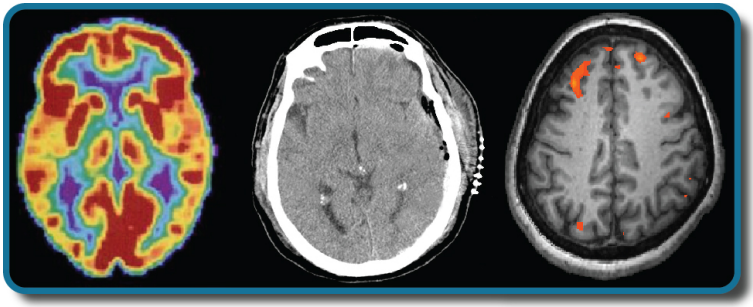

Figure BB.1 Different brain imaging techniques provide scientists with insight into different aspects of how the human brain functions. Left to right, PET scan (positron emission tomography), CT scan (computerized tomography), and fMRI (functional magnetic resonance imaging) are three types of scans. (credit "left": modification of work by Health and Human Services Department, National Institutes of Health; credit "center": modification of work by "Aceofhearts1968"/Wikimedia Commons; credit "right": modification of work by Kim J, Matthews NL, Park S.)

Have you ever taken a device apart to find out how it works? Many of us have done so, whether to attempt a repair or simply to satisfy our curiosity. A device's internal workings are often distinct from its user interface on the outside. For example, we don't think about microchips and circuits when we turn up the volume on a mobile phone; instead, we think about getting the volume just right. Similarly, the inner workings of the human body are often distinct from the external expression of those workings. It is the job of psychologists to find the connection between these—for example, to figure out how the firings of millions of neurons become a thought.

This chapter strives to explain the biological mechanisms that underlie behaviour. These physiological and anatomical foundations are the basis for many areas of psychology. In this chapter, you will become familiar with the structure and function of the nervous system.

20.

CELLS OF THE NERVOUS SYSTEM

Learning Objectives

By the end of this section, you will be able to:

- Identify the basic parts of a neuron
- Describe how neurons communicate with each other
- Explain how drugs act as agonists or antagonists for a given neurotransmitter system

Psychologists striving to understand the human mind may study the nervous system. Learning how the body's cells and organs function can help us understand the biological basis of human psychology. The **nervous system** is composed of two basic cell types: glial cells (also known as glia) and neurons. **Glial cells** are traditionally thought to play a supportive role to neurons, both physically and metabolically. Glial cells provide scaffolding on which the nervous system is built, help neurons line up closely with each other to allow neuronal communication, provide insulation to neurons, transport nutrients and waste products, and mediate immune responses. For years, researchers believed that there were many more glial cells than neurons; however, more recent work from Suzanna Herculano-Houzel's laboratory has called this long-standing assumption into question and has provided important evidence that there may be a nearly 1:1 ratio of glia cells to neurons. This is important because it suggests that human brains are more similar to other primate brains than previously thought (Azevedo et al, 2009; Hercaulano-Houzel, 2012; Herculano-Houzel, 2009). **Neurons**, on the other hand, serve as interconnected information processors that are essential for all of the tasks of the nervous system. This section briefly describes the structure and function of neurons.

Neuron Structure

Neurons are the central building blocks of the nervous system,

100 billion strong at birth. Like all cells, neurons consist of several different parts, each serving a specialized function (Figure BB.2). A neuron's outer surface is made up of a **semipermeable membrane**. This membrane allows smaller molecules and molecules without an electrical charge to pass through it, while stopping larger or highly charged molecules.

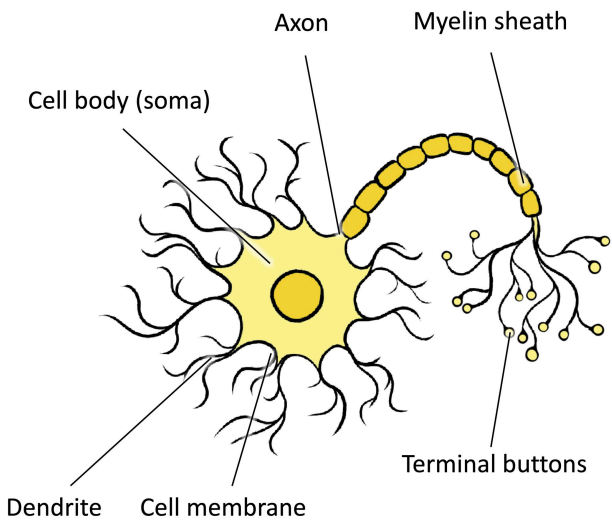

Figure BB.2 This illustration shows a prototypical neuron, which is being myelinated by a glial cell. (credit: Molly Wells Art)

The nucleus of the neuron is located in the **soma,** or cell body. The soma has branching extensions known as **dendrites**. The neuron is a small information processor, and dendrites serve as input sites where signals are received from other neurons. These signals are transmitted electrically across the soma and

down a major extension from the soma known as the **axon**, which ends at multiple **terminal buttons**. The terminal buttons contain **synaptic vesicles** that house **neurotransmitters**, the chemical messengers of the nervous system.

Axons range in length from a fraction of an inch to several feet. In some axons, glial cells form a fatty substance known as the **myelin sheath**, which coats the axon and acts as an insulator, increasing the speed at which the signal travels. The myelin sheath is not continuous and there are small gaps that occur down the length of the axon. These gaps in the myelin sheath are known as the **Nodes of Ranvier**. The myelin sheath is crucial for the normal operation of the neurons within the nervous system: the loss of the insulation it provides can be detrimental to normal function. To understand how this works, let's consider an example. Phenylketonuria (fen-ul-key-toe-NU-ree-uh), also called PKU, causes a reduction in myelin and abnormalities in white matter cortical and subcortical structures. The disorder is associated with a variety of issues including severe cognitive deficits, exaggerated reflexes, and seizures (Anderson & Leuzzi, 2010; Huttenlocher, 2000). Another disorder, multiple sclerosis (MS), an autoimmune disorder, involves a large-scale loss of the myelin sheath on axons throughout the nervous system. The resulting interference in the electrical signal prevents the quick transmittal of information by neurons and can lead to a number of symptoms, such as dizziness, fatigue, loss of motor

control, and sexual dysfunction. While some treatments may help to modify the course of the disease and manage certain symptoms, there is currently no known cure for multiple sclerosis.

TRICKY TOPIC: NEURONAL STRUCTURE

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If the video above does not load, click here: https://youtu.be/zpWZ5PgZFF0
For a full transcript of this video, click here

In healthy individuals, the neuronal signal moves rapidly down the axon to the terminal buttons, where synaptic vesicles release neurotransmitters into the **synaptic cleft** (Figure BB.3). The synaptic cleft is a very small space between two neurons and is an important site where communication between neurons occurs. Once neurotransmitters are released into the synaptic cleft, they travel across it and bind with

corresponding receptors on the dendrite of an adjacent neuron. **Receptors,** proteins on the cell surface where neurotransmitters attach, vary in shape, with different shapes "matching" different neurotransmitters.

How does a neurotransmitter "know" which receptor to bind to? The neurotransmitter and the receptor have what is referred to as a lock-and-key relationship—specific neurotransmitters fit specific receptors similar to how a key fits a lock. The neurotransmitter binds to any receptor that it fits.

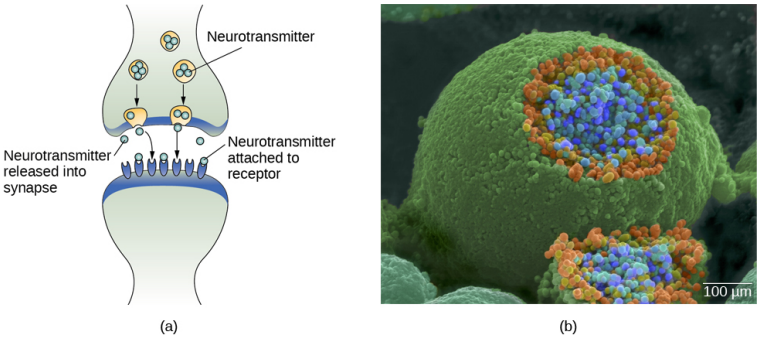

Figure BB.3 (a) The synaptic cleft is the space between the terminal button of one neuron and the dendrite of another neuron. (b) In this pseudo-colored image from a scanning electron microscope, a terminal button (green) has been opened to reveal the synaptic vesicles (orange and blue) inside. Each vesicle contains about 10,000 neurotransmitter molecules. (credit b: modification of work by Tina Carvalho, NIH-NIGMS; scale-bar data from Matt Russell)

TRICKY TOPIC: SYNAPTIC

TRANSMISSION

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Neuronal Communication

Now that we have learned about the basic structures of the neuron and the role that these structures play in neuronal communication, let's take a closer look at the signal itself—how it moves through the neuron and then jumps to the next neuron, where the process is repeated.

We begin at the neuronal membrane. The neuron exists in a fluid environment—it is surrounded by extracellular fluid and contains intracellular fluid (i.e., cytoplasm). The neuronal membrane keeps these two fluids separate—a critical role because the electrical signal that passes through the neuron depends on the intra- and extracellular fluids being electrically

different. This difference in charge across the membrane, called the **membrane potential**, provides energy for the signal.

The electrical charge of the fluids is caused by charged molecules (ions) dissolved in the fluid. The semipermeable nature of the neuronal membrane somewhat restricts the movement of these charged molecules, and, as a result, some of the charged particles tend to become more concentrated either inside or outside the cell.

Between signals, the neuron membrane's potential is held in a state of readiness, called the **resting potential.** The typical resting potential of a neuron is -70 mV. Like a rubber band stretched out and waiting to spring into action, ions line up on either side of the cell membrane, ready to rush across the membrane when the neuron goes active and the membrane opens its gates (i.e., a sodium-potassium pump that allows movement of ions across the membrane). Ions in high-concentration areas are ready to move to low-concentration areas, and positive ions are ready to move to areas with a negative charge.

In the resting state, sodium (Na^+) is at higher concentrations outside the cell, so it will tend to move into the cell. Potassium (K^+), on the other hand, is more concentrated inside the cell, and will tend to move out of the cell (Figure BB.4). In addition, the inside of the cell is slightly negatively charged compared to the outside. This difference in charge, known as the **electrochemical gradient,** provides an additional force on sodium, causing it to move into the cell.

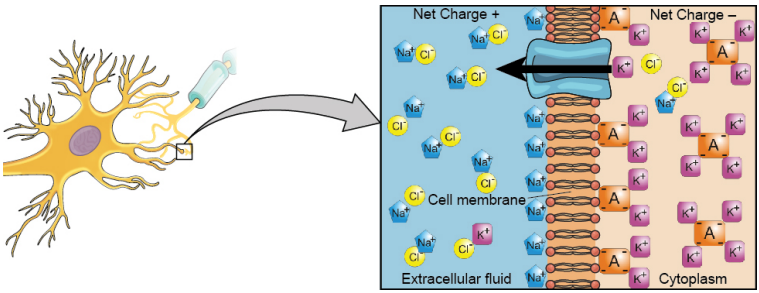

Figure BB.4 At resting potential, Na+ (blue pentagons) is more highly concentrated outside the cell in the extracellular fluid (shown in blue), whereas K+ (purple squares) is more highly concentrated near the membrane in the cytoplasm or intracellular fluid. Other molecules, such as chloride ions (yellow circles) and negatively charged proteins (brown squares), help contribute to a positive net charge in the extracellular fluid and a negative net charge in the intracellular fluid.

From this resting potential state, the neuron receives a signal and its state changes abruptly (Figure BB.5). When a neuron receives signals at the dendrites—due to neurotransmitters from an adjacent neuron binding to its receptors—small pores, or gates, open on the neuronal membrane, allowing Na^+ ions, propelled by both charge and concentration differences, to move into the cell. With this influx of positive ions, the internal charge of the cell becomes more positive. If that charge reaches a certain level, called the **threshold of excitation**, the neuron becomes active and the action potential begins.

Many additional pores open, causing a massive influx of Na^+ ions and a huge positive spike in the membrane potential,

the peak action potential. At the peak of the spike, the sodium gates close and the potassium gates open. As positively charged potassium ions leave, the cell quickly begins repolarization. At first, it hyperpolarizes, becoming slightly more negative than the resting potential, and then it levels off, returning to the resting potential.

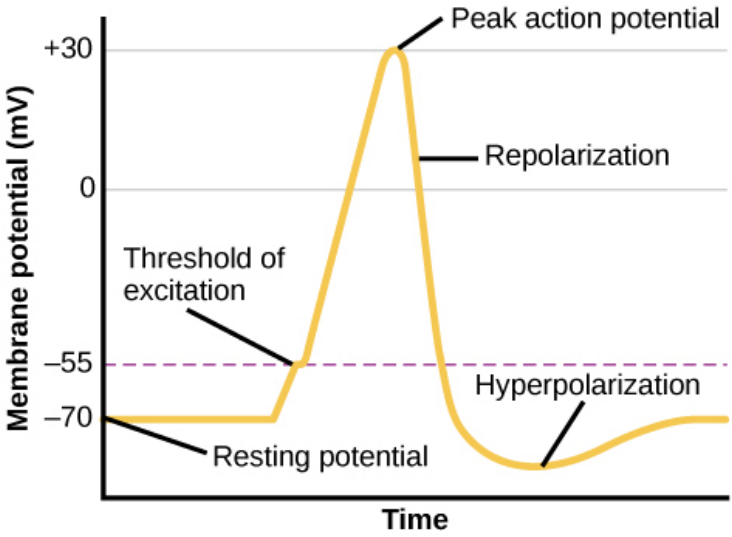

Figure BB.5 During the action potential, the electrical charge across the membrane changes dramatically.

This positive spike constitutes the **action potential:** the electrical signal that typically moves from the cell body down the axon to the axon terminals. The electrical signal moves down the axon with the impulses jumping in a leapfrog fashion between the Nodes of Ranvier. The Nodes of Ranvier are natural gaps in the myelin sheath. At each point, some of

the sodium ions that enter the cell diffuse to the next section of the axon, raising the charge past the threshold of excitation and triggering a new influx of sodium ions. The action potential moves all the way down the axon in this fashion until reaching the terminal buttons.

The action potential is an **all-or-none** phenomenon. In simple terms, this means that an incoming signal from another neuron is either sufficient or insufficient to reach the threshold of excitation. There is no in-between, and there is no turning off an action potential once it starts. Think of it like sending an email or a text message. You can think about sending it all you want, but the message is not sent until you hit the send button. Furthermore, once you send the message, there is no stopping it.

Because it is all or none, the action potential is recreated, or propagated, at its full strength at every point along the axon. Much like the lit fuse of a firecracker, it does not fade away as it travels down the axon. It is this all-or-none property that explains the fact that your brain perceives an injury to a distant body part like your toe as equally painful as one to your nose.

As noted earlier, when the action potential arrives at the terminal button, the synaptic vesicles release their neurotransmitters into the synaptic cleft. The neurotransmitters travel across the synapse and bind to receptors on the dendrites of the adjacent neuron, and the process repeats itself in the new neuron (assuming the signal is sufficiently strong to trigger an action potential). Once the

signal is delivered, excess neurotransmitters in the synaptic cleft drift away, are broken down into inactive fragments, or are reabsorbed in a process known as reuptake. **Reuptake** involves the neurotransmitter being pumped back into the neuron that released it, in order to clear the synapse (Figure BB.6). Clearing the synapse serves both to provide a clear "on" and "off" state between signals and to regulate the production of neurotransmitter (full synaptic vesicles provide signals that no additional neurotransmitters need to be produced). The synapse can also be cleared via **degradation** of the neurotransmitter, which typically involves an enzyme breaking the neurotransmitter down into it's components, so that it can no longer interact with the receptors on the postsynaptic neuron.

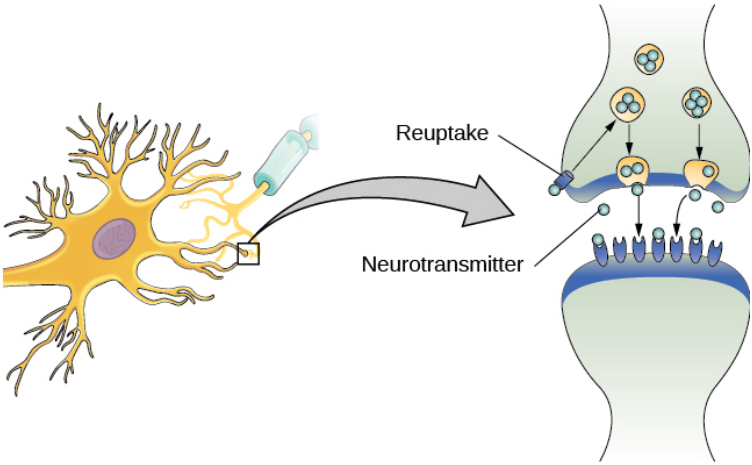

Figure BB.6 Reuptake involves moving a neurotransmitter from the synapse back into the axon terminal from which it was released.

Neuronal communication is often referred to as an electrochemical event. The movement of the action potential down the length of the axon is an electrical event, and movement of the neurotransmitter across the synaptic space represents the chemical portion of the process. However, there are some specialized connections between neurons that are entirely electrical. In such cases, the neurons are said to communicate via an electrical synapse. In these cases, two neurons physically connect to one another via gap junctions, which allows the current from one cell to pass into the next. There are far fewer electrical synapses in the brain, but those that do exist are much faster than the chemical synapses that have been described above (Connors & Long, 2004).

TRICKY TOPIC: ACTION POTENTIALS

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Neurotransmitters and Drugs

There are several different types of neurotransmitters released by different neurons, and we can speak in broad terms about the kinds of functions associated with different neurotransmitters (Table BB.1). Much of what psychologists know about the functions of neurotransmitters comes from research on the effects of drugs in psychological disorders. Psychologists who take a **biological perspective** and focus on the physiological causes of behaviour assert that psychological disorders like depression and schizophrenia are associated with imbalances in one or more neurotransmitter systems. In this perspective, psychotropic medications can help improve the symptoms associated with these disorders. **Psychotropic medications** are drugs that treat psychiatric symptoms by restoring neurotransmitter balance.

Table BB.1 Major Neurotransmitters and How They Affect Behaviour

Neurotransmitter	Involved in	Potential Effect on Behaviour
Acetylcholine	Muscle action, memory	Increased arousal, enhanced cognition
Beta-endorphin	Pain, pleasure	Decreased anxiety, decreased tension
Dopamine	Mood, sleep, learning	Increased pleasure, suppressed appetite
Gamma-aminobutyric acid (GABA)	Brain function, sleep	Decreased anxiety, decreased tension
Glutamate	Memory, learning	Increased learning, enhanced memory
Norepinephrine	Heart, intestines, alertness	Increased arousal, suppressed appetite
Serotonin	Mood, sleep	Modulated mood, suppressed appetite

Psychoactive drugs can act as agonists or antagonists for a given neurotransmitter system. **Agonists** are chemicals that mimic a neurotransmitter at the receptor site. An **antagonist**, on the other hand, blocks or impedes the normal activity of a neurotransmitter at the receptor. Agonists and antagonists represent drugs that are prescribed to correct the specific neurotransmitter imbalances underlying a person's condition. For example, Parkinson's disease, a progressive nervous system disorder, is associated with low levels of dopamine. Therefore,

a common treatment strategy for Parkinson's disease involves using dopamine agonists, which mimic the effects of dopamine by binding to dopamine receptors.

Certain symptoms of schizophrenia are associated with overactive dopamine neurotransmission. The antipsychotics used to treat these symptoms are antagonists for dopamine—they block dopamine's effects by binding its receptors without activating them. Thus, they prevent dopamine released by one neuron from signalling information to adjacent neurons.

In contrast to agonists and antagonists, which both operate by binding to receptor sites, reuptake inhibitors prevent unused neurotransmitters from being transported back to the neuron. This allows neurotransmitters to remain active in the synaptic cleft for longer durations, increasing their effectiveness. Depression, which has been consistently linked with reduced serotonin levels, is commonly treated with selective serotonin reuptake inhibitors (SSRIs). By preventing reuptake, SSRIs strengthen the effect of serotonin, giving it more time to interact with serotonin receptors on dendrites. Common SSRIs on the market today include Prozac, Paxil, and Zoloft. The drug LSD is structurally very similar to serotonin, and it affects the same neurons and receptors as serotonin. Psychotropic drugs are not instant solutions for people suffering from psychological disorders. Often, an individual must take a drug for several weeks before seeing improvement, and many psychoactive drugs have significant

negative side effects. Furthermore, individuals vary dramatically in how they respond to the drugs. To improve chances for success, it is not uncommon for people receiving pharmacotherapy to undergo psychological and/or behavioural therapies as well. Some research suggests that combining drug therapy with other forms of therapy tends to be more effective than any one treatment alone (for one such example, see March et al., 2007).

21.

PARTS OF THE NERVOUS SYSTEM

Learning Objectives

By the end of this section, you will be able to:

- Describe the difference between the central and peripheral nervous systems
- Explain the difference between the somatic and autonomic nervous systems
- Differentiate between the sympathetic and parasympathetic divisions of the autonomic nervous system

The nervous system can be divided into two major subdivisions: the **central nervous system (CNS)** and

the **peripheral nervous system (PNS)**, shown in Figure BB.7. The CNS is comprised of the brain and spinal cord; the PNS connects the CNS to the rest of the body. In this section, we focus on the peripheral nervous system; later, we look at the brain and spinal cord.

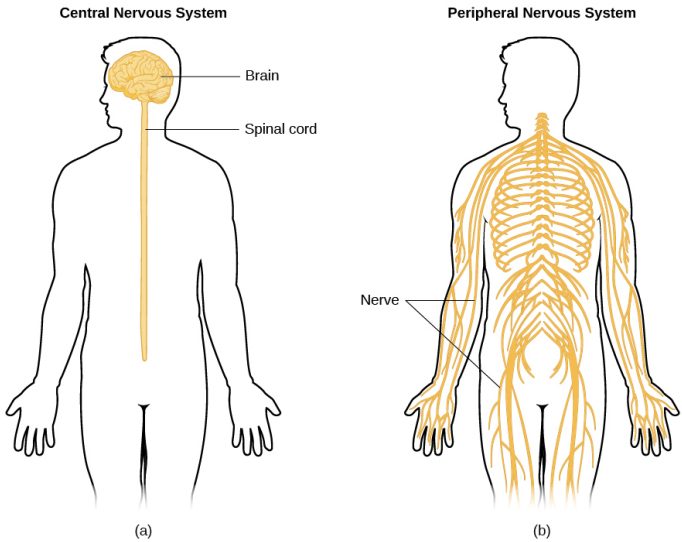

Figure BB.7 The nervous system is divided into two major parts: (a) the Central Nervous System and (b) the Peripheral Nervous System.

Peripheral Nervous System

The peripheral nervous system is made up of thick bundles of axons, called nerves, carrying messages back and forth between

the CNS and the muscles, organs, and senses in the periphery of the body (i.e., everything outside the CNS). The PNS has two major subdivisions: the somatic nervous system and the autonomic nervous system.

The **somatic nervous system** is associated with activities traditionally thought of as conscious or voluntary. It is involved in the relay of sensory and motor information to and from the CNS; therefore, it consists of motor neurons and sensory neurons. **Motor neurons,** carrying instructions from the CNS to the muscles, are efferent fibers (efferent means "moving away from"). **Sensory neurons**, carrying sensory information to the CNS, are afferent fibers (afferent means "moving toward"). A helpful way to remember this is that **e**fferent = **e**xit and **a**fferent = **a**rrive. Each nerve is basically a bundle of neurons forming a two-way superhighway, containing thousands of axons, both efferent and afferent. There is another type of neuron, called an **interneuron**, which is by far the most common type of neuron, which is located primarily within the CNS and is responsible for communicating among the neurons. Interneurons allow the brain to combine the multiple sources of available information to create a coherent picture of the sensory information being conveyed.

The **autonomic nervous system** controls our internal organs and glands and is generally considered to be outside the realm of voluntary control. It can be further subdivided into the sympathetic and parasympathetic divisions (Figure BB.8).

The **sympathetic nervous system** is involved in preparing the body for stress-related activities; the **parasympathetic nervous system** is associated with returning the body to routine, day-to-day operations. The two systems have complementary functions, operating in tandem to maintain the body's homeostasis. **Homeostasis** is a state of equilibrium, or balance, in which biological conditions (such as body temperature) are maintained at optimal levels.

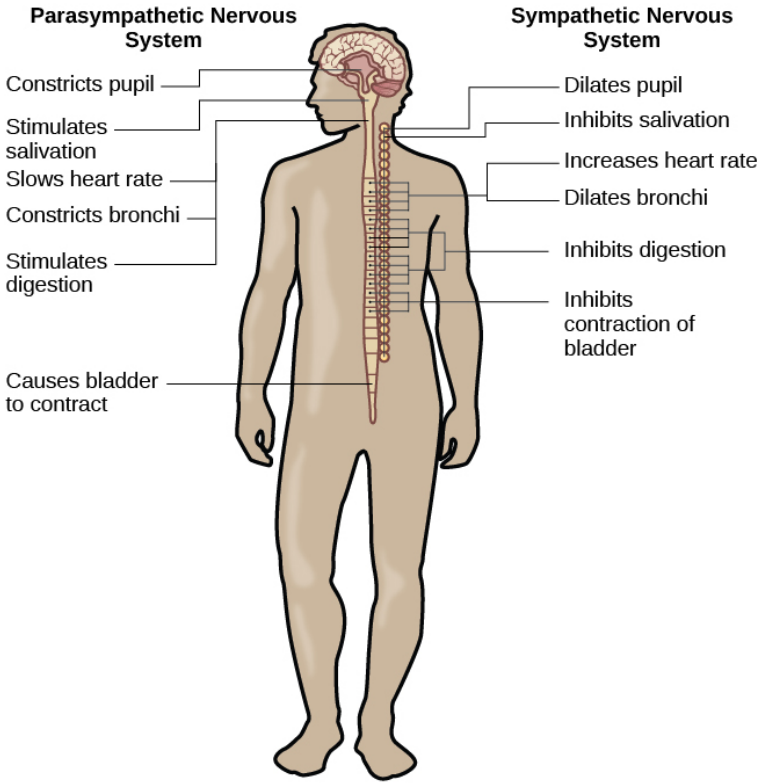

Figure BB.8 The sympathetic and parasympathetic divisions of the autonomic nervous system have the opposite effects on various systems.

The sympathetic nervous system is activated when we are faced with stressful or high-arousal situations. The activity of this system was adaptive for our ancestors, increasing their chances of survival. Imagine, for example, that one of our early ancestors, out hunting small game, suddenly disturbs a large bear with cubs. At that moment, the hunter's body undergoes a series of changes—a direct function of sympathetic

activation—preparing the hunter to face the threat. The hunter's pupils dilate, their heart rate and blood pressure increase, their bladder relaxes, their liver releases glucose, and adrenaline surges into the hunter's bloodstream. This constellation of physiological changes, known as the **fight or flight response**, allows the body access to energy reserves and heightened sensory capacity so that it might fight off a threat or run away to safety.

Link to Learning

Watch this video about the fight-flight-freeze response to learn more.

While it is clear that such a response would be critical for survival for our ancestors, who lived in a world full of real physical threats, many of the high-arousal situations we face in the modern world are more psychological in nature. For example, think about how you feel when you have to stand up and give a presentation in front of a roomful of people, or right before taking a big test. You are in no real physical danger

in those situations, and yet you have evolved to respond to a perceived threat with the fight or flight response. This kind of response is not nearly as adaptive in the modern world; in fact, we suffer negative health consequences when faced constantly with psychological threats that we can neither fight nor flee. Recent research suggests that an increase in susceptibility to heart disease (Chandola, Brunner, & Marmot, 2006) and impaired function of the immune system (Glaser & Kiecolt-Glaser, 2005) are among the many negative consequences of persistent and repeated exposure to stressful situations. Some of this tendency for stress reactivity can be wired by early experiences of trauma.

Once the threat has been resolved, the parasympathetic nervous system takes over and returns bodily functions to a relaxed state. Our hunter's heart rate and blood pressure return to normal, their pupils constrict, they regains control of their bladder, and the liver begins to store glucose in the form of glycogen for future use. These restorative processes are associated with activation of the parasympathetic nervous system.

22.

THE BRAIN AND SPINAL CORD

Learning Objectives

By the end of this section, you will be able to:

- Explain the anatomy and functions of the spinal cord
- Name the major areas of the hindbrain, midbrain, and forebrain, and describe their main functions
- Identify the anatomical and functional divisions of the cortex
- Describe the anatomy and function of the corpus callosum

- Explain brain lateralization and give examples of lateralization in humans
- Contrast the roles of Broca's area and Wernicke's area in language ability
- Describe how neuroscientists measure brain activity

The brain is a complex organ with billions of interconnected neurons and glia. These cells are the basis of communication in the nervous system, which is organized into specialized structures that provide the foundation for thought, emotion, and behaviour. In this section, we discuss the overall organization of the nervous system and the functions associated with different areas, beginning with the spinal cord.

The Spinal Cord

The spinal cord connects the brain to the outside world. It works like a relay station to direct messages to and from the brain, and also has its own system of automatic processes, called reflexes.

The top of the spinal cord is a bundle of nerves that merges with the brain stem, where many basic life processes, like breathing and digestion, are controlled. The spinal cord itself

ends just below the ribs while its nerves extend all the way to the base of the spine. It's functionally organized into 31 segments, each connected to a specific part of the body through the peripheral nervous system. Nerves branch out from the spine at each vertebra: sensory nerves bring messages in; motor nerves send messages out to the muscles and organs.

The spinal cord is set up to make simple decisions about incoming sensory messages without requiring input from the brain. This is the basis of several types of reflexes such as knee jerk and pain withdrawal reflexes. When a sensory message meets certain parameters, its signal passes from the sensory nerve to a spinal interneuron, which then activates a motor neuron to initiate movement. This happens before the brain receives information about the painful stimulus, so this automatic spinal reflex allows the body to react very quickly.

The spinal cord is protected by bony vertebrae and cushioned in cerebrospinal fluid, but injuries still occur. When the spinal cord is damaged in a particular segment, all lower segments are cut off from the brain, usually causing paralysis and loss of sensation. Therefore, someone with a severe spinal injury at the level of the hips will keep motor control and sensation in more body parts than someone with a spinal injury at the level of the shoulders. The higher the damage occurs, the greater the loss of function and sensation.

Hindbrain Structures

The **hindbrain** is located at the back of the head and looks like an extension of the spinal cord. It contains the medulla, pons, and cerebellum (Figure BB.9). The **medulla** controls the automatic processes of the autonomic nervous system, such as breathing, blood pressure, and heart rate. The word pons literally means "bridge," and as the name suggests, the **pons** connects the hindbrain to the rest of the brain. Acting as a bridge, the pons contains several "highways" that send information about body sensations to the brain and bring directions for body movement down to the spinal cord. The pons is also involved in regulating sleep and pain signals. The medulla and pons are part of the brainstem, which extends to the thalamus in the forebrain.

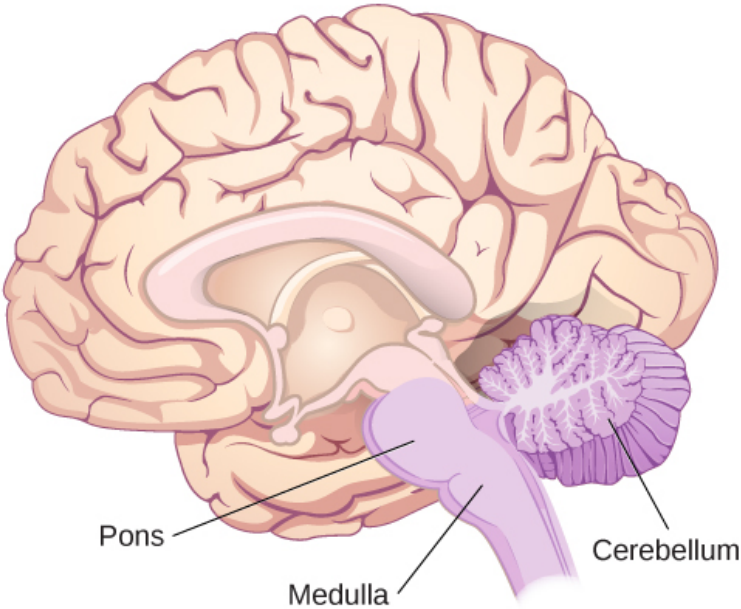

Figure BB.9 The pons, medulla, and cerebellum make up the hindbrain.

The **cerebellum** (Latin for "little brain") receives messages about muscles, tendons, joints, and head position to control balance, coordination, movement, and fine motor skills. The cerebellum is also thought to be an important area for processing some types of memories. In particular, procedural memory, or memory involved in learning and remembering how to perform tasks, is thought to involve the cerebellum.

Midbrain Structures

The **midbrain**, located between the forebrain and the hindbrain, is home to a curious collection of structures involved in diverse functions. The superior colliculus is important in directing eye movements towards important aspects of a visual scene, while the inferior colliculus is involved in sound localization. Both structures direct behaviours to parts of the environment that are relevant to an individual at that moment in time. The midbrain also contains structures that are involved in the sleep/wake cycle, arousal, and motor activity. These structures include the **substantia nigra** (Latin for "black substance") and the **ventral tegmental area** (VTA) (Figure BB.10), which both contain cell bodies that produce the neurotransmitter dopamine and project to areas of the forebrain. The substantia nigra is important for planning and control of voluntary movement, and degeneration of these dopaminergic neurons is thought to be the main cause of the neurological disorder, Parkinson's disease (Parent & Parent, 2010). The VTA sends parallel projections to the forebrain and is involved in reward and motivation, alterations in the neuronal signalling in this pathway is linked to addictive behaviours, such as substance misuse and gambling (George & Le Moal, 2012)

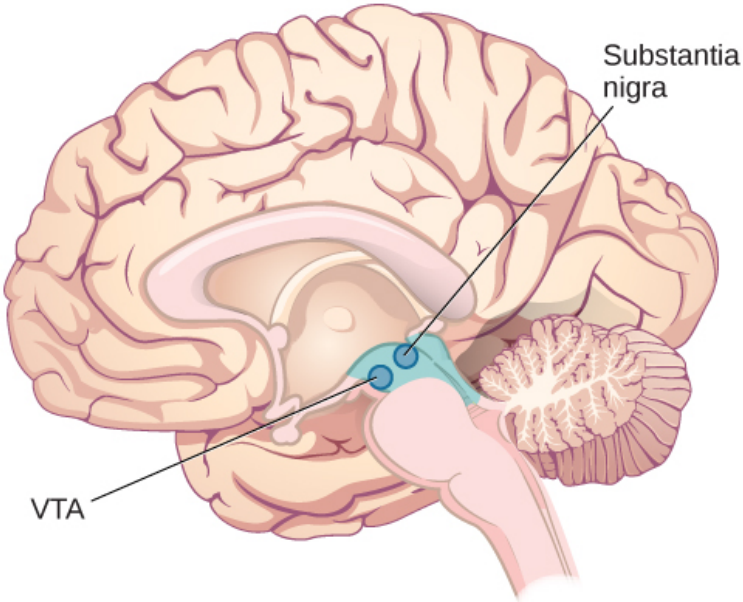

Figure BB.10 The substantia nigra and ventral tegmental area (VTA) are located in the midbrain.

Forebrain Structures

The surface of the forebrain is dominated by the **cerebral cortex**, with its distinctive pattern of folds or bumps, known as **gyri** (singular: gyrus), and grooves, known as sulci (singular: sulcus), shown in Figure BB.11. These gyri and sulci form important landmarks that allow us to separate the brain into functional centers. The most prominent sulcus, known as the **longitudinal fissure**, is the deep groove that separates the brain into two halves or **hemispheres**: the left and the

right.

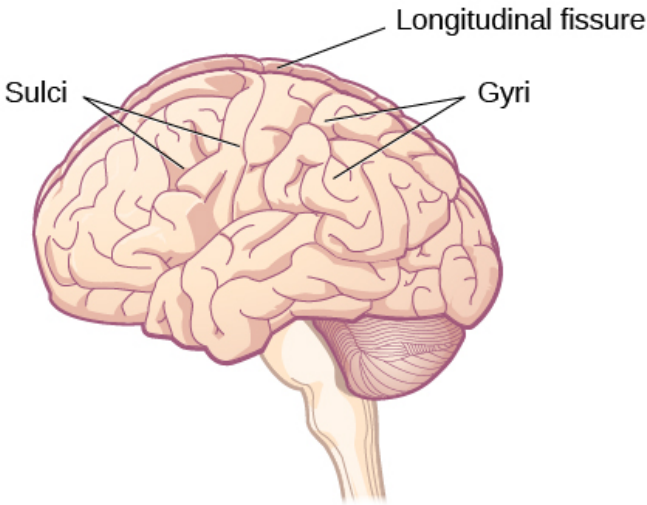

Figure BB.11 The surface of the brain is covered with gyri and sulci. A deep sulcus is called a fissure, such as the longitudinal fissure that divides the brain into left and right hemispheres. (credit: modification of work by Bruce Blaus)

The cerebral cortex makes up the majority of the **forebrain** (Figure BB.12), the largest part of the brain. In addition to the cortex the forebrain contains a number of other subcortical structures including the thalamus, hypothalamus, **pituitary gland**, and a collection of areas called the **limbic system**.

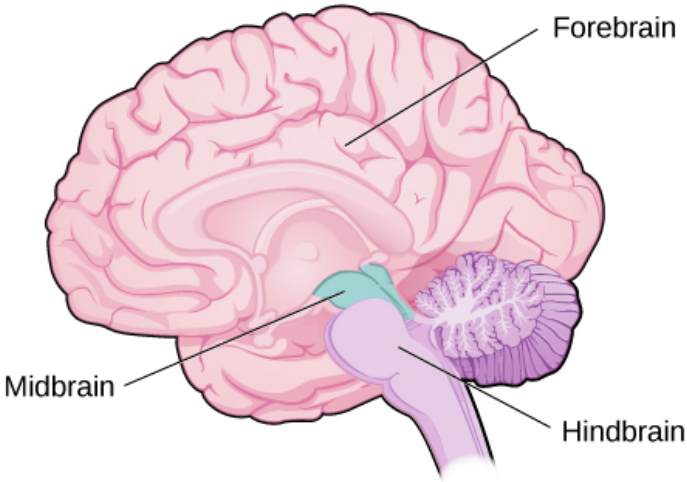

Figure BB.12 The brain and its parts can be divided into three main categories: the forebrain, midbrain, and hindbrain.

TRICKY TOPIC: CORTICAL ANATOMY

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Lobes of the Cerebral Cortex

There are four lobes on each side of the cerebral cortex: frontal, parietal, temporal, and occipital (Figure BB.13). As its name suggests, the **frontal lobe** is located at the front and extends back to a fissure called the **central sulcus**, which separates it from the **parietal lobe** just behind. The **temporal lobe** begins below the lateral sulcus and extends backward towards the **occipital lobe**, which makes up most of the back part of the brain. The cortex can be described anatomically as it is above; size, shape, and location are all anatomical features. Different areas of the cortex can also be described functionally, in terms of what they do. By the end of this section, you should be able to describe and compare different areas of the cortex both functionally and anatomically.

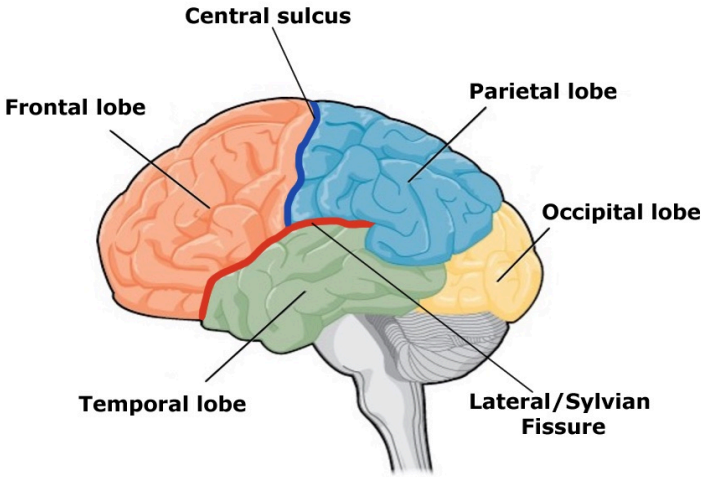

Figure BB.13: Lateral view of the human brain. The brainstem and cerebellum are depicted in grey.

The size and location of the cerebral cortex makes it vulnerable to damage from injury and disease, however this is not usually fatal. In fact, most of what we've learned about the human cortex comes from observations of people living with damage to specific areas. If someone loses function after a brain injury, the damaged area was probably involved in that function.

Potentially the most famous case of brain damage is Phineas Gage:

On September 13, 1848, 25-year old Gage was working as a railroad foreman. He and his crew were using an iron rod to tamp explosives into a blasting hole to remove rock along the railway's path. Unfortunately, this created a spark and the rod exploded out of the hole, into Gage's face, and through his

skull (Figure BB.14). It passed through the left frontal lobe and exited between the parietal and frontal bones of the skull.

(a) (b)

Figure BB.14 (a) Phineas Gage holds the iron rod that penetrated his skull in an 1848 railroad construction accident. (b) Gage's prefrontal cortex was severely damaged in the left hemisphere. The rod entered Gage's face on the left side, passed behind his eye, and exited through the top of his skull, before landing about 80 feet away. (credit a: modification of work by Jack and Beverly Wilgus)

Remarkably, Gage was conscious and capable of moving and talking within minutes. In the following months he had a severe fungal infection of the brain and was cared for by doctor

John Martyn Harlow (Harlow, 1848). Harlow's notes provide the most direct information on Gage's recovery.

In the months following the injury, Harlow wrote that Gage was improving, but he had trouble with self control. His friends also noted this with reports of overspending and inappropriate social behaviour, like swearing (Harlow, 1968). Within three months Gage was healthy enough to move home, but hadn't recovered enough to resume his duties as a foreman. However, just four years later he moved to Chile to establish a line of stage coaches; a job that involved scheduling, managing finances, and interacting with passengers during long journeys. It seems unlikely that this would have been possible for the rude, unpredictable man often described in this case (Macmillan & Lena, 2010).

Harlow didn't have access to imaging technology so we aren't sure what structures were affected by Gage's injury, or which structures adapted so he could recover. Luckily, we can use modern techniques to make an educated guess about what happened to Gage's brain. A study from 2012 (Van Horn et al., 2012) used Gage's skull along with imaging data from similar living subjects to model the damage based on the rod's trajectory (Figure BB. 15). This model suggested that the left orbitofrontal cortex in the frontal lobe was severely damaged. The majority of connective pathways from the left frontal lobe to other areas, including the limbic system, were also affected. Further inspection of Gage's skull indicates that there may

have also been some direct damage to the amygdala (Szczepanski & Knight, 2014).

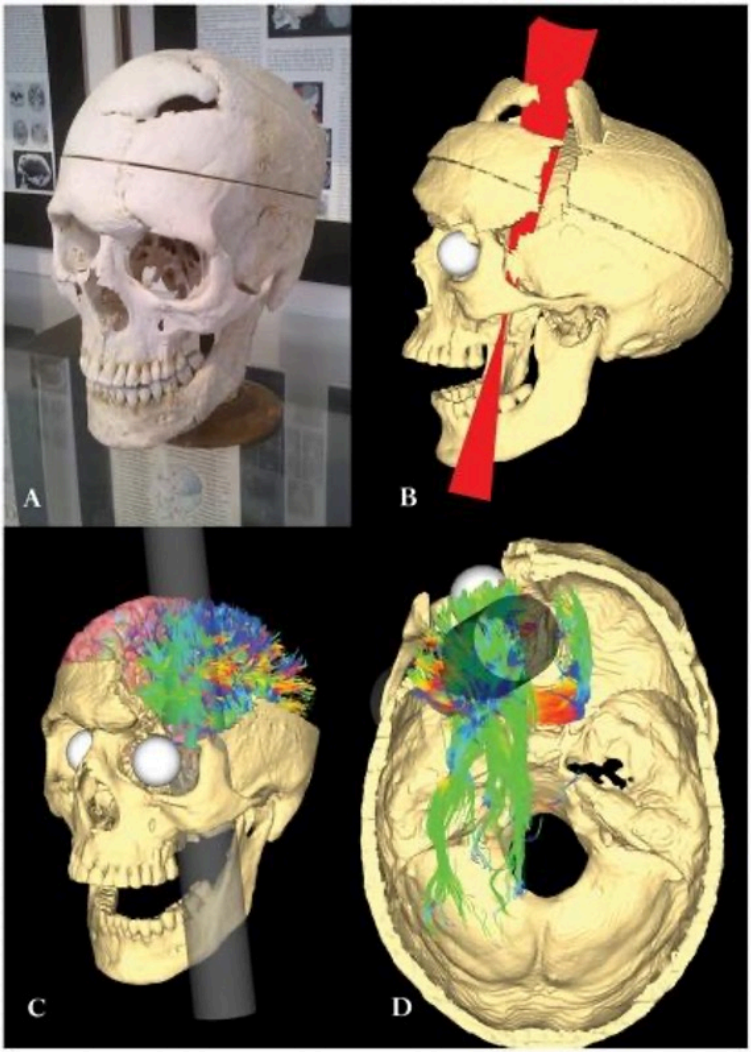

Figure BB.15 (a) Phineas Gage's skull, displayed at Harvard Medical School. b) CT images of the skull and the dimensions of the rod used to model the path it may have taken through Gage's skull. c) Gage's skull with the most likely rod path and example fiber pathways damaged by the rod in the left hemisphere. d) A view of the inside of the skull with

pathways intersected by the rod, also showing the movement of Gage's left eye. (Credit: Van Horn et al., 2012).

So what kind of impairments do we commonly see after damage to these areas? Patients with damage to similar areas of the **prefrontal cortex** show higher scores on tests of impulsivity, taking less time to consider tasks and plan action, and making more errors. These patients are also less likely to change their behaviour in response to consequences, report more inappropriate social behaviours, and more feelings of anger (Berlin et al., 2004, Szepanski & Knight, 2015), similar to what Gage experienced. In fact, Harlow's research with Gage prompted him to coin the term **Frontal Lobe Syndrome**, a term describing deficits in motivation, planning, social behaviour, and language production that can appear after damage to the prefrontal cortex (Pirau & Lui, 2021). Gage's case provides a memorable demonstration of frontal lobe function, but it also shows the brain's remarkable ability to adapt and regain function after injury.

Brain damage studies provide important information about the cortex but advancements in medicine and technology have since given us more precise methods for investigating the brain. A foundational example comes from neurosurgeon Wilder Penfield, who systematically studied the effects of electrical stimulation on different parts of the cortex. At the very back end of the frontal lobe, just before the central sulcus, is a strip of cortex called the precentral gyrus and is home to the

primary motor cortex, an area that activates movements after we decide to make them. Most of what we know about this part of the brain comes from classic research in epilepsy patients done by Penfield and associates Theodore Rassmussen and Edwin Boldrey.

Some patients don't respond to anti-seizure drugs, so in severe cases the seizure-inducing part of the brain is removed. To ensure that *only* the problematic brain tissue was removed, these researchers stimulated the brains of awake, anesthetized patients with a mild electric current and asked them to report their sensations. When he stimulated neurons in the primary motor cortex, patients reported movements of body parts on the opposite side. In other words, the right primary motor cortex controls movement of body parts on the left and the left primary motor cortex controls movement on the right. This arrangement is referred to as **contralateral**, meaning opposite side. These movement-controlling areas can be understood as representations of the body parts they activate, and stimulation studies indicate that they are laid out in the brain in the same order as they appear in the body. For example, finger neurons are located next to hand neurons which are located next to arm neurons, see figure BB.16 (Penfield & Boldrey, 1937). This is called **somatotopy,** the concept that parts of the body correspond to specific parts of the cortex.

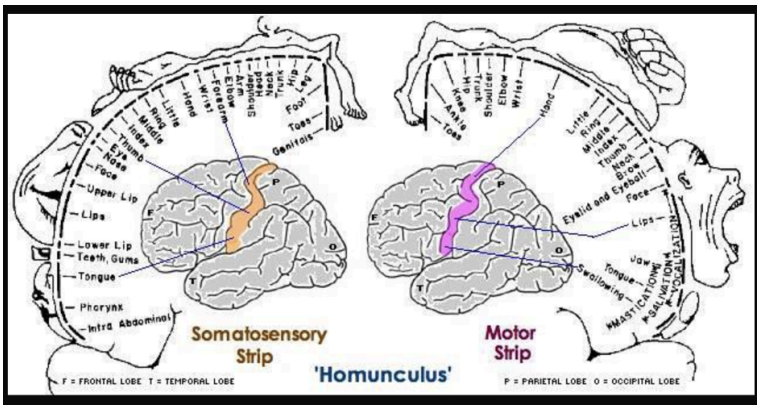

Figure BB. 16: (a) A 2D illustration of Penfield's somatosensory and (b) motor homunculi adapted from Penfield & Boldrey (1937). The original illustrations were created by an artist named H.P Cantile (Griggs, 1988).

Just behind the motor cortex on the other side of the central sulcus is the **primary somatosensory cortex**. This strip of cortex is at the beginning of the **parietal lobe**, and it plays an essential role in the perception of touch, temperature, and pain. Penfield discovered that electrical stimulation of this area produces tactile sensations in different regions of the body on the contralateral side. Like in the primary motor cortex, neurons in the primary somatosensory cortex are also grouped by body part, so that the arrangement in the body is maintained on the surface of the cortex (Figure BB.16). Note that the size of body parts on both these motor and touch maps is distorted, with huge amounts of cortical space devoted to the fingers, hands, and mouth compared to the arms, legs, and torso (Penfield & Boldery, 1937; Penfield & Rasmussen,

1950). The areas of the body that we have more control over or which are more sensitive have the most cortical space. For example, the fingers have more cortical space than the chin, which is much less sensitive and can't carry out coordinated movement.

Penfield's representation of the brain's somatosensory "touch map" as a two-dimensional *homunculus* or 'little man' is one of the most recognizable images in neuroscience. Every introductory Psychology textbook has some version of it, along with its twin, the "motor map", located next door in the frontal lobe. These images demonstrate that 1) the map of the body is retained in the brain and 2) the size of a body part's representation is related to its function rather than its physical size. These features are key to understanding the way movement and somatosensation are coded in the brain.

Dig Deeper

Does the classic homunculus represent us all?

The somatosensory homunculus is a popular

depiction of somatotopy for mainstream culture. You might have seen one of these three-dimensional figures in a museum or at themed exhibits like Ripley's Believe It or Not. Often, the homunculus is presented as a demonstration of neural organization in a *neutral* human body, even though it depicts a person with a penis and testicles. What about bodies that don't have those parts? Glaringly, Penfield didn't make a homunculus with breasts, vagina, clitoris, uterus or ovaries (Di Noto et al., 2012), even though he studied people with those body parts.

Figure BB. 17: (A) 3D model of the H.P. Cantiles somatosensory homunculus. These sculptures depict the homunculus as an anatomically distorted 'little man', with the sizes of body parts corresponding to the amount of representation they have in the somatosensory cortex (adapted from creative commons, author Mpj29). (B) Representation of a 3D female somatosensory homunculus created by Haven Wright (adapted from Wright & Foerder, 2021).

It's possible that Penfield and associates didn't make an equivalent map because they didn't have a big enough sample of people with that anatomy, but it's likely that this exclusion was also influenced by gender or sex-based bias. This bias can be demonstrated in the language these researchers chose. He/him pronouns were always used to refer to patients, even though some of them would have

used she/her pronouns instead (Penfield & Rasmussen, 1950). This bias has long been present in biomedical research, and persists today. In neuroscience specifically, studies that only use assumed male patients outnumber studies using assumed female patients 5.5:1 (Plevkova et al., 2020).

This gap in the research isn't just an issue of representation, it has medical implications that lead to the neglect of one half of the population. Importantly, the somatosensory cortex is a focus of research on neuroplasticity because representations of body parts can change if the way they are used is altered . For example, after amputation of an arm, sensory input from the face starts to activate the area of the somatosensory cortex that used to represent the hand. This change in neural representation can also cause changes in perceptual experience like phantom limb syndrome, where an individual experiences sensations or pain that feel like they are coming from the missing limb (Ramachandran & Rogers-Ramachandran, 2000). Without a somatosensory map that represents the bodies of people who were assigned female at birth (AFAB), we can't assess neuroplasticity after changes to their anatomy.

Consider a common procedure like the mastectomy, the removal of breast tissue. Mastectomies are used to treat breast cancer and also as a gender affirming surgery for trans men and other trans and non-binary people with breasts (Dutta, 2015; Case et al., 2017). Data from people undergoing mastectomy indicates that about 33% of patients show changes in the neural representation of the breast, but we don't know what that change causes perceptually for those patients (Aglioti et al., 1993; Aglioti et al., 1994; Dutta, 2015). Furthermore, many transgender people describe feelings of disconnection with sexed body parts and some experience phantom limb-like sensations from sexed body parts they weren't born with. It isn't surprising that these experiences could relate to differences in the neural representation of those body parts (Ramachandran, 2008; McGeoch et al., 2011). Case et al. (2017) used magnetoencephalography imaging to record brain activity during stimulation of the breast, a body part that many trans men feel disconnected from. Their findings suggest that feelings of disconnection from gender-incongruent body parts in trans men could be related to differences in the neural representation of the body. Mapping the AFAB brain might also have implications for other pain conditions like

hysterectomy, vulvodynia, and fibromyalgia (Di Noto et al., 2012).

There have been recent attempts to create a somatosensory homunculus that represents the AFAB body, for example Di Noto et al. (2012) used existing data to create an illustration of AFAB anatomy in Penfield's 2D homunculus. However, this version is not as precise as the existing homunculus. In 2020, Wright and Foerder created the first 3D somatosensory homunculus to include breasts, nipples, vagina, and clitoris. As of 2022, there is still no comprehensive 2-D map displaying where AFAB body parts are precisely located in the somatosensory cortex. Currently, many of these attempts are being called the *her*munculus, but it should be noted that this term could be more inclusive. Trans men and non binary people who don't use she/her pronouns would also have their bodies represented by it. Given the erasure of transgender people in medical settings and the negative health outcomes associated (Bauer et al., 2009), it would be ideal to work towards using terminology that doesn't force them to identify with the wrong gender in order to receive medical care.

Just like the sense of touch, other senses send information

to the cortex in an organized, map-like arrangement. The **primary visual cortex** is located at the back end of the brain in the **occipital lobe,** and is the first bit of cortex to receive visual information from the eyes. Unlike the somatosensory system, which sends signals separately from each side of the body, the visual system is a little different because the left and right eyes each capture images from the left and right sides of visual space (See Figure BB.18). The inside part of the right eye and the outside part of the left eye both detect stimuli in the right visual field and the optic nerves carry information from the eye to the brain so the right visual world ALL ends up in the left side of the brain. If you follow the lines in the figure you can see the same arrangement is true for the left visual field.

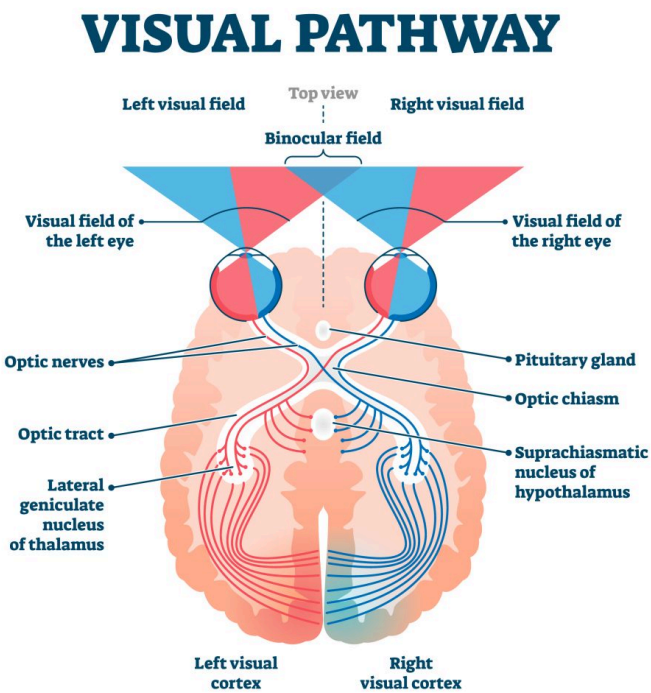

Figure BB.18. Pathway from the eye to the primary visual cortex. note that left and right visual space are sent to the contralateral hemisphere.

The primary auditory cortex is the main area responsible for processing incoming auditory information from the ears, and is located within the **temporal lobe**, tucked inside the lateral fissure**.** The **primary gustatory cortex** is responsible for the perception of taste and is found deeper within the lateral fissure that includes a portion of the frontal lobe as well as a structure called the insula. The sense of smell is sent

from receptors in the nose to the olfactory bulb that runs along the bottom of the frontal lobe and then to the **primary olfactory area** in the piriform cortex. These primary sensory areas are important for categorizing and integrating sensory information, which are the first steps in conscious perception so can be considered the main sites of input from the environment. The primary motor area is responsible for voluntary movement, so is one of the main sites of output by the brain. Collectively, these functional areas make up only a small proportion of the total cortical tissue, the rest is referred to as **association cortex**. It integrates information gathered from other areas to regulate complex thought processes such as problem-solving, decision-making, and language. Unlike the primary sensory and motor areas, electrical stimulation of association cortex does not produce simple movement or sensation.

Other Areas of the Forebrain

Other areas of the forebrain, located beneath the cerebral cortex, include the thalamus and the limbic system. The **thalamus** is a sensory relay for the brain. All of our senses, with the exception of smell, are routed through the thalamus before being directed to other areas of the brain for processing (Figure BB.19).

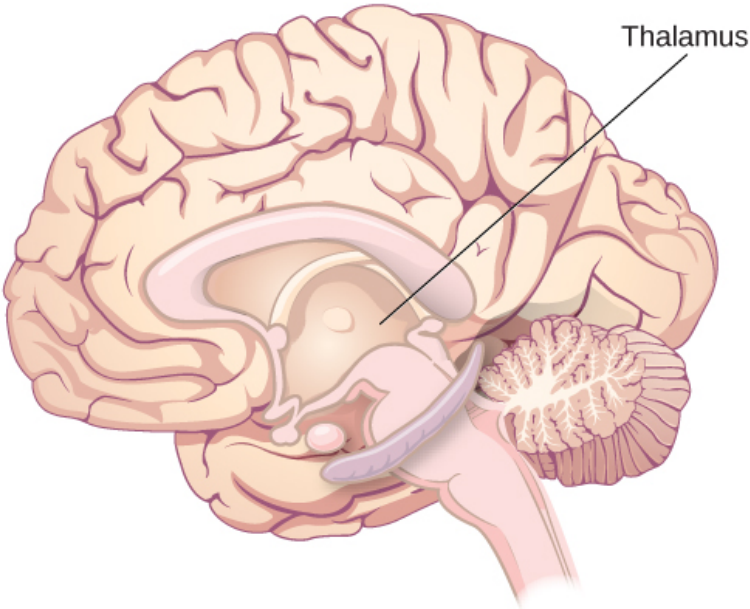

Figure BB.19 The thalamus serves as the relay centre of the brain where most senses are routed for processing.

The limbic system is involved in processing both emotion and memory. The limbic system is made up of a number of different structures, but three of the most important are the hippocampus, the amygdala, and the hypothalamus (Figure BB.20). The **hippocampus** is an essential structure for learning and memory. The **amygdala** is involved in our experience of emotion and in tying emotional meaning to our memories. The **hypothalamus** regulates a number of homeostatic processes, including the regulation of body temperature, appetite, and blood pressure. The hypothalamus

also serves as an interface between the nervous system and the endocrine system and in the regulation of sexual motivation and behaviour.

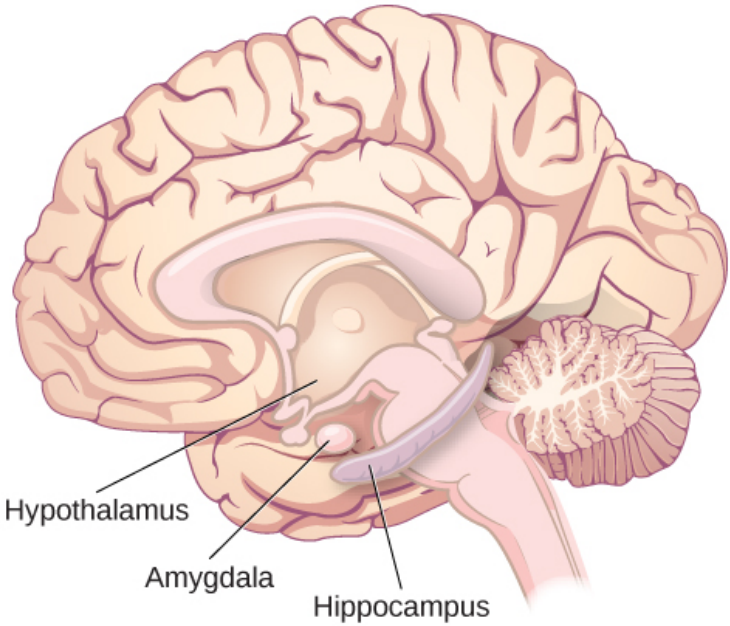

Figure BB.20 The limbic system is involved in mediating emotional response and memory.

The Case of Henry Molaison (H.M.)

In 1953, Henry Gustav Molaison (H. M.) was a 27-year-old man who experienced severe seizures. In an attempt to control his seizures, H. M. underwent brain surgery to remove his hippocampus and amygdala. Following the surgery, H.M's seizures became much less severe, but he also suffered some

unexpected—and devastating—consequences of the surgery: he lost his ability to form many types of new memories. For example, he was unable to learn new facts, such as who was president of the United States. He was able to learn new skills, but afterward he had no recollection of learning them. For example, while he might learn to use a computer, he would have no conscious memory of ever having used one. He could not remember new faces, and he was unable to remember events, even immediately after they occurred. Researchers were fascinated by his experience, and he is considered one of the most studied cases in medical and psychological history (Hardt, Einarsson, & Nader, 2010; Squire, 2009). Indeed, his case has provided tremendous insight into the role that the hippocampus plays in the consolidation of new learning into explicit memory.

Lateralization

You may be familiar with the idea that the right and left hemispheres have different abilities or specialized functions, referred to as **lateralization**. Some of the earliest evidence of lateralization comes from Paul Broca. Broca identified a structure in the frontal lobe now known as **Broca's area**, which typically appears on the left hemisphere (Figure BB.21). This discovery came from work with patients with a particular set of language impairments after damage in the Broca's area, called Broca's aphasia.

Consider Louis Leborgne or 'Tan', Broca's first patient with damage in this area. Leborgne was described as intelligent and understood language, but wasn't able to reply with anything other than "tan" or a single swear word if he was angry. Leborgne's primary communication was a combination of gestures and "tan", spoken in a variety of tones depending on context (Devinsky & Samuels, 2016). This is why Broca's aphasia is also called expressive aphasia, because people affected by it cannot produce communicative language in a verbal or written form, though they have no problems with comprehension.

Wernicke's area, important for speech comprehension, is also located in the left hemisphere, close to the primary auditory cortex. Whereas individuals with damage to Broca's area have difficulty producing language, those with damage to Wernicke's area can produce words, but they aren't able to understand language or combine words in sensible ways (Figure BB. 21). In most people, both Broca's area and Wernicke's area are located in the left hemisphere.

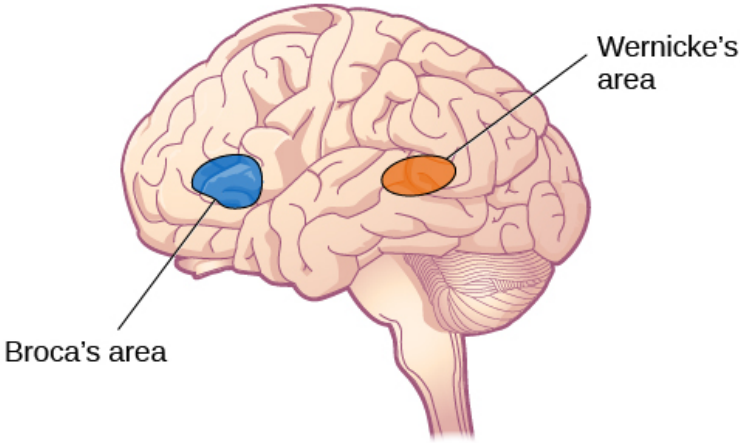

Figure BB.21 Damage to either Broca's area or Wernicke's area can result in language deficits. The types of deficits are very different, however, depending on which area is affected.

These kinds of cases indicate that the left hemisphere may have some specialized control of verbal language. For most people, the left hemisphere is needed for verbal language, while the right hemisphere may be better at some kinds of comprehension and symbol recognition (Taylor & Regard, 2003). It's likely that both hemispheres need to interact to produce a full range of language functions.

More evidence for lateralization comes from Michael Gazzaniga and his colleagues, who studied the function of each hemisphere independently in patients who had undergone 'split-brain' surgery. This surgery is used to stop the spread of seizures from one hemisphere to the other in some cases

of severe epilepsy. To accomplish this the surgeon must cut the **corpus callosum**, a band of about 200 million axons that allows for communication between the two hemispheres (Figure BB.22). Because the two sides normally share the information they have processed, we aren't aware of the different roles they play in day-to-day function.

This is not the case for split-brain patients. For instance, if you show a picture to the patient's left visual field only, they won't be able to name it because the information is only available in the largely nonverbal right hemisphere. However, they can recreate the picture with their left hand, which is also controlled by the right hemisphere. When the more verbal left hemisphere sees the picture that the hand drew, the patient is able to name it (assuming the left hemisphere can interpret what was drawn by the left hand).

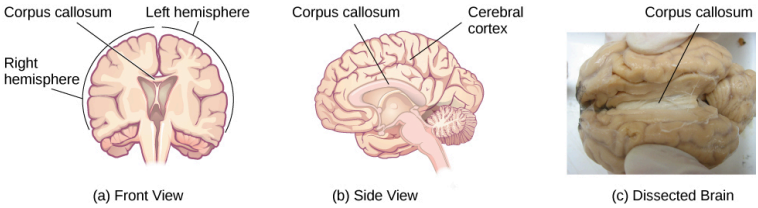

Figure BB.22 (a, b) The corpus callosum connects the left and right hemispheres of the brain. (c) A scientist spreads this dissected sheep brain apart to show the corpus callosum between the hemispheres. (credit c: modification of work by Aaron Bornstein)

More data from Gazzinga and associates suggests that a variety of functions show patterns indicating some degree of hemispheric dominance (Gazzaniga, 2005). For example, the left hemisphere may be superior for forming associations in memory, selective attention, and positive emotions. The right hemisphere, on the other hand, may be superior in pitch perception, arousal, and negative emotions (Ehret, 2006). It's tempting to conclude that certain behaviours can be attributed to one hemisphere or the other, but research in this area produces inconsistent results and there's a natural variation of brain organization in every population of humans (Banich & Heller, 1998).

TRICKY TOPIC: HEMISPHERIC LATERALIZATION

One or more interactive elements has been excluded from this version of the text. You can view them online here: https://caul-cbua.pressbooks.pub/intropsychneuro/?p=406#oembed-2

If the video above does not load, click here: https://youtu.be/uHN-

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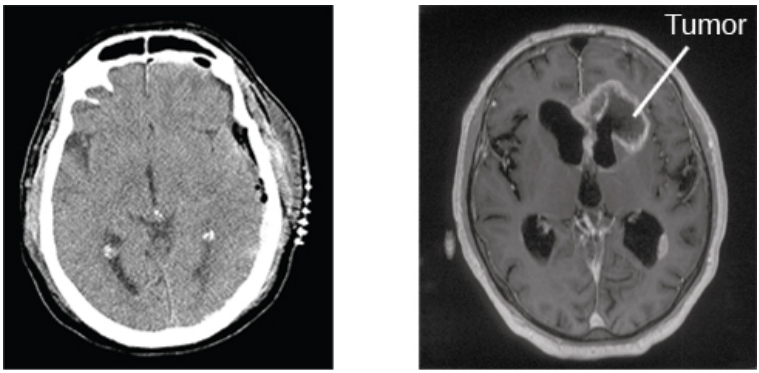
For a full transcript of this video, click here

Brain Imaging

You have learned how brain injury can provide information about the functions of different parts of the brain. Increasingly, however, we are able to obtain that information using brain imaging techniques on individuals who have not suffered brain injury. In this section, we take a more in-depth look at some of the techniques that are available for imaging the brain, including techniques that rely on radiation, magnetic fields, or electrical activity within the brain.

Techniques Involving Radiation

A computerized tomography (CT) scan involves taking a number of x-rays of a particular section of a person's body or brain (Figure BB.23). The x-rays pass through tissues of different densities at different rates, allowing a computer to construct an overall image of the area of the body being scanned. A CT scan is often used to determine whether someone has a tumour or significant brain damage.



(a) (b)

Figure BB.23 CT scan can be used to show brain tumours. (a) The image on the left shows a healthy brain, whereas (b) the image on the right indicates a brain tumour in the left frontal lobe. (credit a: modification of work by "Aceofhearts1968"/Wikimedia Commons; credit b: modification of work by Roland Schmitt et al)

Positron emission tomography (PET) scans create pictures of the living, active brain (Figure BB.24). An individual receiving a PET scan drinks or is injected with a mildly radioactive substance, called a tracer. Once in the bloodstream, the amount of tracer in any given region of the brain can be monitored. As a brain area becomes more active, more blood flows to that area. A computer monitors the movement of the tracer and creates a rough map of active and inactive areas of the brain during a given behaviour. PET scans show little detail, are unable to pinpoint events precisely in time, and require that the brain be exposed to radiation; therefore, this technique has been replaced by the fMRI as an alternative

diagnostic tool. However, combined with CT, PET technology is still being used in certain contexts. For example, CT/PET scans allow better imaging of the activity of neurotransmitter receptors and open new avenues in schizophrenia research. In this hybrid CT/PET technology, CT contributes clear images of brain structures, while PET shows the brain's activity.

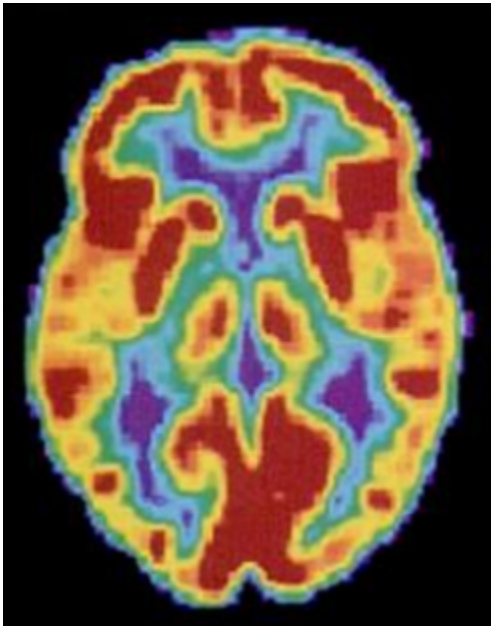


Figure BB.24 PET scan is helpful for showing activity in different parts of the brain. (credit: Health and Human Services Department, National Institutes of Health)

Techniques Involving Magnetic Fields

In **magnetic resonance imaging** (MRI), a person is placed inside a machine that generates a strong magnetic field. The magnetic field causes the hydrogen atoms in the body's cells to move. When the magnetic field is turned off, the hydrogen atoms emit electromagnetic signals as they return to their original positions. Tissues of different densities give off different signals, which a computer interprets and displays on a monitor. **Functional magnetic resonance imaging (fMRI)** operates on the same principles, but it shows changes in brain activity over time by tracking blood flow and oxygen levels. The fMRI provides more detailed images of the brain's structure, as well as better accuracy in time, than is possible in PET scans (Figure BB.25). With their high level of detail, MRI and fMRI are often used to compare the brains of healthy individuals to the brains of individuals with psychological disorders. This comparison helps determine what structural and functional differences exist between these populations.

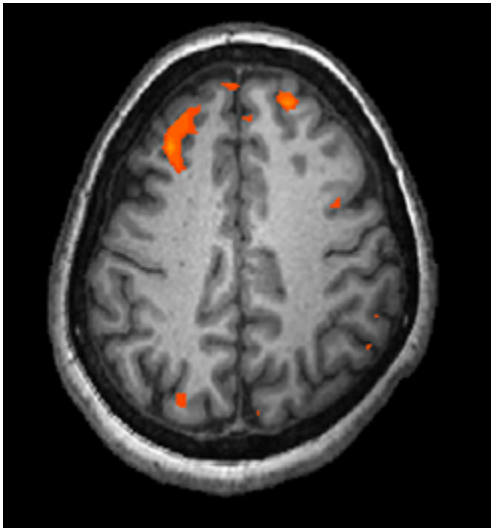


Figure BB.25 An fMRI shows activity in the brain over time. This image represents a single frame from an fMRI. (credit: modification of work by Kim J, Matthews NL, Park S.)

Techniques Involving Electrical Activity

In some situations, it is helpful to gain an understanding of the overall activity of a person's brain, without needing information on the actual location of the activity. Electroencephalography (EEG) serves this purpose by providing a measure of a brain's electrical activity. An array of electrodes is placed around a person's head (Figure BB.26). The signals received by the electrodes result in a printout of the electrical activity of his or her brain, or brainwaves, showing both the frequency (number of waves per second) and

amplitude (height) of the recorded brainwaves, with an accuracy within milliseconds. Such information is especially helpful to researchers studying sleep patterns among individuals with sleep disorders.

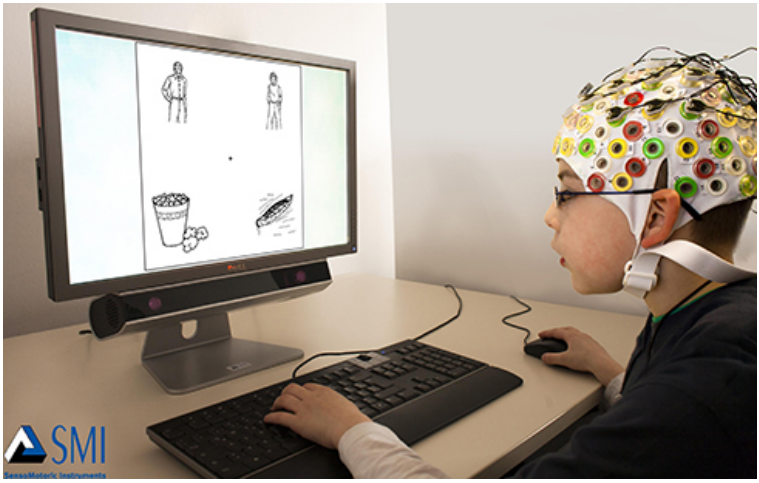


Figure BB.26 Using caps with electrodes, modern EEG research can study the precise timing of overall brain activities. (credit: SMI Eye Tracking)

23.

KEY TERMS OF THE BIOLOGICAL BASIS OF BEHAVIOUR

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action potential
: electrical signal that moves down the neurone's axon

agonist
: drug that mimics or strengthens the effects of a neurotransmitter

all-or-none
: phenomenon that incoming signal from another neurone is either sufficient or insufficient to reach the threshold of excitation

amygdala
: structure in the limbic system involved in our experience of emotion and tying emotional meaning to our memories

antagonist
: drug that blocks or impedes the normal activity of a given neurotransmitter

association cortex

areas of the cortex that are not primary sensory areas, responsible for more complex processing and combining information from multiple senses

auditory cortex

strip of cortex in the temporal lobe that is responsible for processing auditory information

autonomic nervous system

controls our internal organs and glands

axon

major extension of the soma

biological perspective

view that psychological disorders like depression and schizophrenia are associated with imbalances in one or more neurotransmitter systems

Broca's area

region in the left hemisphere that is essential for language production

central nervous system (CNS)

brain and spinal cord

central sulcus

a deep groove separating the temporal lobe and the frontal and parietal lobes

cerebellum

hindbrain structure that controls our balance, coordination, movement, and motor skills, and it is

thought to be important in processing some types of memory

cerebral cortex

surface of the brain that is associated with our highest mental capabilities

computerized tomography (CT) scan

imaging technique in which a computer coordinates and integrates multiple x-rays of a given area

contralateral

a term that refers to something on the opposite side of the body from a particular structure or phenomenon. Eg. The left hemisphere is contralateral to the right hand.

corpus callosum

thick band of neural fibres connecting the brain's two hemispheres

degradation

the process by which an enzyme breaks neurotransmitters in the synaptic cleft down into their components so that they can no longer interact with the receptors on the post synaptic neurone.

dendrite

branch-like extension of the soma that receives incoming signals from other neurones

electroencephalography (EEG)

recording the electrical activity of the brain via electrodes on the scalp

fight or flight response

activation of the sympathetic division of the autonomic nervous system, allowing access to energy reserves and heightened sensory capacity so that we might fight off a given threat or run away to safety

forebrain

largest part of the brain, containing the cerebral cortex, the thalamus, and the limbic system, among other structures

frontal lobe

part of the cerebral cortex involved in reasoning, motor control, emotion, and language; contains motor cortex

Frontal Lobe Syndrome

a set of common symptoms that can occur after damage to the frontal lobe, affecting motivation, planning, social behaviour, and language/speech production

functional magnetic resonance imaging (fMRI)

MRI that shows changes in metabolic activity over time

glial cell

nervous system cell that provides physical and metabolic support to neurones, including neuronal insulation and communication, and nutrient and waste transport

gyrus

(plural: gyri) bump or ridge on the cerebral cortex

hemisphere

left or right half of the brain

hindbrain

division of the brain containing the medulla, pons, and cerebellum

hippocampus

structure in the temporal lobe associated with learning and memory

homeostasis

state of equilibrium—biological conditions, such as body temperature, are maintained at optimal levels

homunculus

a human figure in which the size of different parts represents the relative amount of cortical space that corresponds to each body part

hypothalamus

forebrain structure that regulates sexual motivation and behaviour and a number of homeostatic processes; serves as an interface between the nervous system and the endocrine system

lateralization

concept that each hemisphere of the brain is associated with specialized functions

limbic system

collection of structures involved in processing emotion and memory

longitudinal fissure

deep groove in the brain's cortex

magnetic resonance imaging (MRI)

magnetic fields used to produce a picture of the tissue being imaged

medulla

hindbrain structure that controls automated processes like breathing, blood pressure, and heart rate

membrane potential

difference in charge across the neuronal membrane

midbrain

division of the brain located between the forebrain and the hindbrain; contains the reticular formation

motor cortex

strip of cortex involved in planning and coordinating movement

myelin sheath

fatty substance that insulates axons

neuron

cells in the nervous system that act as interconnected information processors, which are essential for all of the tasks of the nervous system

neuroplasticity

nervous system's ability to change

neurotransmitter

chemical messenger of the nervous system

Nodes of Ranvier

open spaces that are found in the myelin sheath that encases the axon

occipital lobe

part of the cerebral cortex associated with visual processing; contains the primary visual cortex

parasympathetic nervous system

associated with routine, day-to-day operations of the body

parietal lobe

part of the cerebral cortex involved in processing various sensory and perceptual information; contains the primary somatosensory cortex

peripheral nervous system (PNS)

connects the brain and spinal cord to the muscles, organs and senses in the periphery of the body

pituitary gland

secretes a number of key hormones, which regulate fluid levels in the body, and a number of messenger hormones, which direct the activity of other glands in the endocrine system

pons

hindbrain structure that connects the brain and spinal cord; involved in regulating brain activity during sleep

positron emission tomography (PET) scan

involves injecting individuals with a mildly radioactive substance and monitoring changes in blood flow to different regions of the brain

prefrontal cortex

area in the frontal lobe responsible for higher-level

cognitive functioning

primary gustatory cortex

an area that includes a portion of the frontal lobe as well as the insula, buried inside the lateral fissure and responsible for processing information about flavour

primary olfactory area

an area on the ventral surface of the frontal lobe that is responsible for processing information about smells

primary visual cortex

an area at the back of the occipital lobe that is responsible for processing visual information

psychotropic medication

drugs that treat psychiatric symptoms by restoring neurotransmitter balance

receptor

protein on the cell surface where neurotransmitters attach

resting potential

the state of readiness of a neurone membrane's potential between signals

reuptake

neurotransmitter is pumped back into the neurone that released it

semipermeable membrane

cell membrane that allows smaller molecules or

molecules without an electrical charge to pass through it, while stopping larger or highly charged molecules

soma

cell body

somatic nervous system

relays sensory and motor information to and from the CNS

somatosensory cortex

essential for processing sensory information from across the body, such as touch, temperature, and pain

somatotopy

the matching arrangement of body parts and their representation in the cerebral cortex

substantia nigra

midbrain structure where dopamine is produced; involved in control of movement

sulcus

(plural: sulci) depressions or grooves in the cerebral cortex

sympathetic nervous system

involved in stress-related activities and functions

synaptic cleft

small gap between two neurones where communication occurs

synaptic vesicle

storage site for neurotransmitters

temporal lobe

part of cerebral cortex associated with hearing, memory, emotion, and some aspects of language; contains primary auditory cortex

terminal button

axon terminal containing synaptic vesicles

thalamus

sensory relay for the brain

threshold of excitation

level of charge in the membrane that causes the neurone to become active

ventral tegmental area (VTA)

midbrain structure where dopamine is produced: associated with mood, reward, and addiction

Wernicke's area

important for speech comprehension

24.

SUMMARY OF THE BIOLOGICAL BASIS OF BEHAVIOUR

BB.1 Cells of the Nervous System

Glia and neurones are the two cell types that make up the nervous system. While glia generally play supporting roles, the communication between neurones is fundamental to all of the functions associated with the nervous system. Neuronal communication is made possible by the neurone's specialized structures. The soma contains the cell nucleus, and the dendrites extend from the soma in tree-like branches. The axon is another major extension of the cell body; axons are often covered by a myelin sheath, which increases the speed of transmission of neural impulses. At the end of the axon are terminal buttons that contain synaptic vesicles filled with neurotransmitters.

Neuronal communication is an electrochemical event. The dendrites contain receptors for neurotransmitters released by nearby neurones. If the signals received from other neurones

are sufficiently strong, an action potential will travel down the length of the axon to the terminal buttons, resulting in the release of neurotransmitters into the synaptic cleft. Action potentials operate on the all-or-none principle and involve the movement of Na^+ and K^+ across the neuronal membrane.

Different neurotransmitters are associated with different functions. Often, psychological disorders involve imbalances in a given neurotransmitter system. Therefore, psychotropic drugs are prescribed in an attempt to bring the neurotransmitters back into balance. Drugs can act either as agonists or as antagonists for a given neurotransmitter system.

BB.2 Parts of the Nervous System

The brain and spinal cord make up the central nervous system. The peripheral nervous system is comprised of the somatic and autonomic nervous systems. The somatic nervous system transmits sensory and motor signals to and from the central nervous system. The autonomic nervous system controls the function of our organs and glands, and can be divided into the sympathetic and parasympathetic divisions. Sympathetic activation prepares us for fight or flight, while parasympathetic activation is associated with normal functioning under relaxed conditions.

BB.3 The Brain and Spinal Cord

The brain consists of two hemispheres, each controlling the opposite side of the body. Each hemisphere can be subdivided into different lobes: frontal, parietal, temporal, and occipital. In addition to the lobes of the cerebral cortex, the forebrain includes the thalamus (sensory relay) and limbic system (emotion and memory circuit). The midbrain contains the reticular formation, which is important for sleep and arousal, as well as the substantia nigra and ventral tegmental area. These structures are important for movement, reward, and addictive processes. The hindbrain contains the structures of the brainstem (medulla, pons, and midbrain), which control automatic functions like breathing and blood pressure. The hindbrain also contains the cerebellum, which helps coordinate movement and certain types of memories.

Individuals with brain damage have been studied extensively to provide information about the role of different areas of the brain, and recent advances in technology allow us to glean similar information by imaging brain structure and function. These techniques include CT, PET, MRI, fMRI, and EEG.

25.

REVIEW QUESTIONS FOR BIOLOGICAL BASIS OF BEHAVIOUR

Click here for Answer Key

Multiple Choice Questions

1. The _____ receive(s) incoming signals from other neurones.

a. soma
b. terminal buttons
c. myelin sheath
d. dendrites

2. A(n) _____ facilitates or mimics the activity of a given neurotransmitter system.

a. axon
b. SSRI
c. agonist

d. antagonist

3. Multiple sclerosis involves a breakdown of the _____.

a. soma
b. myelin sheath
c. synaptic vesicles
d. dendrites

4. An action potential involves Na^+ moving _____ the cell and K^+ moving _____ the cell.

a. inside; outside
b. outside; inside
c. inside; inside
d. outside; outside

5. Our ability to make our legs move as we walk across the room is controlled by the _____ nervous system.

a. autonomic
b. somatic
c. sympathetic
d. parasympathetic

6. If your _____ is activated, you will feel relatively at ease.

a. somatic nervous system

b. sympathetic nervous system
c. parasympathetic nervous system
d. spinal cord

7. The central nervous system is comprised of _____.

a. sympathetic and parasympathetic nervous systems
b. organs and glands
c. somatic and autonomic nervous systems
d. brain and spinal cord

8. Sympathetic activation is associated with _____.

a. pupil dilation
b. storage of glucose in the liver
c. increased heart rate
d. both A and C

9. The _____ is a sensory relay station where all sensory information, except for smell, goes before being sent to other areas of the brain for further processing.

a. amygdala
b. hippocampus
c. hypothalamus
d. thalamus

10. Damage to the _____ disrupts one's ability to

comprehend language, but it leaves one's ability to produce words intact.

a. amygdala
b. Broca's Area
c. Wernicke's Area
d. occipital lobe

11. A(n) _____ uses magnetic fields to create pictures of a given tissue.

a. EEG
b. MRI
c. PET scan
d. CT scan

12. Which of the following is **not** a structure of the forebrain?

a. thalamus
b. hippocampus
c. amygdala
d. substantia nigra

Critical Thinking Questions

13. Cocaine has two effects on synaptic transmission: it impairs reuptake of dopamine and it causes more dopamine

to be released into the synaptic cleft. Would cocaine be classified as an agonist or antagonist? Why?

14. Drugs such as lidocaine and novocaine act as Na^+ channel blockers. In other words, they prevent sodium from moving across the neuronal membrane. Why would this particular effect make these drugs such effective local anesthetics?

15. Examine Figure 3.14, illustrating the effects of sympathetic nervous system activation. How would all of these things play into the fight or flight response?

16. Before the advent of modern imaging techniques, scientists and clinicians relied on autopsies of people who suffered brain injury with resultant change in behaviour to determine how different areas of the brain were affected. What are some of the limitations associated with this kind of approach?

17. Which of the techniques discussed would be viable options for you to determine how activity in the reticular formation is related to sleep and wakefulness? Why?

Personal Application Questions

18. Have you or someone you know ever been prescribed a psychotropic medication? If so, what side effects were associated with the treatment?

19. You read about H. M.'s memory deficits following the bilateral removal of his hippocampus and amygdala. Have you encountered a character in a book, television program, or movie that suffered memory deficits? How was that character

similar to and different from H. M.?

26.

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The Brain and Spinal Cord

Max Dysart and **Dr. Jennifer Stamp** worked to rework and rewrite large portions of this section of the Biological Basis of Behaviour chapter.

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CHAPTER IV
SENSATION & PERCEPTION

27.

INTRODUCTION TO SENSATION & PERCEPTION

Chapter Outline

- Sensation versus Perception
- Waves and Wavelengths
- Vision
- Hearing
- The Other Senses
- Gestalt Principles of Perception

Figure SAP.1 If you were standing in the midst of this street scene, you would be absorbing and processing numerous pieces of sensory input. (credit: modification of work by Cory Zanker)

Imagine standing on a city street corner. You might be struck by movement everywhere as cars and people go about their business, by the sound of a street musician's melody or a horn honking in the distance, by the smell of exhaust fumes or of food being sold by a nearby vendor, and by the sensation of hard pavement under your feet.

We rely on our sensory systems to provide important information about our surroundings. We use this information to successfully navigate and interact with our environment so that we can find nourishment, seek shelter, maintain social relationships, and avoid potentially dangerous situations.

This chapter will provide an overview of how sensory information is received and processed by the nervous system and how that affects our conscious experience of the world.

We begin by learning the distinction between sensation and perception. Then we consider the physical properties of light and sound stimuli, along with an overview of the basic structure and function of the major sensory systems. The chapter will close with a discussion of a historically important theory of perception called Gestalt.

28.

SENSATION VS. PERCEPTION

Learning Objectives

By the end of this section, you will be able to:

- Distinguish between sensation and perception
- Describe the concepts of absolute threshold and difference threshold
- Discuss the roles attention, motivation, and sensory adaptation play in perception

Sensation

What does it mean to sense something? Sensory receptors are

specialized neurones that respond to specific types of stimuli. When sensory information is detected by a sensory receptor, **sensation** has occurred. For example, light that enters the eye causes chemical changes in cells that line the back of the eye. These cells relay messages, in the form of action potentials (as you learned when studying biopsychology), to the central nervous system. The conversion from sensory stimulus energy to action potential is known as **transduction**.

You have probably known since elementary school that we have five senses: vision, hearing (audition), smell (olfaction), taste (gustation), and touch (somatosensation). It turns out that this notion of five senses is oversimplified. We also have sensory systems that provide information about balance (the vestibular sense), body position and movement (proprioception and kinesthesia), pain (nociception), and temperature (thermoception).

Psychophysics is the branch of psychology that studies the effects of physical stimuli on sensory perceptions and mental states. The field of psychophysics was founded by the German psychologist Gustav Fechner (1801-1887), who was the first to study the relationship between the strength of a stimulus and a person's ability to detect the stimulus.

The measurement techniques developed by Fechner and his colleagues are designed in part to help determine the limits of human sensation. One important criterion is the ability to detect very faint stimuli. The **absolute threshold** of a sensation is defined as the intensity of a stimulus that allows

an organism to just barely detect it. In a typical psychophysics experiment, an individual is presented with a series of trials in which a signal is sometimes presented and sometimes not, or in which two stimuli are presented that are either the same or different. Imagine, for instance, that you were asked to take a hearing test. On each of the trials your task is to indicate either "yes" if you heard a sound or "no" if you did not. The signals are purposefully made to be very faint, making accurate judgments difficult.

The problem for you is that the very faint signals create uncertainty. Because our ears are constantly sending background information to the brain, you will sometimes think that you heard a sound when none was there, and you will sometimes fail to detect a sound that is there. Your task is to determine whether the neural activity that you are experiencing is due to the background noise alone or is the result of a signal within the noise. The responses that you give on the hearing test can be analyzed using signal detection analysis. **Signal detection analysis** is a technique used to determine the ability of the perceiver to separate true signals from background noise (Macmillan & Creelman, 2005; Wickens, 2002). As you can see in Figure SAP.2, "Outcomes of a Signal Detection Analysis," each judgment trial creates four possible outcomes: A hit occurs when you, as the listener, correctly say "yes" when there was a sound. A false alarm occurs when you respond "yes" to no signal. In the other two cases you respond "no" — either a miss (saying "no" when

there was a signal) or a correct rejection (saying "no" when there was in fact no signal).

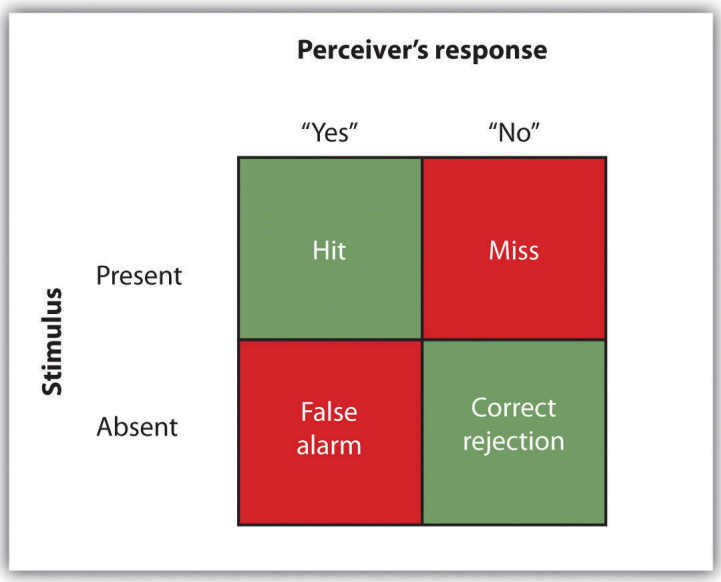

Figure SAP.2 Outcomes of a Signal Detection Analysis. Our ability to accurately detect stimuli is measured using a signal detection analysis. Two of the possible decisions (hits and correct rejections) are accurate; the other two (misses and false alarms) are errors.

The analysis of the data from a psychophysics experiment creates two measures. One measure, known as **sensitivity**, refers to the true ability of the individual to detect the presence or absence of signals. People who have better hearing will have higher sensitivity than will those with poorer hearing. The other measure, **response bias**, refers to a behavioural tendency

to respond "yes" to the trials, which is independent of sensitivity.

Imagine, for instance, that rather than taking a hearing test, you are a soldier on guard duty, and your job is to detect the very faint sound of the breaking of a branch that indicates that an enemy is nearby. You can see that in this case making a false alarm by alerting the other soldiers to the sound might not be as costly as a miss (a failure to report the sound), which could be deadly. Therefore, you might well adopt a very lenient response bias in which whenever you are at all unsure, you send a warning signal. In this case your responses may not be very accurate (your sensitivity may be low because you are making a lot of false alarms) and yet the extreme response bias can save lives.

Another application of signal detection occurs when medical technicians study body images for the presence of cancerous tumours. Again, a miss (in which the technician incorrectly determines that there is no tumour) can be very costly, but false alarms (referring patients who do not have tumours to further testing) also have costs. The ultimate decisions that the technicians make are based on the quality of the signal (clarity of the image), their experience and training (the ability to recognize certain shapes and textures of tumours), and their best guesses about the relative costs of misses versus false alarms.

Although we have focused to this point on the absolute threshold, a second important criterion concerns the ability to

assess differences between stimuli. The **difference threshold** (or **just noticeable difference** [JND]), refers to the change in a stimulus that can just barely be detected by the organism. The German physiologist Ernst Weber (1795-1878) made an important discovery about the JND — namely, that the ability to detect differences depends not so much on the size of the difference but on the size of the difference in relation to the absolute size of the stimulus. **Weber's law** maintains that the just noticeable difference of a stimulus is a constant proportion of the original intensity of the stimulus. As an example, if you have a cup of coffee that has only a very little bit of sugar in it (say one teaspoon), adding another teaspoon of sugar will make a big difference in taste. But if you added that same teaspoon to a cup of coffee that already had five teaspoons of sugar in it, then you probably wouldn't taste the difference as much (in fact, according to Weber's law, you would have to add five more teaspoons to make the same difference in taste).

One interesting application of Weber's law is in our everyday shopping behaviour. Our tendency to perceive cost differences between products is dependent not only on the amount of money we will spend or save, but also on the amount of money saved relative to the price of the purchase. For example, if you were about to buy a soda or candy bar in a convenience store, and the price of the items ranged from $1 to $3, you would likely think that the $3 item cost "a lot more" than the $1 item. But now imagine that you were comparing between two music systems, one that cost $397 and one that

cost $399. Probably you would think that the cost of the two systems was "about the same," even though buying the cheaper one would still save you $2.

Research Focus: Influence without Awareness

If you study Figure SAP.3, "Absolute Threshold," you will see that the absolute threshold is the point where we become aware of a faint stimulus. After that point, we say that the stimulus is conscious because we can accurately report on its existence (or its nonexistence) more than 50% of the time. But can **subliminal stimuli** (events that occur below the absolute threshold and of which we are not conscious) have an influence on our behaviour?

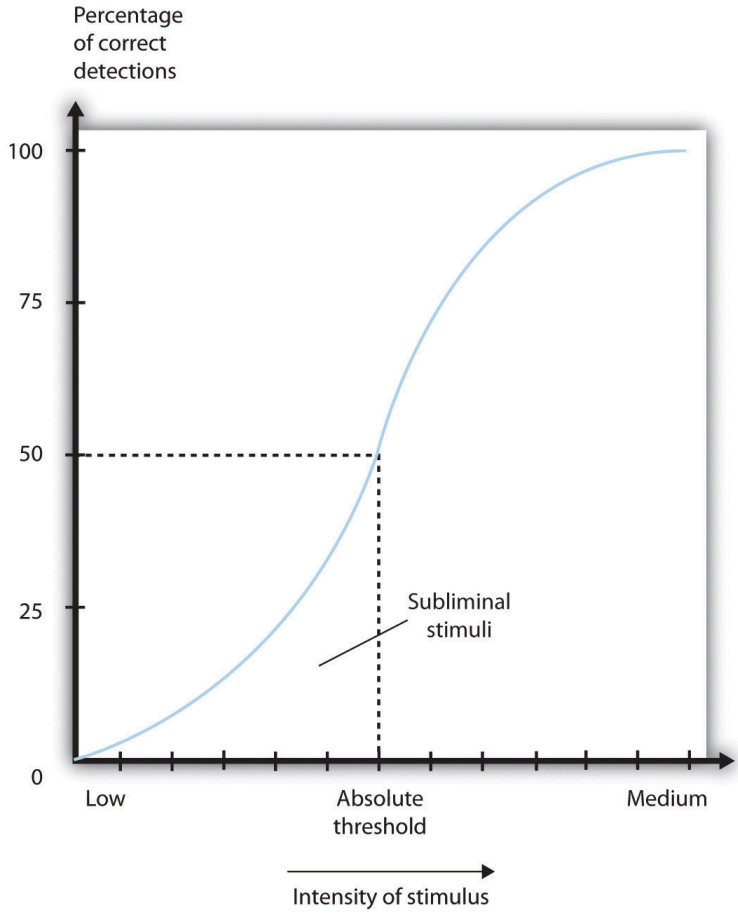

Figure SAP.3 Absolute Threshold. As the intensity of a stimulus increases, we are more likely to perceive it. Stimuli below the absolute threshold can still have at least some influence on us, even though we cannot consciously detect them.

A variety of research programs have found that subliminal stimuli can influence our judgments and behaviour, at least in the short term (Dijksterhuis, 2010). But whether the

presentation of subliminal stimuli can influence the products that we buy has been a more controversial topic in psychology. In one relevant experiment, Karremans, Stroebe, and Claus (2006) had Dutch college students view a series of computer trials in which a string of letters such as BBBBBBBBB or BBBbBBBBB were presented on the screen. To be sure they paid attention to the display, the students were asked to note whether the strings contained a small b. However, immediately before each of the letter strings, the researchers presented either the name of a drink that is popular in Holland (Lipton Ice) or a control string containing the same letters as Lipton Ice (NpeicTol). These words were presented so quickly (for only about one-fiftieth of a second) that the participants could not see them.

Then the students were asked to indicate their intention to drink Lipton Ice by answering questions such as "If you would sit on a terrace now, how likely is it that you would order Lipton Ice," and also to indicate how thirsty they were at the time. The researchers found that the students who had been exposed to the "Lipton Ice" words (and particularly those who indicated that they were already thirsty) were significantly more likely to say that they would drink Lipton Ice than were those who had been exposed to the control words.

If they were effective, procedures such as this (we can call the technique "subliminal advertising" because it advertises a product outside awareness) would have some major advantages for advertisers, because it would allow them to

promote their products without directly interrupting the consumers' activity and without the consumers' knowing they are being persuaded. People cannot argue with, or attempt to avoid being influenced by, messages received outside awareness. Due to fears that people may be influenced without their knowing, subliminal advertising has been banned in many countries, including Australia, Canada, Great Britain, the United States, and Russia.

Although it has been proven to work in some research, subliminal advertising's effectiveness is still uncertain. Charles Trappey (1996) conducted a meta-analysis in which he combined 23 leading research studies that had tested the influence of subliminal advertising on consumer choice. The results showed that subliminal advertising had a negligible effect on consumer choice. Saegert (1987, p. 107) concluded that "marketing should quit giving subliminal advertising the benefit of the doubt," arguing that the influences of subliminal stimuli are usually so weak that they are normally overshadowed by the person's own decision making about the behaviour.

Taken together then, the evidence for the effectiveness of subliminal advertising is weak, and its effects may be limited to only some people and in only some conditions. You probably don't have to worry too much about being subliminally persuaded in your everyday life, even if subliminal ads are allowed in your country. But even if subliminal advertising is not all that effective itself, there are plenty of other indirect

advertising techniques that are used and that do work. For instance, many ads for automobiles and alcoholic beverages are subtly sexualized, which encourages the consumer to indirectly (even if not subliminally) associate these products with sexuality. And there is the ever more frequent "product placement" technique, where images of brands (cars, sodas, electronics, and so forth) are placed on websites and in popular television shows and movies. Harris, Bargh, & Brownell (2009) found that being exposed to food advertising on television significantly increased child and adult snacking behaviours, again suggesting that the effects of perceived images, even if presented above the absolute threshold, may nevertheless be very subtle.

Another example of processing that occurs outside our awareness is seen when certain areas of the visual cortex are damaged, causing **blindsight**, a condition in which people are unable to consciously report on visual stimuli but nevertheless are able to accurately answer questions about what they are seeing. When people with blindsight are asked directly what stimuli look like, or to determine whether these stimuli are present at all, they cannot do so at better than chance levels. They report that they cannot see anything. However, when they are asked more indirect questions, they are able to give correct answers. For example, people with blindsight are able to correctly determine an object's location and direction of movement, as well as identify simple geometrical forms and patterns (Weiskrantz, 1997). It seems that although conscious

reports of the visual experiences are not possible, there is still a parallel and implicit process at work, enabling people to perceive certain aspects of the stimuli.

Perception

While our sensory receptors are constantly collecting information from the environment, it is ultimately how we interpret that information that affects how we interact with the world. **Perception** refers to the way sensory information is organized, interpreted, and consciously experienced. Perception involves both bottom-up and top-down processing. **Bottom-up processing** refers to sensory information from a stimulus in the environment driving a process, and **top-down processing** refers to knowledge and expectancy driving a process, as shown in Figure SAP.4 (Egeth & Yantis, 1997; Fine & Minnery, 2009; Yantis & Egeth, 1999).

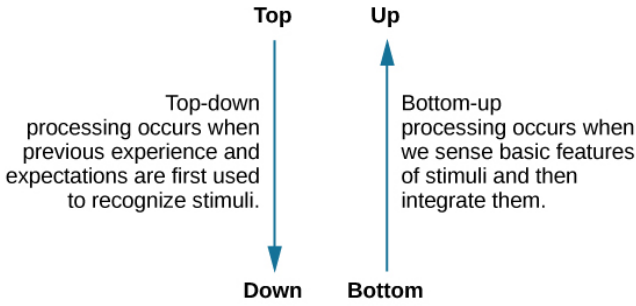

Figure SAP.4 Top-down and bottom-up are ways we process our perceptions.

Imagine that you and some friends are sitting in a crowded restaurant eating lunch and talking. It is very noisy, and you are concentrating on your friend's face to hear what she is saying, then the sound of breaking glass and clang of metal pans hitting the floor rings out. The server dropped a large tray of food. Although you were attending to your meal and conversation, that crashing sound would likely get through your attentional filters and capture your attention. You would have no choice but to notice it. That attentional capture would be caused by the sound from the environment: it would be bottom-up.

Alternatively, top-down processes are generally goal directed, slow, deliberate, effortful, and under your control (Fine & Minnery, 2009; Miller & Cohen, 2001; Miller & D'Esposito, 2005). For instance, if you misplaced your keys, how would you look for them? If you had a yellow key fob, you would probably look for yellowness of a certain size in specific locations, such as on the counter, coffee table, and other similar places. You would not look for yellowness on your ceiling fan, because you know keys are not normally lying on top of a ceiling fan. That act of searching for a certain size of yellowness in some locations and not others would be top-down—under your control and based on your experience.

One way to think of this concept is that sensation is a physical process, whereas perception is psychological. For example, upon walking into a kitchen and smelling the scent of baking cinnamon rolls, the *sensation* is the scent receptors

detecting the odour of cinnamon, but the *perception* may be "Mmm, this smells like the bread Grandma used to bake when the family gathered for holidays."

Although our perceptions are built from sensations, not all sensations result in perception. In fact, we often don't perceive stimuli that remain relatively constant over prolonged periods of time. This is known as **sensory adaptation**. Imagine going to a city that you have never visited. You check in to the hotel, but when you get to your room, there is a road construction sign with a bright flashing light outside your window. Unfortunately, there are no other rooms available, so you are stuck with a flashing light. You decide to watch television to unwind. The flashing light was extremely annoying when you first entered your room. It was as if someone was continually turning a bright yellow spotlight on and off in your room, but after watching television for a short while, you no longer notice the light flashing. The light is still flashing and filling your room with yellow light every few seconds, and the photoreceptors in your eyes still sense the light, but you no longer perceive the rapid changes in lighting conditions. That you no longer perceive the flashing light demonstrates sensory adaptation and shows that while closely associated, sensation and perception are different.

There is another factor that affects sensation and perception: attention. Attention plays a significant role in determining what is sensed versus what is perceived. Imagine you are at a party full of music, chatter, and laughter. You get

involved in an interesting conversation with a friend, and you tune out all the background noise. If someone interrupted you to ask what song had just finished playing, you would probably be unable to answer that question.

Link to Learning

See for yourself how inattentional blindness works by checking out this video from Nova, 'Why You Miss Big Changes Right Before Your Eyes'.

One of the most interesting demonstrations of how important attention is in determining our perception of the environment occurred in a famous study conducted by Daniel Simons and Christopher Chabris (1999). In this study, participants watched a video of people dressed in black and white passing basketballs. Participants were asked to count the number of times the team dressed in white passed the ball. During the video, a person dressed in a black gorilla costume walks among the two teams. You would think that someone would notice the gorilla, right? Nearly half of the people who watched the video didn't notice the gorilla at all, despite the fact that he

was clearly visible for nine seconds. Because participants were so focused on the number of times the team dressed in white was passing the ball, they completely tuned out other visual information. **Inattentional blindness** is the failure to notice something that is completely visible because the person was actively attending to something else and did not pay attention to other things (Mack & Rock, 1998; Simons & Chabris, 1999).

In a similar experiment, researchers tested inattentional blindness by asking participants to observe images moving across a computer screen. They were instructed to focus on either white or black objects, disregarding the other colour. When a red cross passed across the screen, about one third of subjects did not notice it (Figure SAP.5) (Most, Simons, Scholl, & Chabris, 2000).

SAP.5 Nearly one third of participants in a study did not notice that a red cross passed on the screen because their attention was focused on the black or white figures. (credit: Cory Zanker)

Motivation can also affect perception. Have you ever been expecting a really important phone call and, while taking a shower, you think you hear the phone ringing, only to discover that it is not? If so, then you have experienced how motivation to detect a meaningful stimulus can shift our ability to discriminate between a true sensory stimulus and background noise.

Our perceptions can also be affected by our beliefs, values, prejudices, expectations, and life experiences. As you will see later in this chapter, individuals who are deprived of the experience of binocular vision during critical periods of development have trouble perceiving depth (Fawcett, Wang, &

Birch, 2005). The shared experiences of people within a given cultural context can have pronounced effects on perception. For example, Marshall Segall, Donald Campbell, and Melville Herskovits (1963) published the results of a multinational study in which they demonstrated that individuals from Western cultures were more prone to experience certain types of visual illusions than individuals from non-Western cultures, and vice versa. One such illusion that Westerners were more likely to experience was the Müller-Lyer illusion (Figure SAP.6): The lines appear to be different lengths, but they are actually the same length.

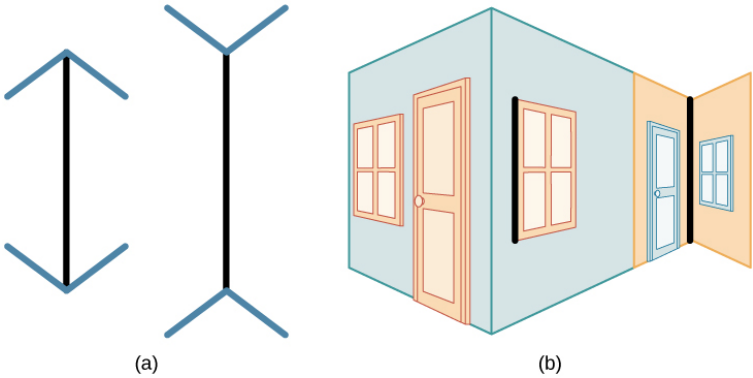

Figure SAP.6 In the Müller-Lyer illusion, lines appear to be different lengths although they are identical. (a) Arrows at the ends of lines may make the line on the right appear longer, although the lines are the same length. (b) When applied to a three-dimensional image, the line on the right again may appear longer although both black lines are the same length.

These perceptual differences were consistent with differences

in the types of environmental features experienced on a regular basis by people in a given cultural context. People in Western cultures, for example, have a perceptual context of buildings with straight lines, what Segall's study called a carpentered world (Segall et al., 1966). In contrast, people from certain non-Western cultures with an uncarpentered view, such as the Zulu of South Africa, whose villages are made up of round huts arranged in circles, are less susceptible to this illusion (Segall et al., 1999). It is not just vision that is affected by cultural factors. Indeed, research has demonstrated that the ability to identify an odour, and rate its pleasantness and its intensity, varies cross-culturally (Ayabe-Kanamura, Saito, Distel, Martínez-Gómez, & Hudson, 1998).

Children described as thrill seekers are more likely to show taste preferences for intense sour flavours (Liem, Westerbeek, Wolterink, Kok, & de Graaf, 2004), which suggests that basic aspects of personality might affect perception. Furthermore, individuals who hold positive attitudes toward reduced-fat foods are more likely to rate foods labeled as reduced fat as tasting better than people who have less positive attitudes about these products (Aaron, Mela, & Evans, 1994).

29.

WAVES AND WAVELENGTHS

Learning Objectives

By the end of this section, you will be able to:

- Describe important physical features of wave forms
- Show how physical properties of sound waves are associated with perceptual experience
- Show how physical properties of light waves are associated with perceptual experience

Visual and auditory stimuli both occur in the form of waves.

Although the two stimuli are very different in terms of composition, wave forms share similar characteristics that are especially important to our visual and auditory perceptions. In this section, we describe the physical properties of the waves as well as the perceptual experiences associated with them.

Amplitude and Wavelength

Two physical characteristics of a wave are amplitude and wavelength (Figure SAP.7). The **amplitude** of a wave is the distance from the centre line to the top point of the crest or the bottom point of the trough. **Wavelength** refers to the length of a wave from one peak to the next.

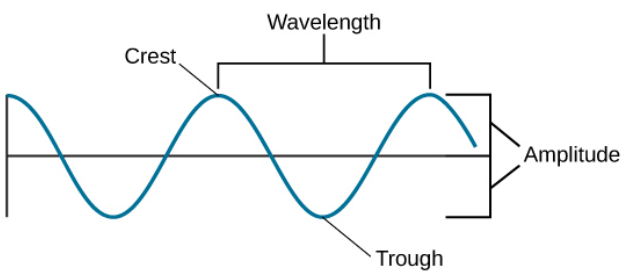

Figure SAP.7 The amplitude or height of a wave is measured from the peak to the trough. The wavelength is measured from peak to peak.

Wavelength is directly related to the frequency of a given wave form. **Frequency** refers to the number of waves that pass

a given point in a given time period and is often expressed in terms of **hertz (Hz)**, or cycles per second. Longer wavelengths will have lower frequencies, and shorter wavelengths will have higher frequencies (Figure SAP.8).

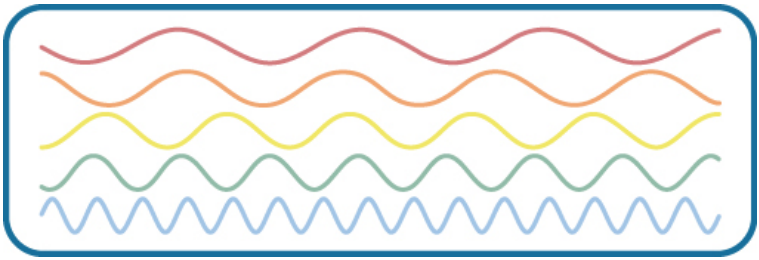

Figure SAP.8 This figure illustrates waves of differing wavelengths/frequencies. At the top of the figure, the red wave has a long wavelength/short frequency. Moving from top to bottom, the wavelengths decrease and frequencies increase.

Sound Waves

The physical properties of sound waves are associated with various aspects of our perception of sound. The frequency of a sound wave is associated with our perception of that sound's **pitch**. High-frequency sound waves are perceived as high-pitched sounds, while low-frequency sound waves are perceived as low-pitched sounds. In humans, the audible range of sound frequencies is between 20 and 20000 Hz, with

greatest sensitivity to those frequencies that fall in the middle of this range.

Other species show differences in their audible ranges. For instance, chickens have a very limited audible range, from 125 to 2000 Hz. Mice have an audible range from 1000 to 91000 Hz, and the beluga whale's audible range is from 1000 to 123000 Hz. Our pet dogs and cats have audible ranges of about 70–45000 Hz and 45–64000 Hz, respectively (Strain, 2003).

The loudness of a given sound is closely associated with the amplitude of the sound wave. Higher amplitudes are associated with louder sounds. Loudness is measured in terms of **decibels (dB)**, a logarithmic unit of sound intensity. A typical conversation would correlate with 60 dB; a rock concert might check in at 120 dB (Figure SAP.9). A whisper 5 feet away or rustling leaves are at the low end of our hearing range; sounds like a window air conditioner, a normal conversation, and even heavy traffic or a vacuum cleaner are within a tolerable range. However, there is the potential for hearing damage from about 80 dB to 130 dB: These are sounds of a food processor, power lawnmower, heavy truck (25 feet away), subway train (20 feet away), live rock music, and a jackhammer. About one-third of all hearing loss is due to noise exposure, and the louder the sound, the shorter the exposure needed to cause hearing damage (Le, Straatman, Lea, & Westerberg, 2017). Listening to music through earbuds at maximum volume (around 100–105 decibels) can cause noise-

induced hearing loss after 15 minutes of exposure. Although listening to music at maximum volume may not seem to cause damage, it increases the risk of age-related hearing loss (Kujawa & Liberman, 2006). The threshold for pain is about 130 dB, a jet plane taking off or a revolver firing at close range (Dunkle, 1982).

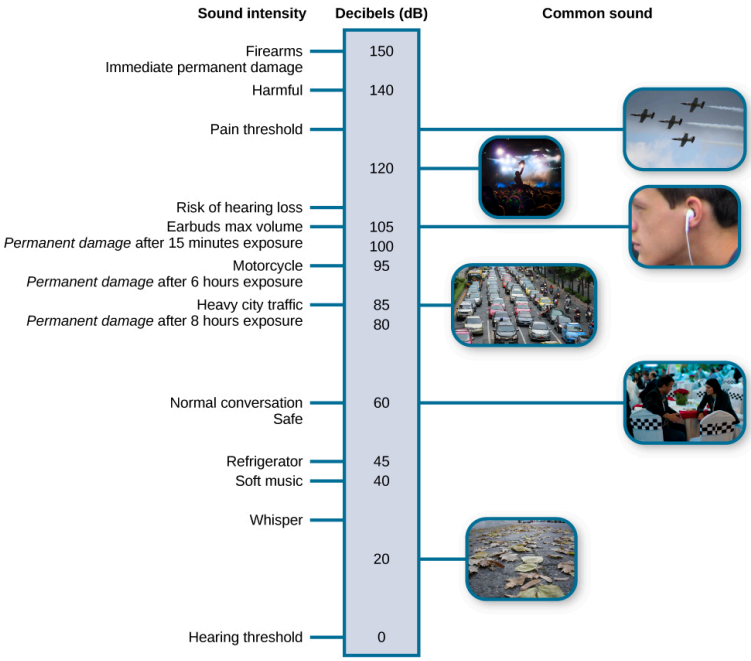

Figure SAP.9 This figure illustrates the loudness of common sounds. (credit "planes": modification of work by Max Pfandl; credit "crowd": modification of work by Christian Holmér; credit: "earbuds": modification of work by "Skinny Guy Lover_Flickr"/Flickr; credit "traffic": modification of work by "quinntheislander_Pixabay"/Pixabay; credit "talking": modification of work by Joi Ito; credit "leaves": modification of work by Aurelijus Valeiša)

Although wave amplitude is generally associated with loudness, there is some interaction between frequency and amplitude in our perception of loudness within the audible range. For example, a 10 Hz sound wave is inaudible no matter the amplitude of the wave. A 1000 Hz sound wave, on the other hand, would vary dramatically in terms of perceived loudness as the amplitude of the wave increased.

Link to Learning

Watch this video about wavelengths, amplitude, and frequency to learn more.

Of course, different musical instruments can play the same musical note at the same level of loudness, yet they still sound quite different. This is known as the timbre of a sound. **Timbre** refers to a sound's purity, and it is affected by the complex interplay of frequency, amplitude, and timing of sound waves. Sound, specifically hearing, will be discussed later in this section.

Light Waves

The **visible spectrum** is the portion of the larger **electromagnetic spectrum** that we can see. As Figure SAP.10 shows, the electromagnetic spectrum encompasses all of the electromagnetic radiation that occurs in our environment and includes gamma rays, x-rays, ultraviolet light, visible light, infrared light, microwaves, and radio waves. The visible spectrum in humans is associated with wavelengths that range from 380 to 740 nm—a very small distance, since a nanometer (nm) is one billionth of a meter. Other species can detect other portions of the electromagnetic spectrum. For instance, honeybees can see light in the ultraviolet range (Wakakuwa, Stavenga, & Arikawa, 2007), and some snakes can detect infrared radiation in addition to more traditional visual light cues (Chen, Deng, Brauth, Ding, & Tang, 2012; Hartline, Kass, & Loop, 1978).

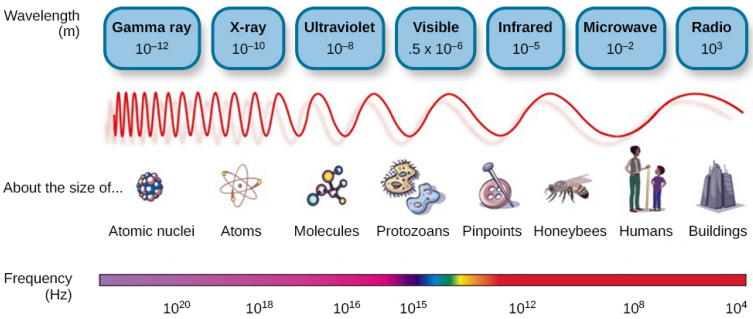

Figure SAP.10 Light that is visible to humans makes up only a small portion of the electromagnetic spectrum.

In humans, light wavelength is associated with perception of colour (Figure SAP.11). Within the visible spectrum, our experience of red is associated with longer wavelengths, greens are intermediate, and blues and violets are shorter in wavelength. (An easy way to remember this is the mnemonic ROYGBIV: **r**ed, **o**range, **y**ellow, **g**reen, **b**lue, **i**ndigo, **v**iolet.) The amplitude of light waves is associated with our experience of brightness or intensity of colour, with larger amplitudes appearing brighter.

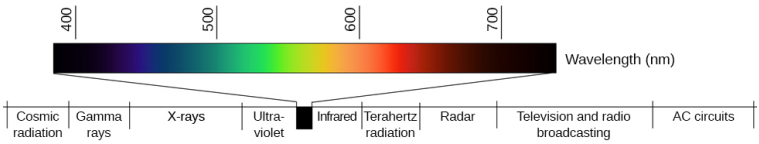

Figure SAP.11 Different wavelengths of light are associated with our perception of different colours. (credit: modification of work by Johannes Ahlmann)

30.

VISION

Learning Objectives

By the end of this section, you will be able to:

- Describe the basic anatomy of the visual system
- Discuss how rods and cones contribute to different aspects of vision
- Describe how monocular and binocular cues are used in the perception of depth

The visual system constructs a mental representation of the world around us (Figure SAP.12). This contributes to our ability to successfully navigate through physical space and interact with important individuals and objects in our

environments. This section will provide an overview of the basic anatomy and function of the visual system. In addition, we will explore our ability to perceive colour and depth.

Figure SAP.12 Our eyes take in sensory information that helps us understand the world around us. (credit modified from Shutterstock)

Anatomy of the Visual System

The eye is the major sensory organ involved in vision (Figure SAP.13). Light waves are transmitted across the cornea and enter the eye through the pupil. The **cornea** is the transparent covering over the eye. It serves as a barrier between the inner eye and the outside world, and it is involved in focusing light waves that enter the eye. The **pupil** is the small opening in the eye through which light passes, and the size of the pupil can change as a function of light levels as well as emotional arousal. When light levels are low, the pupil will become dilated, or expanded, to allow more light to enter the eye. When light levels are high, the pupil will constrict, or become smaller, to reduce the amount of light that enters the eye. The pupil's size is controlled by muscles that are connected to the **iris**, which is the coloured portion of the eye.

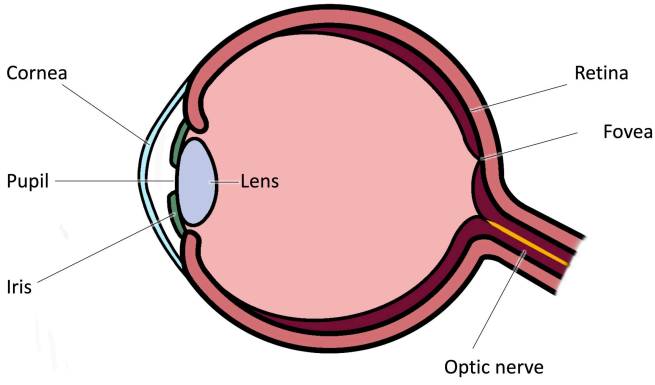

Figure SAP.13 The anatomy of the eye is illustrated in this diagram. (Molly Wells Art)

After passing through the pupil, light crosses the **lens**, a curved, transparent structure that serves to provide additional focus. The lens is attached to muscles that can change its shape to aid in focusing light that is reflected from near or far objects. As our gaze shifts from near to distant objects, accommodation occurs. **Accommodation** refers to the process of changing the curvature of the lens to keep light entering the eye focused on the retina. In a normal-sighted individual, the lens will focus images perfectly on a small indentation in the back of the eye known as the **fovea**, which is part of the **retina**, the light-sensitive lining of the eye. The fovea contains densely packed specialized **photoreceptor** cells (Figure SAP.14). These photoreceptor cells, known as **cones**, are light-detecting cells. The cones are specialized types of

photoreceptors that work best in bright light conditions. Cones are very sensitive to acute detail and provide tremendous spatial resolution. They also are directly involved in our ability to perceive colour.

While cones are concentrated in the fovea, where images tend to be focused, rods, another type of photoreceptor, are located throughout the remainder of the retina. **Rods** are specialized photoreceptors that work well in low light conditions, and while they lack the spatial resolution and colour function of the cones, they are involved in our vision in dimly lit environments as well as in our perception of movement on the periphery of our visual field.

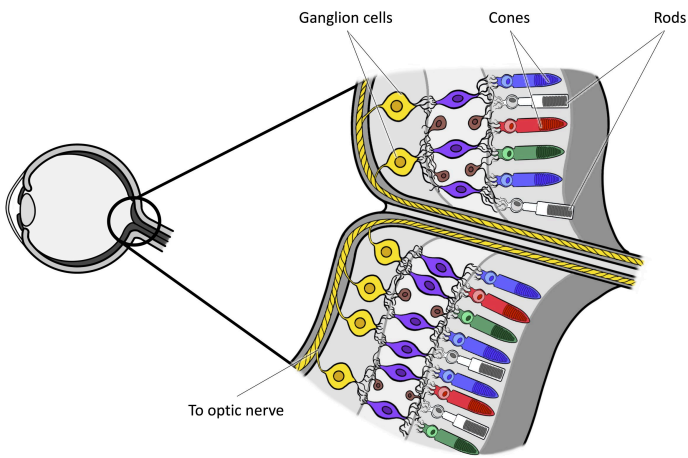

Figure SAP.14 The two types of photoreceptors are shown in this image. (Molly Wells Art).

We have all experienced the different sensitivities of rods and cones when making the transition from a brightly lit environment to a dimly lit environment. Imagine going to see a blockbuster movie on a clear summer day. As you walk from the brightly lit lobby into the dark theatre, you notice that you immediately have difficulty seeing much of anything. After a few minutes, you begin to adjust to the darkness and can see the interior of the theatre. In the bright environment, your vision was dominated primarily by cone activity. As you move to the dark environment, rod activity dominates, but there is a delay in transitioning between the phases. If your rods do not transform light into nerve impulses as easily and efficiently as they should, you will have difficulty seeing in dim light, a condition known as night blindness.

Rods and cones are connected (via several interneurons) to retinal ganglion cells. Axons from the retinal ganglion cells converge and exit through the back of the eye to form the **optic nerve**. The optic nerve carries visual information from the retina to the brain. There is a point in the visual field called the **blind spot**: Even when light from a small object is focused on the blind spot, we do not see it. We are not consciously aware of our blind spots for two reasons: First, each eye gets a slightly different view of the visual field; therefore, the blind spots do not overlap. Second, our visual system fills in the blind spot so that although we cannot respond to visual information that occurs in that portion of

the visual field, we are also not aware that information is missing.

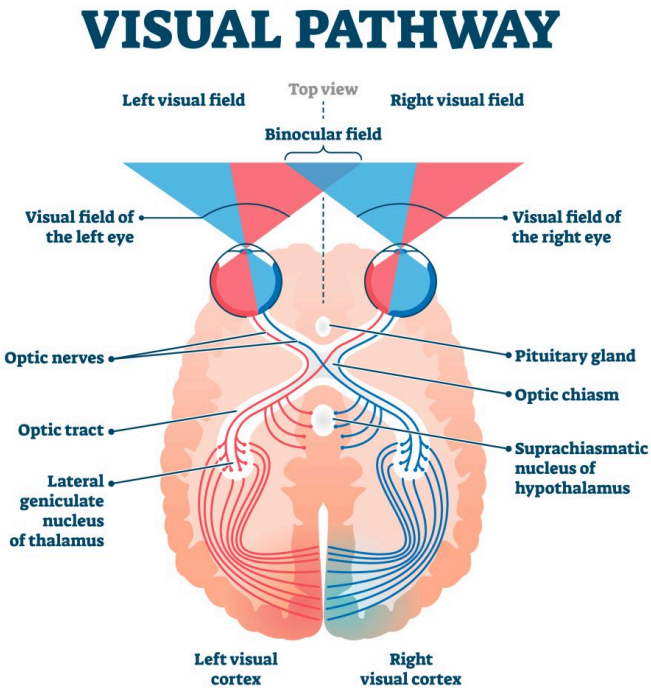

Figure SAP.15 This illustration shows the optic chiasm at the front of the brain and the pathways to the occipital lobe at the back of the brain, where visual sensations are processed into meaningful perceptions (credit: Shutterstock)

The optic nerve from each eye merges just below the brain at a point called the **optic chiasm**. As Figure SAP.15 shows, the optic chiasm is an X-shaped structure that sits just below the cerebral cortex at the front of the brain. At the point of the

optic chiasm, information from the right visual field (which comes from both eyes) is sent to the left side of the brain, and information from the left visual field is sent to the right side of the brain.

Once inside the brain, visual information is sent via a number of structures, such as the lateral geniculate nucleus (LGN), to the occipital lobe at the back of the brain for processing. The LGN is a cluster of neurone cell bodies located in the thalamus. Visual information might be processed in parallel pathways which can generally be described as the "what pathway" and the "where/how" pathway. The "what pathway" (ventral stream) is involved in object recognition and identification, while the "where/how pathway" (dorsal stream) is involved with location in space and how one might interact with a particular visual stimulus (Milner & Goodale, 2008; Ungerleider & Haxby, 1994). For example, when you see a ball rolling down the street, the "what pathway" identifies what the object is, and the "where/how pathway" identifies its location or movement in space.

TRICKY TOPIC: VISUAL PATHWAY

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What do you think?

The Ethics of Research Using Animals

David Hubel and Torsten Wiesel were awarded the Nobel Prize in Medicine in 1981 for their research on the visual system. They collaborated for more than twenty years and made significant discoveries about the neurology of visual perception (Hubel & Wiesel, 1959, 1962, 1963, 1970; Wiesel & Hubel, 1963). They studied animals, mostly cats and monkeys. Although

they used several techniques, they did considerable single unit recordings, during which tiny electrodes were inserted in the animal's brain to determine when a single cell was activated. Among their many discoveries, they found that specific brain cells respond to lines with specific orientations (called ocular dominance), and they mapped the way those cells are arranged in areas of the visual cortex known as columns and hypercolumns.

In some of their research, they sutured one eye of newborn kittens closed and followed the development of the kittens' vision. They discovered there was a critical period of development for vision. If kittens were deprived of input from one eye, other areas of their visual cortex filled in the area that was normally used by the eye that was sewn closed. In other words, neural connections that exist at birth can be lost if they are deprived of sensory input.

What do you think about sewing a kitten's eye closed for research? To many animal advocates, this would seem brutal, abusive, and unethical. What if you could do research that would help ensure babies and children born with certain conditions could develop normal vision instead of becoming blind? Would you want that research done? Would you

conduct that research, even if it meant causing some harm to cats? Would you think the same way if you were the parent of such a child? What if you worked at the animal shelter?

Color and Depth Perception

We do not see the world in black and white; neither do we see it as two-dimensional (2-D) or flat (just height and width, no depth). Let's look at how colour vision works and how we perceive three dimensions (height, width, and depth).

Color Vision

Normal-sighted individuals have three different types of cones that mediate colour vision. Each of these cone types is maximally sensitive to a slightly different wavelength of light. According to the **trichromatic theory of colour vision**, shown in Figure SAP.16, all colours in the spectrum can be produced by combining red, green, and blue. The three types of cones are each receptive to one of the colours.

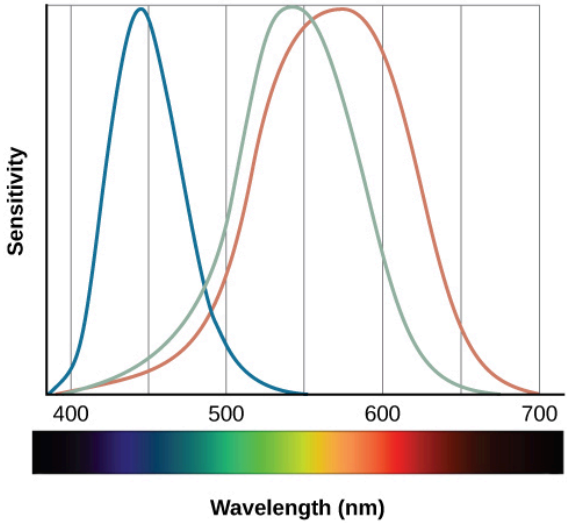

Figure SAP.16 This figure illustrates the different sensitivities for the three cone types found in a normal-sighted individual. (credit: modification of work by Vanessa Ezekowitz)

The trichromatic theory of colour vision is not the only theory—another major theory of colour vision is known as the **opponent-process theory**. According to this theory, colour is coded in opponent pairs: black-white, yellow-blue, and green-red. The basic idea is that some cells of the visual system are excited by one of the opponent colours and inhibited by the other. So, a cell that was excited by wavelengths associated with green would be inhibited by wavelengths associated with red, and vice versa. One of the implications of opponent processing is that we do not experience greenish-reds or yellowish-blues as colours.

Another implication is that this leads to the experience of negative afterimages. An **afterimage** describes the continuation of a visual sensation after removal of the stimulus. For example, when you stare briefly at the sun and then look away from it, you may still perceive a spot of light although the stimulus (the sun) has been removed. When colour is involved in the stimulus, the colour pairings identified in the opponent-process theory lead to a negative afterimage. You can test this concept using the flag in Figure SAP.18.

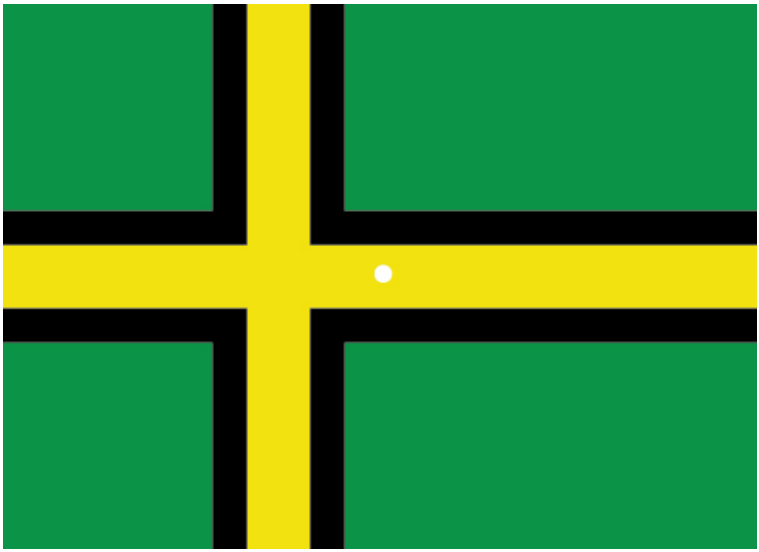

Figure SAP.18 Stare at the white dot for 30–60 seconds and then move your eyes to a blank piece of white paper. What do you see? This is known as a negative afterimage, and it provides empirical support for the opponent-process theory of colour vision.

But these two theories—the trichromatic theory of colour

vision and the opponent-process theory—are not mutually exclusive. Research has shown that they just apply to different levels of the nervous system. For visual processing on the retina, trichromatic theory applies: the cones are responsive to three different wavelengths that represent red, blue, and green. But once the signal moves past the retina on its way to the brain, the cells respond in a way consistent with opponent-process theory (Land, 1959; Kaiser, 1997).

TRICKY TOPIC: VISUAL TRANSDUCTION

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Link to Learning

Watch this video about colour perception to learn more.

Depth Perception

Our ability to perceive spatial relationships in three-dimensional (3-D) space is known as **depth perception**. With depth perception, we can describe things as being in front, behind, above, below, or to the side of other things.

Our world is three-dimensional, so it makes sense that our mental representation of the world has three-dimensional properties. We use a variety of cues in a visual scene to establish our sense of depth. Some of these are **binocular cues**, which means that they rely on the use of both eyes. One example of a binocular depth cue is **binocular disparity**, the slightly different view of the world that each of our eyes receives. To experience this slightly different view, do this simple exercise: extend your arm fully and extend one of your fingers and focus on that finger. Now, close your left eye without moving your

head, then open your left eye and close your right eye without moving your head. You will notice that your finger seems to shift as you alternate between the two eyes because of the slightly different view each eye has of your finger.

A 3-D movie works on the same principle: the special glasses you wear allow the two slightly different images projected onto the screen to be seen separately by your left and your right eye. As your brain processes these images, you have the illusion that the leaping animal or running person is coming right toward you.

Although we rely on binocular cues to experience depth in our 3-D world, we can also perceive depth in 2-D arrays. Think about all the paintings and photographs you have seen. Generally, you pick up on depth in these images even though the visual stimulus is 2-D. When we do this, we are relying on a number of **monocular cues**, or cues that require only one eye. If you think you can't see depth with one eye, note that you don't bump into things when using only one eye while walking—and, in fact, we have more monocular cues than binocular cues.

Table SAP.1 Monocular Depth Cues That Help Us Judge Depth at a Distance.

Name	Description	Example	Image
Position	We tend to see objects higher up in our field of vision as farther away.	The fence posts at right appear farther away not only because they become smaller but also because they appear higher up in the picture.	
Relative size	Assuming that the objects in a scene are the same size, smaller objects are perceived as farther away.	At right, the cars in the distance appear smaller than those nearer to us.	

Table SAP.1 Monocular Depth Cues That Help Us Judge Depth at a Distance.

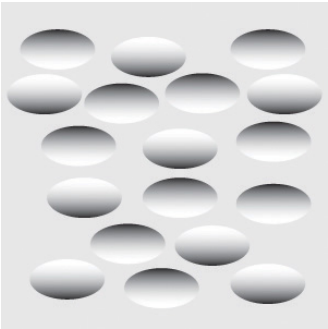
Name	Description	Example	Image
Linear perspective	Parallel lines appear to converge at a distance.	We know that the tracks at right are parallel. When they appear closer together, we determine they are farther away.	
Light and shadow	The eye receives more reflected light from objects that are closer to us. Normally, light comes from above, so darker images are in shadow.	We see the images at right as extending and indented according to their shadowing. If we invert the picture, the images will reverse.	

Table SAP.1 Monocular Depth Cues That Help Us Judge Depth at a Distance.

Name	Description	Example	Image
Interposition	When one object overlaps another object, we view it as closer.	At right, because the blue star covers the pink bar, it is seen as closer than the yellow moon.	
Aerial perspective	Objects that appear hazy, or that are covered with smog or dust, appear farther away.	The artist who painted the picture on the right used aerial perspective to make the clouds more hazy and thus appear farther away.	

Table credit: USask Psychology Textbook

TRICKY TOPIC: BINOCULAR DEPTH PERCEPTION

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Dig Deeper

Stereoblindness

Bruce Bridgeman was born with an extreme case of lazy eye that resulted in him being stereoblind, or

unable to respond to binocular cues of depth. He relied heavily on monocular depth cues, but he never had a true appreciation of the 3-D nature of the world around him. This all changed one night in 2012 while Bruce was seeing a movie with his wife.

The movie the couple was going to see was shot in 3-D, and even though he thought it was a waste of money, Bruce paid for the 3-D glasses when he purchased his ticket. As soon as the film began, Bruce put on the glasses and experienced something completely new. For the first time in his life he appreciated the true depth of the world around him. Remarkably, his ability to perceive depth persisted outside of the movie theatre.

There are cells in the nervous system that respond to binocular depth cues. Normally, these cells require activation during early development in order to persist, so experts familiar with Bruce's case (and others like his) assume that at some point in his development, Bruce must have experienced at least a fleeting moment of binocular vision. It was enough to ensure the survival of the cells in the visual system tuned to binocular cues. The mystery now is why it took Bruce nearly 70 years to have these cells activated (Peck, 2012).

31.

HEARING

Learning Objectives

By the end of this section, you will be able to:

- Describe the basic anatomy and function of the auditory system
- Explain how we encode and perceive pitch
- Discuss how we localize sound

Our auditory system converts pressure waves into meaningful sounds. This translates into our ability to hear the sounds of nature, to appreciate the beauty of music, and to communicate with one another through spoken language. This section will provide an overview of the basic anatomy and function of the auditory system. It will include a discussion of how the sensory

stimulus is translated into neural impulses, where in the brain that information is processed, how we perceive pitch, and how we know where sound is coming from.

Anatomy of the Auditory System

The ear can be separated into multiple sections. The outer ear includes the **pinna**, which is the visible part of the ear that protrudes from our heads, the auditory canal, and the **tympanic membrane**, or eardrum. The middle ear contains three tiny bones known as the **ossicles**, which are named the **malleus** (or hammer), **incus** (or anvil), and the **stapes** (or stirrup). The inner ear contains the semicircular canals, which are involved in balance and movement (the vestibular sense), and the cochlea. The **cochlea** is a fluid-filled, snail-shaped structure that contains the sensory receptor cells (hair cells) of the auditory system (Figure SAP.19).

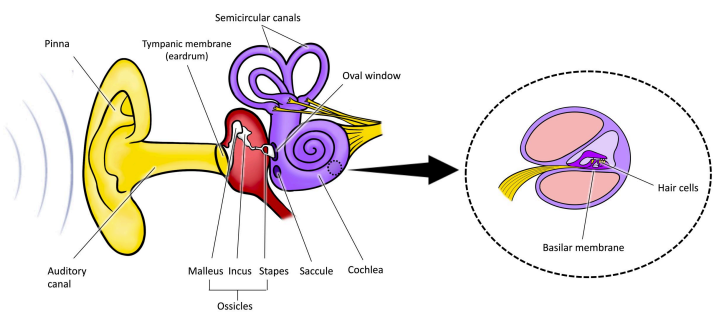

Figure SAP. 19 The ear is divided into outer (pinna and tympanic membrane), middle (the three ossicles: malleus, incus, and stapes), and inner (cochlea and basilar membrane) divisions. (credit: Molly Wells Art)

Sound waves travel along the auditory canal and strike the tympanic membrane, causing it to vibrate. This vibration results in movement of the three ossicles (malleus, incus, stapes). As the ossicles move, the stapes presses into a thin membrane of the cochlea known as the oval window. As the stapes presses into the oval window, the fluid inside the cochlea begins to move, which in turn stimulates **hair cells**, which are auditory receptor cells of the inner ear embedded in the basilar membrane. The **basilar membrane** is a thin strip of tissue within the cochlea.

The activation of hair cells is a mechanical process: the stimulation of the hair cell ultimately leads to activation of the cell. As hair cells become activated, they generate neural impulses that travel along the auditory nerve to the brain. Auditory information is shuttled to the inferior colliculus, the medial geniculate nucleus of the thalamus, and finally to the auditory cortex in the temporal lobe of the brain for processing. Like the visual system, there is also evidence suggesting that information about auditory recognition and localization is processed in parallel streams (Rauschecker & Tian, 2000; Renier et al., 2009).

TRICKY TOPIC: AUDITORY TRANSDUCTION

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Pitch Perception

Different frequencies of sound waves are associated with differences in our perception of the pitch of those sounds. Low-frequency sounds are lower pitched, and high-frequency sounds are higher pitched. How does the auditory system differentiate among various pitches?

Several theories have been proposed to account for pitch perception. We'll discuss two of them here: temporal theory and place theory. The **temporal theory** of pitch perception asserts that frequency is coded by the activity level of a sensory neurone. This would mean that a given hair cell would fire

action potentials related to the frequency of the sound wave. Sometimes, we refer to this as phase-locking. While this is a very intuitive explanation, we detect such a broad range of frequencies (20–20,000 Hz) that the frequency of action potentials fired by hair cells cannot account for the entire range. Because of properties related to sodium channels on the neuronal membrane that are involved in action potentials, there is a point at which a cell cannot fire any faster (Shamma, 2001).

The **place theory** of pitch perception suggests that different portions of the basilar membrane are sensitive to sounds of different frequencies. More specifically, the base of the basilar membrane responds best to high frequencies and the tip of the basilar membrane responds best to low frequencies. Therefore, hair cells that are in the base portion would be labeled as high-pitch receptors, while those in the tip of basilar membrane would be labeled as low-pitch receptors (Shamma, 2001). We call this place coding.

In reality, both theories explain different aspects of pitch perception. At frequencies < 3000 Hz, it is clear that both the rate of action potentials (phase-locking) and place contribute to our perception of pitch. However, much higher frequency sounds (> 3000 Hz) can only be encoded using place cues (Shamma, 2001).

TRICKY TOPIC: AUDITORY DISCRIMINATION

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Sound Localization

The ability to locate sound in our environments is an important part of hearing. Localizing sound could be considered similar to the way that we perceive depth in our visual fields. Like the monocular and binocular cues that provided information about depth, the auditory system uses both **monaural** (one-eared) and **binaural** (two-eared) cues to localize sound.

Each pinna interacts with incoming sound waves differently, depending on the sound's source relative to our bodies. This interaction provides a monaural cue that is helpful in locating

sounds that occur above or below and in front or behind us. The sound waves received by your two ears from sounds that come from directly above, below, in front, or behind you would be identical; therefore, monaural cues are essential (Grothe, Pecka, & McAlpine, 2010).

Binaural cues, on the other hand, provide information on the location of a sound along a horizontal axis by relying on differences in patterns of vibration of the eardrum between our two ears. If a sound comes from an off-center location, it creates two types of binaural cues: interaural level differences and interaural timing differences. **Interaural level difference** refers to the fact that a sound coming from the right side of your body is more intense at your right ear than at your left ear because of the attenuation of the sound wave as it passes through your head. **Interaural timing difference** refers to the small difference in the time at which a given sound wave arrives at each ear (Figure SAP.20). Certain brain areas monitor these differences to construct where along a horizontal axis a sound originates (Grothe et al., 2010).

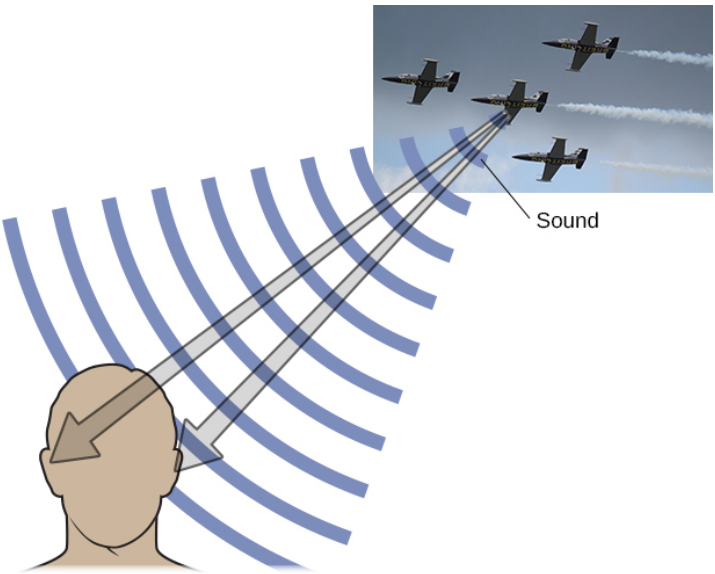


Figure SAP.20 Localizing sound involves the use of both monaural and binaural cues. (credit "plane": modification of work by Max Pfandl)

Hearing Loss

Deafness is the partial or complete inability to hear. Some people are born without hearing, which is known as **congenital deafness**. Other people have **conductive hearing loss**, which is due to a problem delivering sound energy to the cochlea. Causes for conductive hearing loss include blockage of the ear canal, a hole in the tympanic membrane, problems with the ossicles, or fluid in the space between the eardrum and cochlea. Another group of people experience sensorineural hearing loss, which is the most

common form of hearing loss. Sensorineural hearing loss can be caused by many factors, such as aging, head or acoustic trauma, infections and diseases (such as measles or mumps), medications, environmental effects such as noise exposure (noise-induced hearing loss, as shown in Figure SAP.21), tumours, and toxins (such as those found in certain solvents and metals).

(a) (b)

Figure SAP.21 Environmental factors that can lead to sensorineural hearing loss include regular exposure to loud music or construction equipment. (a) Musical performers and (b) construction workers are at risk for this type of hearing loss. (credit a: modification of work by "GillyBerlin_Flickr"/Flickr; credit b: modification of work by Nick Allen)

Given the mechanical nature by which the sound wave stimulus is transmitted from the eardrum through the ossicles to the oval window of the cochlea, some degree of hearing loss is inevitable. With conductive hearing loss, hearing deficits are associated with a lack of vibration of the eardrum and/or

movement of the ossicles. These symptoms can be alleviated by using devices like hearing aids that amplify incoming sound waves to make vibration of the eardrum and movement of the ossicles more likely to occur.

When the hearing problem is associated with a failure to transmit neural signals from the cochlea to the brain, it is called **sensorineural hearing loss**. One disease that results in sensorineural hearing loss is Ménière's disease. Although not well understood, Ménière's disease results in a degeneration of inner ear structures that can lead to hearing loss, tinnitus (constant ringing or buzzing), **vertigo** (a sense of spinning), and an increase in pressure within the inner ear (Semaan & Megerian, 2011). This kind of loss cannot be treated with hearing aids, but some individuals might be candidates for a cochlear implant as a treatment option. **Cochlear implants** are electronic devices that consist of a microphone, a speech processor, and an electrode array. The device receives incoming sound information and directly stimulates the auditory nerve to transmit information to the brain.

Link to Learning

Watch this video about how cochlear implants work, and this animated video about the implantation procedure, to learn more.

Everyday Connection

Deaf Culture

In Canada, the United States, and other places around the world, Deaf people have their own language, schools, and customs. This is called Deaf Culture. In Canada, there are two official sign languages: American Sign Language (ASL) and Quebec Sign Language, la langue des

signes quebecoise (LSQ). ASL has no verbal component and is based entirely on visual signs and gestures. The primary mode of communication is signing. One of the values of Deaf Culture is to continue traditions like using sign language rather than teaching Deaf children to try to speak, read lips, or have cochlear implant surgery.

32.

THE OTHER SENSES

Learning Objectives

By the end of this section, you will be able to:

- Describe the basic functions of the chemical senses
- Explain the basic functions of the somatosensory, nociceptive, and thermoceptive sensory systems
- Describe the basic functions of the vestibular, proprioceptive, and kinaesthetic sensory systems

Vision and hearing have received an incredible amount of attention from researchers over the years. While there is still

much to be learned about how these sensory systems work, we have a much better understanding of them than of our other sensory modalities. In this section, we will explore our chemical senses (taste and smell) and our body senses (touch, temperature, pain, balance, and body position).

The Chemical Senses

Taste (gustation) and smell (olfaction) are called chemical senses because both have sensory receptors that respond to molecules in the food we eat or in the air we breathe. There is a pronounced interaction between our chemical senses. For example, when we describe the flavour of a given food, we are really referring to both gustatory and olfactory properties of the food working in combination.

Taste (Gustation)

You have learned since elementary school that there are four basic groupings of taste: sweet, salty, sour, and bitter. Research demonstrates, however, that we have at least six taste groupings. Umami is our fifth taste. **Umami** is actually a Japanese word that roughly translates to yummy, and it is associated with a taste for monosodium glutamate (Kinnamon & Vandenbeuch, 2009). There is also a growing body of experimental evidence suggesting that we possess a

taste for the fatty content of a given food (Mizushige, Inoue, & Fushiki, 2007).

Molecules from the food and beverages we consume dissolve in our saliva and interact with taste receptors on our tongue and in our mouth and throat. **Taste buds** are formed by groupings of taste receptor cells with hair-like extensions that protrude into the central pore of the taste bud (Figure SAP.22). Taste buds have a life cycle of ten days to two weeks, so even destroying some by burning your tongue won't have any long-term effect; they just grow right back. Taste molecules bind to receptors on this extension and cause chemical changes within the sensory cell that result in neural impulses being transmitted to the brain via different nerves, depending on where the receptor is located. Taste information is transmitted to the medulla, thalamus, and limbic system, and to the gustatory cortex, which is tucked underneath the overlap between the frontal and temporal lobes (Maffei, Haley, & Fontanini, 2012; Roper, 2013).

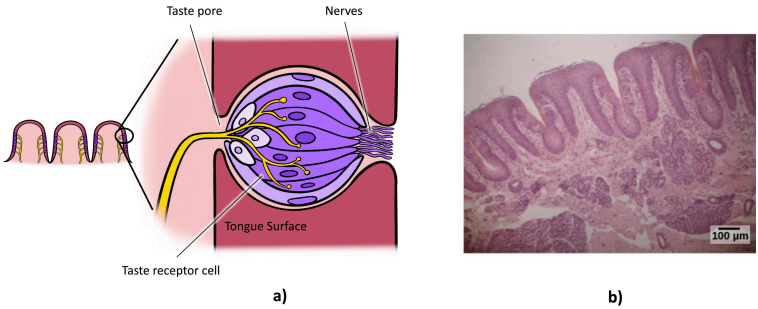


Figure SAP.22 (a) Taste buds are composed of a number of individual taste receptors cells that transmit information to nerves. (b) This micrograph shows a close-up view of the tongue's surface. (credit a: Molly Wells Art; credit b: scale-bar data from Matt Russell)

Smell (Olfaction)

Olfactory receptor cells are located in a mucous membrane at the top of the nose. Small hair-like extensions from these receptors serve as the sites for odour molecules dissolved in the mucus to interact with chemical receptors located on these extensions (Figure SAP.23). Once an odour molecule has bound a given receptor, chemical changes within the cell result in signals being sent to the **olfactory bulb**: a bulb-like structure at the tip of the frontal lobe where the olfactory nerves begin. From the olfactory bulb, information is sent to regions of the limbic system and to the primary olfactory cortex, which is located very near the gustatory cortex (Lodovichi & Belluscio, 2012; Spors et al., 2013).

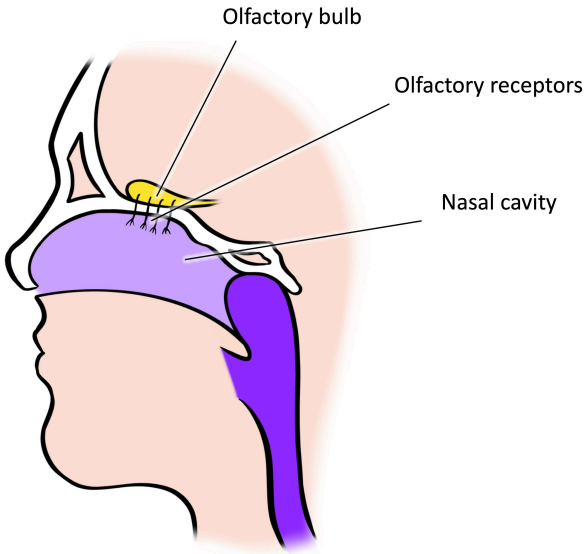


Figure SAP.23 Olfactory receptors are the hair-like parts that extend from the olfactory bulb into the mucous membrane of the nasal cavity. (credit: Molly Wells Art)

There is tremendous variation in the sensitivity of the olfactory systems of different species. We often think of dogs as having far superior olfactory systems than our own, and indeed, dogs can do some remarkable things with their noses. There is some evidence to suggest that dogs can "smell" dangerous drops in blood glucose levels as well as cancerous tumours (Wells, 2010). Dogs' extraordinary olfactory abilities may be due to the increased number of functional genes for olfactory receptors (between 800 and 1200), compared to the

fewer than 400 observed in humans and other primates (Niimura & Nei, 2007).

Many species respond to chemical messages, known as **pheromones**, sent by another individual (Wysocki & Preti, 2004). Pheromonal communication often involves providing information about the reproductive status of a potential mate. So, for example, when a female rat is ready to mate, she secretes pheromonal signals that draw attention from nearby male rats. Pheromonal activation is actually an important component in eliciting sexual behaviour in the male rat (Furlow, 1996, 2012; Purvis & Haynes, 1972; Sachs, 1997). There has also been a good deal of research (and controversy) about pheromones in humans (Comfort, 1971; Russell, 1976; Wolfgang-Kimball, 1992; Weller, 1998).

Touch, Thermoception, and Nociception

A number of receptors are distributed throughout the skin to respond to various touch-related stimuli (Figure SAP.24). These receptors include Meissner's corpuscles, Pacinian corpuscles, Merkel's disks, and Ruffini corpuscles. **Meissner's corpuscles** respond to pressure and lower frequency vibrations, and **Pacinian corpuscles** detect transient pressure and higher frequency vibrations. **Merkel's disks** respond to light pressure, while **Ruffini corpuscles** detect stretch (Abraira & Ginty, 2013).

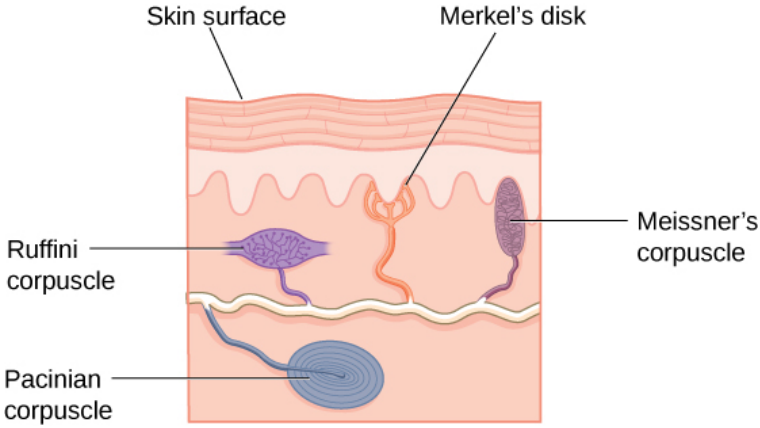


Figure SAP.24 There are many types of sensory receptors located in the skin, each attuned to specific touch-related stimuli.

In addition to the receptors located in the skin, there are also a number of free nerve endings that serve sensory functions. These nerve endings respond to a variety of different types of touch-related stimuli and serve as sensory receptors for both **thermoception** (temperature perception) and **nociception** (a signal indicating potential harm and maybe pain) (Garland, 2012; Petho & Reeh, 2012; Spray, 1986). Sensory information collected from the receptors and free nerve endings travels up the spinal cord and is transmitted to regions of the medulla, thalamus, and ultimately to somatosensory cortex, which is located in the postcentral gyrus of the parietal lobe.

Pain Perception

Pain is an unpleasant experience that involves both physical and psychological components. Feeling pain is quite adaptive because it makes us aware of an injury, and it motivates us to remove ourselves from the cause of that injury. In addition, pain also makes us less likely to suffer additional injury because we will be gentler with our injured body parts.

Generally speaking, pain can be considered to be neuropathic or inflammatory in nature. Pain that signals some type of tissue damage is known as **inflammatory pain**. In some situations, pain results from damage to neurones of either the peripheral or central nervous system. As a result, pain signals that are sent to the brain get exaggerated. This type of pain is known as **neuropathic pain**. Multiple treatment options for pain relief range from relaxation therapy to the use of analgesic medications to deep brain stimulation. The most effective treatment option for a given individual will depend on a number of considerations, including the severity and persistence of the pain and any medical/psychological conditions.

Some individuals are born without the ability to feel pain. This very rare genetic disorder is known as **congenital insensitivity to pain** (or **congenital analgesia**). While those with congenital analgesia can detect differences in temperature and pressure, they cannot experience pain. As a result, they often suffer significant injuries. Young children have serious

mouth and tongue injuries because they have bitten themselves repeatedly. Not surprisingly, individuals suffering from this disorder have much shorter life expectancies due to their injuries and secondary infections of injured sites (U.S. National Library of Medicine, 2013).

Link to Learning

Watch this video about congenital insensitivity to pain to learn more.

The Vestibular Sense, Proprioception, and Kinaesthesia

The **vestibular sense** contributes to our ability to maintain balance and body posture. As Figure SAP.25 shows, the major sensory organs (utricle, saccule, and the three semicircular canals) of this system are located next to the cochlea in the inner ear. The vestibular organs are fluid-filled and have hair cells, similar to the ones found in the auditory system, which respond to movement of the head and gravitational forces. When these hair cells are stimulated, they send signals to the

brain via the vestibular nerve. Although we may not be consciously aware of our vestibular system's sensory information under normal circumstances, its importance is apparent when we experience motion sickness and/or dizziness related to infections of the inner ear (Khan & Chang, 2013).

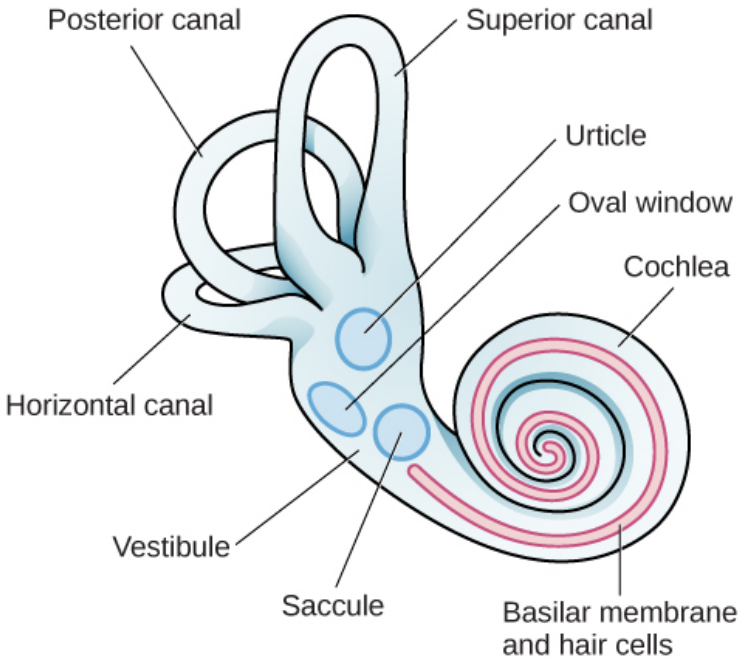


Figure SAP.25 The major sensory organs of the vestibular system are located next to the cochlea in the inner ear. These include the utricle, saccule, and the three semicircular canals (posterior, superior, and horizontal).

In addition to maintaining balance, the vestibular system collects information critical for controlling movement and the

reflexes that move various parts of our bodies to compensate for changes in body position. Therefore, both **proprioception** (perception of body position) and **kinaesthesia** (perception of the body's movement through space) interact with information provided by the vestibular system.

These sensory systems also gather information from receptors that respond to stretch and tension in muscles, joints, skin, and tendons (Lackner & DiZio, 2005; Proske, 2006; Proske & Gandevia, 2012). Proprioceptive and kinaesthetic information travels to the brain via the spinal column. Several cortical regions in addition to the cerebellum receive information from and send information to the sensory organs of the proprioceptive and kinaesthetic systems.

33.

GESTALT PRINCIPLES OF PERCEPTION

Learning Objectives

By the end of this section, you will be able to:

- Define Gestalt principles
- Describe how perceptual set is influenced by an individual's characteristics and mental state

In the early part of the 20th century, Max Wertheimer published a paper demonstrating that individuals perceived motion in rapidly flickering static images—an insight that came to him as he used a child's toy tachistoscope. Wertheimer, and his assistants Wolfgang Köhler and Kurt Koffka, who later

became his partners, believed that perception involved more than simply combining sensory stimuli. This belief led to a new movement within the field of psychology known as **Gestalt psychology**. The word *gestalt* literally means form or pattern, but its use reflects the idea that the whole is different from the sum of its parts. In other words, the brain creates a perception that is more than simply the sum of available sensory inputs, and it does so in predictable ways. Gestalt psychologists translated these predictable ways into principles by which we organize sensory information. As a result, Gestalt psychology has been extremely influential in the area of sensation and perception (Rock & Palmer, 1990).

Table SAP.2 Summary of Gestalt Principles of Form Perception.

Principle	Description	Example
Figure-ground relationship	We structure input so that we always see a figure (image) against a ground (background).	At right, you may see either case, you will o ground.

Table SAP.2 Summary of Gestalt Principles of Form Perception.

Principle	Description	Example
Similarity	Stimuli that are similar to each other tend to be grouped together.	You are more likely to characters at right tha

Table SAP.2 Summary of Gestalt Principles of Form Perception.

Principle	Description	Example
Proximity	We tend to group nearby figures together.	Do you see four or eig suggest that you migh

Table SAP.2 Summary of Gestalt Principles of Form Perception.

Principle	Description	Example
Continuity	We tend to perceive stimuli in smooth, continuous ways rather than in more discontinuous ways.	At right, most people lower left to the uppe the left and then sudd continuity leads us to possible path.

Table SAP.2 Summary of Gestalt Principles of Form Perception.

Principle	Description	Example
Closure	We tend to fill in gaps in an incomplete image to create a complete, whole object.	Closure leads us to se than a set of unrelate

Table credit: USask Psychology Textbook

Link to Learning

Watch this entertaining (and informative) video on perception from Hank Green and Crash Course.

According to Gestalt theorists, **pattern perception**, or our ability to discriminate among different figures and shapes, occurs by following the principles described above. You probably feel fairly certain that your perception accurately matches the real world, but this is not always the case. Our perceptions are based on **perceptual hypotheses**: educated guesses that we make while interpreting sensory information. These hypotheses are informed by a number of factors, including our personalities, experiences, and expectations. We use these hypotheses to generate our perceptual set. For instance, research has demonstrated that those who are given verbal priming produce a biased interpretation of complex ambiguous figures (Goolkasian & Woodbury, 2010).

Everyday Connection

The Depths of Perception: Bias, Prejudice, and Cultural Factors

In this chapter, you have learned that perception is a complex process. Built from sensations, but influenced by our own experiences, biases,

prejudices, and cultures, perceptions can be very different from person to person. Research suggests that implicit racial prejudice and stereotypes affect perception. For instance, several studies have demonstrated that non-Black participants identify weapons faster and are more likely to identify non-weapons as weapons when the image of the weapon is paired with the image of a Black person (Payne, 2001; Payne, Shimizu, & Jacoby, 2005). Furthermore, White individuals' decisions to shoot an armed target in a video game is made more quickly when the target is Black (Correll, Park, Judd, & Wittenbrink, 2002; Correll, Urland, & Ito, 2006). This research is important, considering the number of very high-profile cases in the last few decades in which young POC were killed by people who claimed to believe that the unarmed individuals were armed and/or represented some threat to their personal safety.

34.

KEY TERMS OF SENSATION & PERCEPTION

absolute threshold
: minimum amount of stimulus energy that must be present for the stimulus to be detected 50% of the time

afterimage
: continuation of a visual sensation after removal of the stimulus

amplitude
: height of a wave

basilar membrane
: thin strip of tissue within the cochlea that contains the hair cells which serve as the sensory receptors for the auditory system

binaural cue
: two-eared cue to localize sound

binocular cue
: cue that relies on the use of both eyes

binocular disparity
slightly different view of the world that each eye receives

blind spot
point where we cannot respond to visual information in that portion of the visual field

bottom-up processing
system in which perceptions are built from sensory input

closure
organizing our perceptions into complete objects rather than as a series of parts

cochlea
fluid-filled, snail-shaped structure that contains the sensory receptor cells of the auditory system

cochlear implant
electronic device that consists of a microphone, a speech processor, and an electrode array to directly stimulate the auditory nerve to transmit information to the brain

conductive hearing loss
failure in the vibration of the eardrum and/or movement of the ossicles

cone
specialized photoreceptor that works best in bright light conditions and detects colour

congenital deafness
deafness from birth

congenital insensitivity to pain (congenital analgesia)

genetic disorder that results in the inability to experience pain

cornea

transparent covering over the eye

deafness

partial or complete inability to hear

decibel (dB)

logarithmic unit of sound intensity

depth perception

ability to perceive depth

electromagnetic spectrum

all the electromagnetic radiation that occurs in our environment

figure-ground relationship

segmenting our visual world into figure and ground

fovea

small indentation in the retina that contains cones

frequency

number of waves that pass a given point in a given time period

Gestalt psychology

field of psychology based on the idea that the whole is different from the sum of its parts

good continuation

(also, continuity) we are more likely to perceive continuous, smooth flowing lines rather than jagged,

broken lines

hair cell

auditory receptor cell of the inner ear

hertz (Hz)

cycles per second; measure of frequency

inattentional blindness

failure to notice something that is completely visible because of a lack of attention

incus

middle ear ossicle; also known as the anvil

inflammatory pain

signal that some type of tissue damage has occurred

interaural level difference

sound coming from one side of the body is more intense at the closest ear because of the attenuation of the sound wave as it passes through the head

interaural timing difference

small difference in the time at which a given sound wave arrives at each ear

iris

coloured portion of the eye

just noticeable difference

difference in stimuli required to detect a difference between the stimuli

kinaesthesia

perception of the body's movement through space

lens

curved, transparent structure that provides additional focus for light entering the eye

linear perspective

perceive depth in an image when two parallel lines seem to converge

malleus

middle ear ossicle; also known as the hammer

Meissner's corpuscle

touch receptor that responds to pressure and lower frequency vibrations

Ménière's disease

results in a degeneration of inner ear structures that can lead to hearing loss, tinnitus, vertigo, and an increase in pressure within the inner ear

Merkel's disk

touch receptor that responds to light touch

monaural cue

one-eared cue to localize sound

monocular cue

cue that requires only one eye

neuropathic pain

pain from damage to neurones of either the peripheral or central nervous system

nociception

sensory signal indicating potential harm and maybe pain

olfactory bulb

bulb-like structure at the tip of the frontal lobe, where the olfactory nerves begin

olfactory receptor

sensory cell for the olfactory system

opponent-process theory of colour perception

colour is coded in opponent pairs: black-white, yellow-blue, and red-green

optic chiasm

X-shaped structure that sits just below the brain's ventral surface; represents the merging of the optic nerves from the two eyes and the separation of information from the two sides of the visual field to the opposite side of the brain

optic nerve

carries visual information from the retina to the brain

Pacinian corpuscle

touch receptor that detects transient pressure and higher frequency vibrations

pattern perception

ability to discriminate among different figures and shapes

peak

(also, crest) highest point of a wave

perception

way that sensory information is interpreted and consciously experienced

perceptual hypothesis
educated guess used to interpret sensory information

pheromone
chemical message sent by another individual

photoreceptor
light-detecting cell

pinna
visible part of the ear that protrudes from the head

pitch
perception of a sound's frequency

place theory of pitch perception
different portions of the basilar membrane are sensitive to sounds of different frequencies

principle of closure
organize perceptions into complete objects rather than as a series of parts

proprioception
perception of body position

proximity
things that are close to one another tend to be grouped together

psychophysics
branch of psychology that studies the effects of physical stimuli on sensory perceptions and mental states

pupil small opening in the eye through which light passes

response bias
behavioural tendency to respond "yes"

retina light-sensitive lining of the eye

rod

specialized photoreceptor that works well in low light conditions

Ruffini corpuscle

touch receptor that detects stretch

sensation

what happens when sensory information is detected by a sensory receptor

sensitivity

the true ability of the individual to detect the presence or absence of signals

sensorineural hearing loss

failure to transmit neural signals from the cochlea to the brain

sensory adaptation

not perceiving stimuli that remain relatively constant over prolonged periods of time

signal detection analysis

technique used to determine the ability of the perceiver to separate true signals from background noise

similarity

things that are alike tend to be grouped together

stapes

middle ear ossicle; also known as the stirrup

subliminal stimuli

events that occur below the absolute threshold and of

which we are not conscious

taste bud

grouping of taste receptor cells with hair-like extensions that protrude into the central pore of the taste bud

temporal theory of pitch perception

sound's frequency is coded by the activity level of a sensory neurone

thermoception

temperature perception

timbre

sound's purity

top-down processing

interpretation of sensations is influenced by available knowledge, experiences, and thoughts

transduction

conversion from sensory stimulus energy to action potential

trichromatic theory of colour perception

colour vision is mediated by the activity across the three groups of cones

trough

lowest point of a wave

tympanic membrane

eardrum

umami

taste for monosodium glutamate

vertigo

spinning sensation

vestibular sense

contributes to our ability to maintain balance and body posture

visible spectrum

portion of the electromagnetic spectrum that we can see

wavelength

length of a wave from one peak to the next peak

Weber's law

the just noticeable difference of a stimulus is a constant proportion of the original intensity of the stimulus

35.

SUMMARY OF SENSATION & PERCEPTION

SAP.1 Sensation versus Perception

Sensation occurs when sensory receptors detect sensory stimuli. Perception involves the organization, interpretation, and conscious experience of those sensations. All sensory systems have both absolute and difference thresholds, which refer to the minimum amount of stimulus energy or the minimum amount of difference in stimulus energy required to be detected about 50% of the time, respectively. Sensory adaptation, selective attention, and signal detection theory can help explain what is perceived and what is not. In addition, our perceptions are affected by a number of factors, including beliefs, values, prejudices, culture, and life experiences.

SAP.2 Waves and Wavelengths

Both light and sound can be described in terms of wave forms

with physical characteristics like amplitude, wavelength, and timbre. Wavelength and frequency are inversely related so that longer waves have lower frequencies, and shorter waves have higher frequencies. In the visual system, a light wave's wavelength is generally associated with colour, and its amplitude is associated with brightness. In the auditory system, a sound's frequency is associated with pitch, and its amplitude is associated with loudness.

SAP.3 Vision

Light waves cross the cornea and enter the eye at the pupil. The eye's lens focuses this light so that the image is focused on a region of the retina known as the fovea. The fovea contains cones that possess high levels of visual acuity and operate best in bright light conditions. Rods are located throughout the retina and operate best under dim light conditions. Visual information leaves the eye via the optic nerve. Information from each visual field is sent to the opposite side of the brain at the optic chiasm. Visual information then moves through a number of brain sites before reaching the occipital lobe, where it is processed.

Two theories explain colour perception. The trichromatic theory asserts that three distinct cone groups are tuned to slightly different wavelengths of light, and it is the combination of activity across these cone types that results in our perception of all the colours we see. The opponent-

process theory of colour vision asserts that colour is processed in opponent pairs and accounts for the interesting phenomenon of a negative afterimage. We perceive depth through a combination of monocular and binocular depth cues.

SAP.4 Hearing

Sound waves are funnelled into the auditory canal and cause vibrations of the eardrum; these vibrations move the ossicles. As the ossicles move, the stapes presses against the oval window of the cochlea, which causes fluid inside the cochlea to move. As a result, hair cells embedded in the basilar membrane become enlarged, which sends neural impulses to the brain via the auditory nerve.

Pitch perception and sound localization are important aspects of hearing. Our ability to perceive pitch relies on both the firing rate of the hair cells in the basilar membrane as well as their location within the membrane. In terms of sound localization, both monaural and binaural cues are used to locate where sounds originate in our environment.

Individuals can be born deaf, or they can develop deafness as a result of age, genetic predisposition, and/or environmental causes. Hearing loss that results from a failure of the vibration of the eardrum or the resultant movement of the ossicles is called conductive hearing loss. Hearing loss that involves a

failure of the transmission of auditory nerve impulses to the brain is called sensorineural hearing loss.

SAP.5 The Other Senses

Taste (gustation) and smell (olfaction) are chemical senses that employ receptors on the tongue and in the nose that bind directly with taste and odour molecules in order to transmit information to the brain for processing. Our ability to perceive touch, temperature, and pain is mediated by a number of receptors and free nerve endings that are distributed throughout the skin and various tissues of the body. The vestibular sense helps us maintain a sense of balance through the response of hair cells in the utricle, saccule, and semi-circular canals that respond to changes in head position and gravity. Our proprioceptive and kinaesthetic systems provide information about body position and body movement through receptors that detect stretch and tension in the muscles, joints, tendons, and skin of the body.

SAP.6 Gestalt Principles of Perception

Gestalt theorists have been incredibly influential in the areas of sensation and perception. Gestalt principles such as figure-ground relationship, grouping by proximity or similarity, the law of good continuation, and closure are all used to help explain how we organize sensory information. Our

perceptions are not infallible, and they can be influenced by bias, prejudice, and other factors.

36.

REVIEW QUESTIONS FOR SENSATION & PERCEPTION

Click here for Answer Key

Multiple Choice Questions

1. _____ refers to the minimum amount of stimulus energy required to be detected 50% of the time.

a. absolute threshold
b. difference threshold
c. just noticeable difference
d. transduction

2. Decreased sensitivity to an unchanging stimulus is known as _____.

a. transduction
b. difference threshold
c. sensory adaptation

d. inattentional blindness

3. _____ involves the conversion of sensory stimulus energy into neural impulses.

a. sensory adaptation
b. inattentional blindness
c. difference threshold
d. transduction

4. _____ occurs when sensory information is organized, interpreted, and consciously experienced.

a. sensation
b. perception
c. transduction
d. sensory adaptation

5. Which of the following correctly matches the pattern in our perception of colour as we move from short wavelengths to long wavelengths?

a. red to orange to yellow
b. yellow to orange to red
c. yellow to red to orange
d. orange to yellow to red

6. The visible spectrum includes light that ranges from about _____.

a. 400–700 nm
b. 200–900 nm
c. 20–20000 Hz
d. 10–20 dB

7. The electromagnetic spectrum includes _____.

a. radio waves
b. x-rays
c. infrared light
d. all of the above

8. The audible range for humans is _____.

a. 380–740 Hz
b. 10–20 dB
c. less than 300 dB
d. 20-20,000 Hz

9. The quality of a sound that is affected by frequency, amplitude, and timing of the sound wave is known as _____.

a. pitch
b. tone

c. electromagnetic
d. timbre

10. The _____ is a small indentation of the retina that contains cones.

a. optic chiasm
b. optic nerve
c. fovea
d. iris

11. _____ operate best under bright light conditions.

a. cones
b. rods
c. retinal ganglion cells
d. striate cortex

12. _____ depth cues require the use of both eyes.

a. monocular
b. binocular
c. linear perspective
d. accommodating

13. If you were to stare at a green dot for a relatively long period of time and then shift your gaze to a blank white screen, you would see a _____ negative afterimage.

a. blue
b. yellow
c. black
d. red

14. Hair cells located near the base of the basilar membrane respond best to _____ sounds.

a. low-frequency
b. high-frequency
c. low-amplitude
d. high-amplitude

15. The three ossicles of the middle ear are known as _____.

a. malleus, incus, and stapes
b. hammer, anvil, and stirrup
c. pinna, cochlea, and utricle
d. both a and b

16. Hearing aids might be effective for treating _____.

a. Ménière's disease
b. sensorineural hearing loss
c. conductive hearing loss
d. interaural time differences

17. Cues that require two ears are referred to as _____ cues.

a. monocular
b. monaural
c. binocular
d. binaural

18. Chemical messages often sent between two members of a species to communicate something about reproductive status are called _____.

a. hormones
b. pheromones
c. Merkel's disks
d. Meissner's corpuscles

19. Which taste is associated with monosodium glutamate?

a. sweet
b. bitter
c. umami
d. sour

20. _____ serve as sensory receptors for temperature and pain stimuli.

a. free nerve endings

b. Pacinian corpuscles
c. Ruffini corpuscles
d. Meissner's corpuscles

21. Which of the following is involved in maintaining balance and body posture?

a. auditory nerve
b. nociceptors
c. olfactory bulb
d. vestibular system

22. According to the principle of _____, objects that occur close to one another tend to be grouped together.

a. similarity
b. good continuation
c. proximity
d. closure

23. Our tendency to perceive things as complete objects rather than as a series of parts is known as the principle of _____.

a. closure
b. good continuation
c. proximity
d. similarity

24. According to the law of _____, we are more likely to perceive smoothly flowing lines rather than choppy or jagged lines.

a. closure
b. good continuation
c. proximity
d. similarity

25. The main point of focus in a visual display is known as the _____.

a. closure
b. perceptual set
c. ground
d. figure

Critical Thinking Questions

26. Not everything that is sensed is perceived. Do you think there could ever be a case where something could be perceived without being sensed?

27. Please generate a novel example of how just noticeable difference can change as a function of stimulus intensity.

28. Why do you think other species have such different ranges

of sensitivity for both visual and auditory stimuli compared to humans?

29. Why do you think humans are especially sensitive to sounds with frequencies that fall in the middle portion of the audible range?

30. Compare the two theories of colour perception. Are they completely different?

31. Colour is not a physical property of our environment. What function (if any) do you think colour vision serves?

32. Given what you've read about sound localization, from an evolutionary perspective, how does sound localization facilitate survival?

33. How can temporal and place theories both be used to explain our ability to perceive the pitch of sound waves with frequencies up to 4000 Hz?

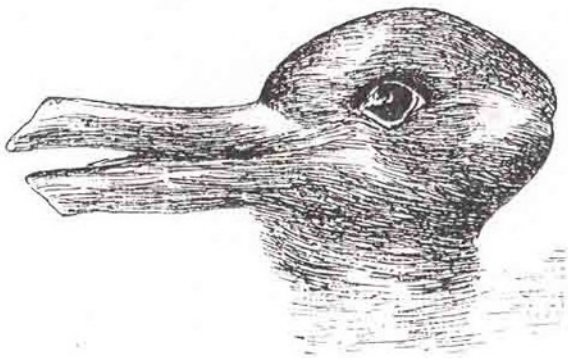
34. Many people experience nausea while traveling in a car, plane, or boat. How might you explain this as a function of sensory interaction?

35. If you heard someone say that they would do anything not to feel the pain associated with significant injury, how would you respond given what you've just read?

36. Do you think women experience pain differently than men? Why do you think this is?

37. The central tenet of Gestalt psychology is that the whole is different from the sum of its parts. What does this mean in the context of perception?

38. Take a look at the following figure. How might you influence whether people see a duck or a rabbit?



Personal Application Questions

39. Think about a time when you failed to notice something around you because your attention was focused elsewhere. If someone pointed it out, were you surprised that you hadn't noticed it right away?

40. If you grew up with a family pet, then you have surely noticed that they often seem to hear things that you don't hear. Now that you've read this section, you probably have

some insight as to why this may be. How would you explain this to a friend who never had the opportunity to take a class like this?

41. Take a look at a few of your photos or personal works of art. Can you find examples of linear perspective as a potential depth cue?

42. If you had to choose to lose either your vision or your hearing, which would you choose and why?

43. As mentioned earlier, a food's flavour represents an interaction of both gustatory and olfactory information. Think about the last time you were seriously congested due to a cold or the flu. What changes did you notice in the flavours of the foods that you ate during this time?

44. Have you ever listened to a song on the radio and sung along only to find out later that you have been singing the wrong lyrics? Once you found the correct lyrics, did your perception of the song change?

37.

ACKNOWLEDGEMENTS & ATTRIBUTIONS

CHAPTER V
STATES OF CONSCIOUSNESS

38.

INTRODUCTION TO STATES OF CONSCIOUSNESS

Chapter Outline

- What Is Consciousness?
- Sleep and Why We Sleep
- Stages of Sleep
- Sleep Problems and Disorders
- Drugs and Altered Consciousness
- Other States of Consciousness

Figure SC.1 Sleep, which we all experience, is a quiet and mysterious pause in our daily lives. Two sleeping children are depicted in this 1895 oil painting titled Zwei schlafende Mädchen auf der Ofenbank, which translates as "two sleeping girls on the stove," by Swiss painter Albert Anker.

Our lives involve regular, dramatic changes in the degree to which we are aware of our surroundings and our internal states. While awake, we feel alert and aware of the many important things going on around us. Our experiences change dramatically while we are in deep sleep and once again when we are dreaming. Some people also experience altered states of consciousness through meditation, hypnosis, or alcohol and other drugs.

This chapter will discuss states of consciousness with a particular emphasis on sleep. The different stages of sleep will be identified, and sleep disorders will be described. The chapter will close with discussions of altered states of

consciousness produced by psychoactive drugs, hypnosis, and meditation.

39.

WHAT IS CONSCIOUSNESS?

Learning Objectives

By the end of this section, you will be able to:

- Understand what is meant by consciousness and attention
- Explain how circadian rhythms are involved in regulating the sleep-wake cycle, and how circadian cycles can be disrupted
- Discuss the concept of sleep debt

Consciousness describes our awareness of internal and external stimuli. Awareness of internal stimuli includes feeling

pain, hunger, thirst, sleepiness, and being aware of our thoughts and emotions. Awareness of external stimuli includes experiences such as seeing the light from the sun, feeling the warmth of a room, and hearing the voice of a friend.

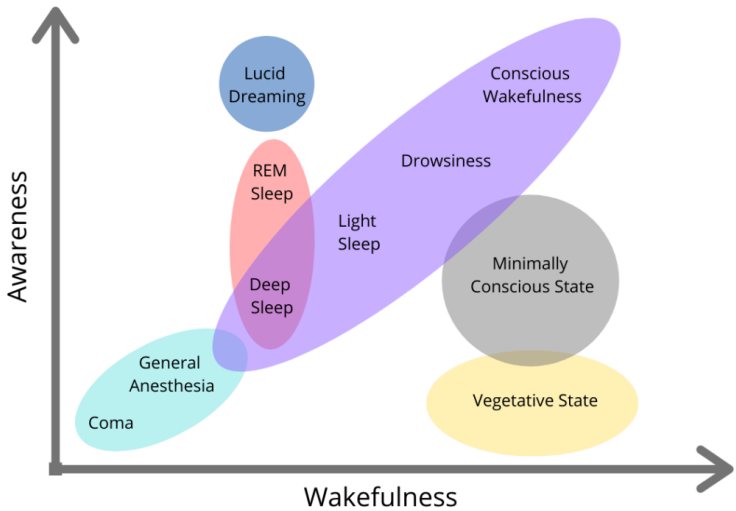


Figure SC.2 Consciousness can be understood as a continuum, with varying levels of wakefulness and awareness.

We experience different states of consciousness and different levels of awareness on a regular basis. We might even describe consciousness as a continuum that ranges from full awareness to a deep sleep. **Sleep** is a state marked by relatively low levels of physical activity and reduced sensory awareness that is distinct from periods of rest that occur during wakefulness. **Wakefulness** is characterized by high levels of

sensory awareness, thought, and behaviour. Beyond being awake or asleep, there are many other states of consciousness people experience. These include daydreaming, intoxication, and unconsciousness due to anesthesia. We might also experience unconscious states of being via drug-induced anesthesia for medical purposes. Often, we are not completely aware of our surroundings, even when we are fully awake. For instance, have you ever daydreamed while driving home from work or school without really thinking about the drive itself? You were capable of engaging in the all of the complex tasks involved with operating a motor vehicle even though you were not aware of doing so. Many of these processes, like much of psychological behaviour, are rooted in our biology. More information on the dimensions of consciousness is available in the video below, and in Figure SC.2.

TRICKY TOPIC: MEASURING CONSCIOUSNESS

One or more interactive elements has been excluded from this version of the text. You can view them online here: https://caul-cbua.pressbooks.pub/intropsychneuro/?p=435#oembed-1

If the video above does not load, click here: https://youtu.be/jnsmMWKsHiY
For a full transcript of this video, click here

Attention

William James wrote extensively about attention in the late 1800s. An often quoted passage (James, 1890-1983) beautifully captures how intuitively obvious the concept of attention is, while it remains very difficult to define in measurable, concrete terms: Everyone knows what attention is. It is the taking possession by the mind, in clear and vivid form, of one out of what seem several simultaneously possible objects or trains of thought. Focalization, concentration of consciousness are of its essence. It implies withdrawal from some things in order to deal effectively with others.

Notice that this description touches on the conscious nature of attention, as well as the notion that what is in consciousness is often controlled voluntarily but can also be determined by events that capture our attention. Implied in this description is the idea that we seem to have a **limited capacity** for information processing, and that we can only attend to or be consciously aware of a small amount of information at any given time.

Many aspects of attention have been studied in the field of psychology. In some respects, we define different types of attention by the nature of the task used to study it. For

example, a crucial issue in World War II was how long an individual could remain highly alert and accurate while watching a radar screen for enemy planes, and this problem led psychologists to study how attention works under such conditions. When watching for a rare event, it is easy to allow concentration to lag. (This a continues to be a challenge today for TSA agents, charged with looking at images of the contents of your carry-on items in search of knives, guns, or shampoo bottles larger than 3 oz.) Attention in the context of this type of search task refers to the level of *sustained attention* or *vigilance* one can maintain. In contrast, **divided attention** tasks allow us to determine how well individuals can attend to many sources of information at once. *Spatial attention* refers specifically to how we focus on one part of our environment and how we move attention to other locations in the environment. These are all examples of different aspects of attention, but an implied element of most of these ideas is the concept of **selective attention**; some information is attended to while other information is intentionally blocked out.

Selective attention is the ability to select certain stimuli in the environment to process, while ignoring distracting information. One way to get an intuitive sense of how attention works is to consider situations in which attention is used. A party provides an excellent example for our purposes. Many people may be milling around, there is a dazzling variety of colours and sounds and smells, the buzz of many

conversations is striking. There are so many conversations going on; how is it possible to select just one and follow it? You don't have to be looking at the person talking; you may be listening with great interest to some gossip while pretending not to hear. However, once you are engaged in conversation with someone, you quickly become aware that you cannot also listen to other conversations at the same time. You also are probably *not* aware of how tight your shoes feel or of the smell of a nearby flower arrangement. On the other hand, if someone behind you mentions your name, you typically notice it immediately and may start attending to that (much more interesting) conversation. This situation highlights an interesting set of observations. We have an amazing ability to select and track one voice, visual object, etc., even when a million things are competing for our attention, but at the same time, we seem to be limited in how much we can attend to at one time, which in turn suggests that attention is crucial in selecting what is important.

This cocktail party scenario is the quintessential example of selective attention, and it is essentially what some early researchers tried to replicate under controlled laboratory conditions as a starting point for understanding the role of attention in perception (e.g., Cherry, 1953; Moray, 1959). In particular, they used **dichotic listening** and **shadowing** tasks to evaluate the selection process. Dichotic listening simply refers to the situation when two messages are presented simultaneously to an individual, with one message in each ear.

In order to control which message the person attends to, the individual is asked to repeat back or "shadow" one of the messages as they hear it. For example, let's say that a story about a camping trip is presented to Finch's left ear, and a story about Wayne Gretzky is presented to their right ear. The typical dichotic listening task would have Finch repeat the story presented to one ear as they hear it. Can Finch do that without being distracted by the information in the other ear?

People can become pretty good at the shadowing task, and they can easily report the content of the message that they attend to. But what happens to the ignored message? Typically, people can tell you if the ignored message was a man's or a woman's voice, or other physical characteristics of the speech, but they cannot tell you what the message was about. In fact, many studies have shown that people in a shadowing task were not aware of a change in the language of the message (e.g., from English to German; Cherry, 1953), and they didn't even notice when the same word was repeated in the unattended ear more than 35 times (Moray, 1959)! Only the basic physical characteristics, such as the pitch of the unattended message, could be reported.

Biological Rhythms

Biological rhythms are internal rhythms of biological activity. The menstrual cycle is an example of a biological rhythm—a recurring, cyclical pattern of bodily changes. One

complete menstrual cycle takes about 28 days—a lunar month—but many biological cycles are much shorter. For example, body temperature fluctuates cyclically over a 24-hour period (Figure SC.3). Alertness is associated with higher body temperatures, and sleepiness with lower body temperatures.

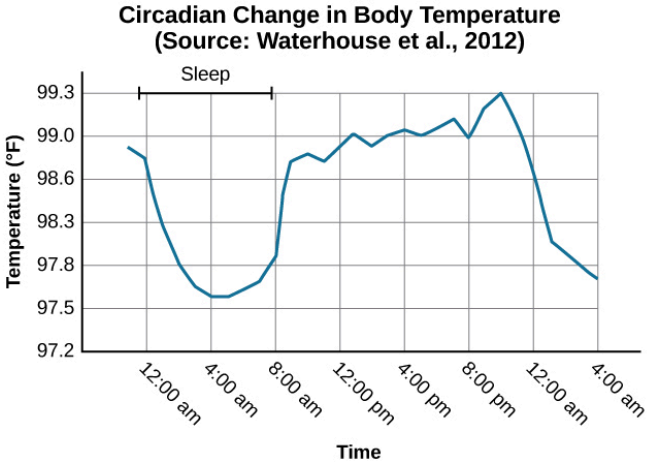


Figure SC.3 This chart illustrates the circadian change in body temperature over 28 hours in a group of eight young men. Body temperature rises throughout the waking day, peaking in the afternoon, and falls during sleep with the lowest point occurring during the very early morning hours.

This pattern of temperature fluctuation, which repeats every day, is one example of a circadian rhythm. A **circadian rhythm** is a biological rhythm that takes place over a period of about 24 hours. Our sleep-wake cycle, which is linked to our environment's natural light-dark cycle, is perhaps the most obvious example of a circadian rhythm, but we also have daily

fluctuations in heart rate, blood pressure, blood sugar, and body temperature. Some circadian rhythms play a role in changes in our state of consciousness.

If we have biological rhythms, then is there some sort of biological clock? In the brain, the hypothalamus, which lies above the pituitary gland, is a main centre of homeostasis. Homeostasis is the tendency to maintain a balance, or optimal level, within a biological system.

The brain's clock mechanism is located in an area of the hypothalamus known as the **suprachiasmatic nucleus (SCN)**. The axons of light-sensitive neurones in the retina provide information to the SCN based on the amount of light present, allowing this internal clock to be synchronized with the outside world (Klein, Moore, & Reppert, 1991; Welsh, Takahashi, & Kay, 2010) (Figure SC.3).

When the retina in the eye is exposed to light, it then stimulates the SCN, which then prompts the pineal gland to decrease the amount of melatonin it secretes. In the evening, decreased stimulation of the SCN leads to an increase in melatonin secretion which increases drowsiness and relaxation.

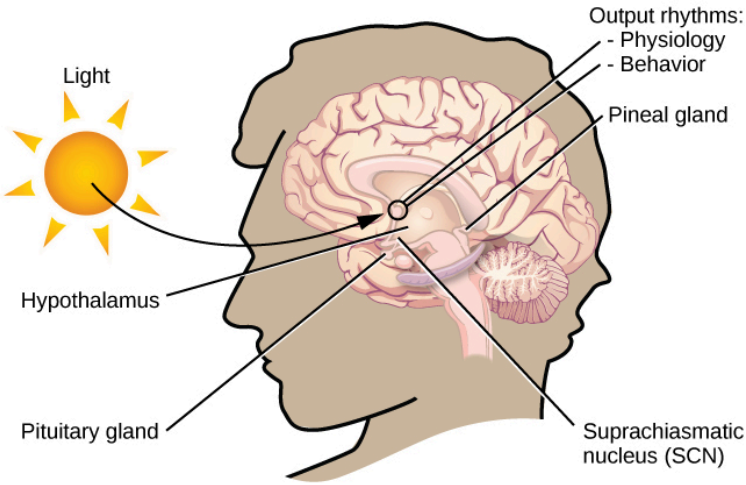


Figure SC.3 The suprachiasmatic nucleus (SCN) serves as the brain's clock mechanism. The clock sets itself with light information received through projections from the retina.

Problems With Circadian Rhythms

Generally, and for most people, our circadian cycles are aligned with the outside world. For example, most people sleep during the night and are awake during the day. One important regulator of sleep-wake cycles is the hormone **melatonin.** The **pineal gland**, an endocrine structure located inside the brain that releases melatonin, is thought to be involved in the regulation of various biological rhythms and of the immune system during sleep (Hardeland, Pandi-Perumal, & Cardinali, 2006). Melatonin release is stimulated by darkness and inhibited by light.

There are individual differences in regard to our sleep-wake

cycle. For instance, some people would say they are morning people, while others would consider themselves to be night owls. These individual differences in circadian patterns of activity are known as a person's chronotype, and research demonstrates that morning larks and night owls differ with regard to sleep regulation (Taillard, Philip, Coste, Sagaspe, & Bioulac, 2003). **Sleep regulation** refers to the brain's control of switching between sleep and wakefulness as well as coordinating this cycle with the outside world.

Link to Learning

Watch this brief video about circadian rhythms and how they affect sleep to learn more.

Disruptions of Normal Sleep

Whether lark, owl, or somewhere in between, there are situations in which a person's circadian clock gets out of synchrony with the external environment. One way that this happens involves traveling across multiple time zones. When we do this, we often experience jet lag. **Jet lag** is a collection of symptoms that results from the mismatch between our

internal circadian cycles and our environment. These symptoms include fatigue, sluggishness, irritability, and **insomnia** (i.e., a consistent difficulty in falling or staying asleep for at least three nights a week over a month's time) (Roth, 2007).

Individuals who do rotating shift work are also likely to experience disruptions in circadian cycles. **Rotating shift work** refers to a work schedule that changes from early to late on a daily or weekly basis. For example, a person may work from 7:00 a.m. to 3:00 p.m. on Monday, 3:00 a.m. to 11:00 a.m. on Tuesday, and 11:00 a.m. to 7:00 p.m. on Wednesday. In such instances, the individual's schedule changes so frequently that it becomes difficult for a normal circadian rhythm to be maintained. This often results in sleeping problems, and it can lead to signs of depression and anxiety. These kinds of schedules are common for individuals working in health care professions and service industries, and they are associated with persistent feelings of exhaustion and agitation that can make someone more prone to making mistakes on the job (Gold et al., 1992; Presser, 1995).

Rotating shift work has pervasive effects on the lives and experiences of individuals engaged in that kind of work, which is clearly illustrated in stories reported in a qualitative study that researched the experiences of middle-aged nurses who worked rotating shifts (West, Boughton & Byrnes, 2009). Several of the nurses interviewed commented that their work

schedules affected their relationships with their family. One of the nurses said,

> *"If you've had a partner who does work regular job 9 to 5 office hours . . . the ability to spend time, good time with them when you're not feeling absolutely exhausted . . . that would be one of the problems that I've encountered."* (West et al., 2009, p. 114)

While disruptions in circadian rhythms can have negative consequences, there are things we can do to help us realign our biological clocks with the external environment. Some of these approaches, such as using a bright light as shown in Figure SC.4, have been shown to alleviate some of the problems experienced by individuals suffering from jet lag or from the consequences of rotating shift work. Because the biological clock is driven by light, exposure to bright light during working shifts and dark exposure when not working can help combat insomnia and symptoms of anxiety and depression (Huang, Tsai, Chen, & Hsu, 2013).

Figure SC.4 Devices like this are designed to provide exposure to bright light to help people maintain a regular circadian cycle. They can be helpful for people working night shifts or for people affected by seasonal variations in light.

Link to Learning

Watch this video about overcoming jet lag to learn some tips.

Insufficient Sleep

When people have difficulty getting sleep due to their work or the demands of day-to-day life, they accumulate a **sleep debt**. A person with a sleep debt does not get sufficient sleep on a chronic basis. The consequences of sleep debt include decreased levels of alertness and mental efficiency. Interestingly, since the advent of electric light, the amount of sleep that people get has declined. While we certainly welcome the convenience of having the darkness lit up, we also suffer the consequences of reduced amounts of sleep because we are more active during the nighttime hours than our ancestors were. As a result, many of us sleep less than 7–8 hours a night and accrue a sleep debt. While there is tremendous variation in any given individual's sleep needs, the National Sleep Foundation (n.d.) cites research to estimate that newborns require the most sleep (between 12 and 18 hours a night) and that this amount declines to just 7–9 hours by the time we are adults.

If you lie down to take a nap and fall asleep very easily, chances are you may have sleep debt. Given that college students are notorious for suffering from significant sleep debt (Hicks, Fernandez, & Pelligrini, 2001; Hicks, Johnson, & Pelligrini, 1992; Miller, Shattuck, & Matsangas, 2010), chances are you and your classmates deal with sleep debt-related issues on a regular basis. In 2015, the National Sleep Foundation updated their sleep duration hours, to better

accommodate individual differences. Table SC.1 shows the new recommendations, which describe sleep durations that are “recommended”, “may be appropriate”, and “not recommended”.

Table SC.1 Sleep Needs at Different Ages

Age	Recommended	May be appropriate	Not recommended
0–3 months	14–17 hours	11–13 hours 18–19 hours	Fewer than 11 hours More than 19 hours
4–11 months	12–15 hours	10–11 hours 16–18 hours	Fewer than 10 hours More than 18 hours
1–2 years	11–14 hours	9–10 hours 15–16 hours	Fewer than 9 hours More than 16 hours
3–5 years	10–13 hours	8–9 hours 14 hours	Fewer than 8 hours More than 14 hours
6–13 years	9–11 hours	7–8 hours 12 hours	Fewer than 7 hours More than 12 hours
14–17 years	8–10 hours	7 hours 11 hours	Fewer than 7 hours More than 11 hours
18–25 years	7–9 hours	6 hours 10–11 hours	Fewer than 6 hours More than 11 hours

Table SC.1 Sleep Needs at Different Ages

Age	Recommended	May be appropriate	Not recommended
26–64 years	7–9 hours	6 hours 10 hours	Fewer than 6 hours More than 10 hours
≥65 years	7–8 hours	5–6 hours 9 hours	Fewer than 5 hours More than 9 hours

Sleep debt and sleep deprivation have significant negative psychological and physiological consequences Figure SC.5. As mentioned earlier, lack of sleep can result in decreased mental alertness and cognitive function. In addition, sleep deprivation often results in depression-like symptoms. These effects can occur as a function of accumulated sleep debt or in response to more acute periods of sleep deprivation. It may surprise you to know that sleep deprivation is associated with obesity, increased blood pressure, increased levels of stress hormones, and reduced immune functioning (Banks & Dinges, 2007). A sleep deprived individual generally will fall asleep more quickly than if she were not sleep deprived. Some sleep-deprived individuals have difficulty staying awake when they stop moving (example sitting and watching television or driving a car). That is why individuals suffering from sleep deprivation can also put themselves and others at risk when they put themselves behind the wheel of a car or work with

dangerous machinery. Some research suggests that sleep deprivation affects cognitive and motor function as much as, if not more than, alcohol intoxication (Williamson & Feyer, 2000). Research shows that the most severe effects of sleep deprivation occur when a person stays awake for more than 24 hours (Killgore & Weber, 2014; Killgore et al., 2007), or following repeated nights with fewer than four hours in bed (Wickens, Hutchins, Lauk, Seebook, 2015). For example, irritability, distractibility, and impairments in cognitive and moral judgment can occur with fewer than four hours of sleep. If someone stays awake for 48 consecutive hours, they could start to hallucinate.

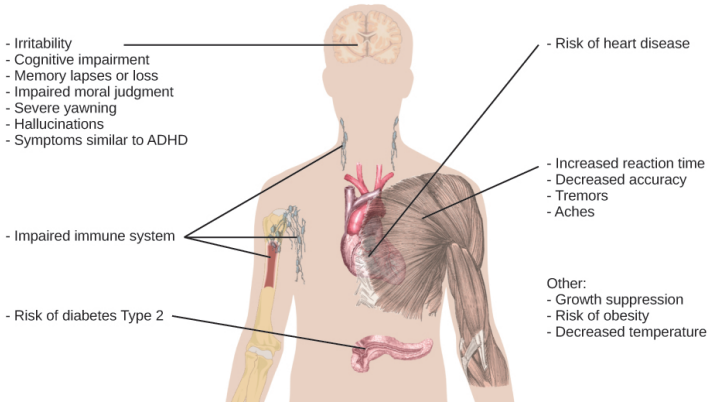


Figure SC.5 This figure illustrates some of the negative consequences of sleep deprivation. While cognitive deficits may be the most obvious, many body systems are negatively impacted by lack of sleep. (credit: modification of work by Mikael Häggström)

Link to Learning

Check out this article designed to help you evaluate potential poor sleeping habits.

The amount of sleep we get varies across the lifespan. When we are very young, we spend up to 16 hours a day sleeping. As we grow older, we sleep less. In fact, a **meta-analysis,** which is a study that combines the results of many related studies, conducted within the last decade indicates that by the time we are 65 years old, we average fewer than 7 hours of sleep per day (Ohayon, Carskadon, Guilleminault, & Vitiello, 2004).

40.

SLEEP AND WHY WE SLEEP

Learning Objectives

By the end of this section, you will be able to:

- Describe areas of the brain involved in sleep
- Understand hormone secretions associated with sleep
- Describe several theories aimed at explaining the function of sleep

We spend approximately one-third of our lives sleeping. Given the average life expectancy for Canadian citizens is about 82 years of age (Statistics Canada, 2018), we can expect to spend

approximately 25+ years of our lives sleeping. Some animals never sleep (e.g., some fish and amphibian species); other animals sleep very little without apparent negative consequences (e.g., giraffes); yet some animals (e.g., rats) die after two weeks of sleep deprivation (Siegel, 2008). Why do we devote so much time to sleeping? Is it absolutely essential that we sleep? This section will consider these questions and explore various explanations for why we sleep.

What is Sleep?

You have read that sleep is distinguished by low levels of physical activity and reduced sensory awareness. As discussed by Siegel (2008), a definition of sleep must also include mention of the interplay of the circadian and homeostatic mechanisms that regulate sleep. Homeostatic regulation of sleep is evidenced by sleep rebound following sleep deprivation. **Sleep rebound** refers to the fact that a sleep-deprived individual will fall asleep more quickly during subsequent opportunities for sleep. Sleep is characterized by certain patterns of activity of the brain that can be visualized using electroencephalography (EEG), and different phases of sleep can be differentiated using EEG as well.

Sleep-wake cycles seem to be controlled by multiple brain areas acting in conjunction with one another. Some of these areas include the thalamus, the hypothalamus, and the pons. As already mentioned, the hypothalamus contains the

SCN—the biological clock of the body—in addition to other nuclei that, in conjunction with the thalamus, regulate slow-wave sleep. The pons is important for regulating rapid eye movement (REM) sleep (National Institutes of Health, n.d.).

Sleep is also associated with the secretion and regulation of a number of hormones from several endocrine glands including: melatonin, follicle stimulating hormone (FSH), luteinizing hormone (LH), and growth hormone (National Institutes of Health, n.d.). You have read that the pineal gland releases melatonin during sleep (Figure SC.6). Melatonin is thought to be involved in the regulation of various biological rhythms and the immune system (Hardeland et al., 2006). During sleep, the pituitary gland secretes both FSH and LH which are important in regulating the reproductive system (Christensen et al., 2012; Sofikitis et al., 2008). The pituitary gland also secretes growth hormone, during sleep, which plays a role in physical growth and maturation as well as other metabolic processes (Bartke, Sun, & Longo, 2013).

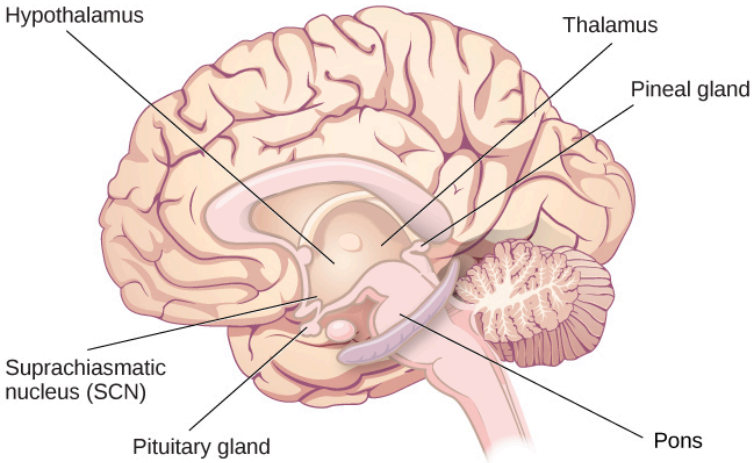


Figure SC.6 The pineal and pituitary glands secrete a number of hormones during sleep.

Why Do We Sleep?

Given the central role that sleep plays in our lives and the number of adverse consequences that have been associated with sleep deprivation, one would think that we would have a clear understanding of why it is that we sleep. Unfortunately, this is not the case; however, several hypotheses have been proposed to explain the function of sleep.

Adaptive Function of Sleep

One popular hypothesis of sleep incorporates the perspective

of evolutionary psychology. **Evolutionary psychology** is a discipline that studies how universal patterns of behaviour and cognitive processes have evolved over time as a result of natural selection. Variations and adaptations in cognition and behaviour make individuals more or less successful in reproducing and passing their genes to their offspring. One hypothesis from this perspective might argue that sleep is essential to restore resources that are expended during the day. Just as bears hibernate in the winter when resources are scarce, perhaps people sleep at night to reduce their energy expenditures. While this is an intuitive explanation of sleep, there is little research that supports this explanation. In fact, it has been suggested that there is no reason to think that energetic demands could not be addressed with periods of rest and inactivity (Frank, 2006; Rial et al., 2007), and some research has actually found a negative correlation between energetic demands and the amount of time spent sleeping (Capellini, Barton, McNamara, Preston, & Nunn, 2008).

Another evolutionary hypothesis of sleep holds that our sleep patterns evolved as an adaptive response to predatory risks, which increase in darkness. Thus we sleep in safe areas to reduce the chance of harm. Again, this is an intuitive and appealing explanation for why we sleep. Perhaps our ancestors spent extended periods of time asleep to reduce attention to themselves from potential predators. Comparative research indicates, however, that the relationship that exists between predatory risk and sleep is very complex and equivocal. Some

research suggests that species that face higher predatory risks sleep fewer hours than other species (Capellini et al., 2008), while other researchers suggest there is no relationship between the amount of time a given species spends in deep sleep and its predation risk (Lesku, Roth, Amlaner, & Lima, 2006).

It is quite possible that sleep serves no single universally adaptive function, and different species have evolved different patterns of sleep in response to their unique evolutionary pressures. While we have discussed the negative outcomes associated with sleep deprivation, it should be pointed out that there are many benefits that are associated with adequate amounts of sleep. A few such benefits listed by the National Sleep Foundation (n.d.) include maintaining healthy weight, lowering stress levels, improving mood, and increasing motor coordination, as well as a number of benefits related to cognition and memory formation.

Cognitive Function of Sleep

Another theory regarding why we sleep involves sleep's importance for cognitive function and memory formation (Rattenborg, Lesku, Martinez-Gonzalez, & Lima, 2007). Indeed, we know sleep deprivation results in disruptions in cognition and memory deficits (Brown, 2012), leading to impairments in our abilities to maintain attention, make decisions, and recall long-term memories. Moreover, these impairments become more severe as the amount of sleep

deprivation increases (Alhola & Polo-Kantola, 2007). Furthermore, slow-wave sleep after learning a new task can improve resultant performance on that task (Huber, Ghilardi, Massimini, & Tononi, 2004) and seems essential for effective memory formation (Stickgold, 2005). Understanding the impact of sleep on cognitive function should help you understand that cramming all night for a test may be not effective and can even prove counterproductive.

Link to Learning

Watch this brief video that outlines 6 scientifically backed techniques for better sleep.

Getting the optimal amount of sleep has also been associated with other cognitive benefits. Research indicates that included among these possible benefits are increased capacities for creative thinking (Cai, Mednick, Harrison, Kanady, & Mednick, 2009; Wagner, Gais, Haider, Verleger, & Born, 2004), language learning (Fenn, Nusbaum, & Margoliash, 2003; Gómez, Bootzin, & Nadel, 2006), and inferential judgments (Ellenbogen, Hu, Payne, Titone, & Walker, 2007).

It is possible that even the processing of emotional information is influenced by certain aspects of sleep (Walker, 2009).

Link to Learning

Watch this video about the relationship between sleep and memory to learn more.

41.

STAGES OF SLEEP

Learning Objectives

By the end of this section, you will be able to:

- Differentiate between REM and non-REM sleep
- Describe the differences between the three stages of non-REM sleep
- Understand the role that REM and non-REM sleep play in learning and memory

Sleep is not a uniform state of being. Instead, sleep is composed of several different stages that can be differentiated from one another by the patterns of brain wave activity that occur during each stage. These changes in brain wave activity

can be visualized using EEG and are distinguished from one another by both the frequency and amplitude of brain waves (Figure SC.7). Sleep can be divided into two different general phases: REM sleep and non-REM (NREM) sleep. **Rapid eye movement (REM)** sleep is characterized by darting movements of the eyes under closed eyelids. Brain waves during REM sleep appear very similar to brain waves during wakefulness. In contrast, **non-REM (NREM)** sleep is subdivided into three stages distinguished from each other and from wakefulness by characteristic patterns of brain waves. The first three stages of sleep are NREM sleep, while the fourth and final stage of sleep is REM sleep. In this section, we will discuss each of these stages of sleep and their associated patterns of brain wave activity.

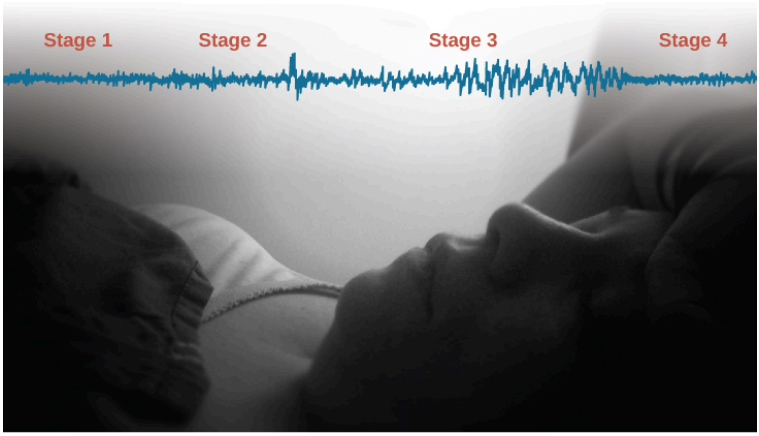


Figure SC.7 Brainwave activity changes dramatically across the different stages of sleep. (credit "sleeping": modification of work by Ryan Vaarsi)

NREM Stages of Sleep

The first stage of NREM sleep is known as stage 1 sleep. **Stage 1 sleep** is a transitional phase that occurs between wakefulness and sleep, the period during which we drift off to sleep. During this time, there is a slowdown in both the rates of respiration and heartbeat. In addition, stage 1 sleep involves a marked decrease in both overall muscle tension and core body temperature.

In terms of brain wave activity, stage 1 sleep is associated with both alpha and theta waves. The early portion of stage 1 sleep produces **alpha waves,** which are relatively low frequency (8–13Hz), high amplitude patterns of electrical activity (waves) that become synchronized (Figure SC.8). This pattern of brain wave activity resembles that of someone who is very relaxed, yet awake. As an individual continues through stage 1 sleep, there is an increase in theta wave activity. **Theta waves** are even lower frequency (4–7 Hz), higher amplitude brain waves than alpha waves. It is relatively easy to wake someone from stage 1 sleep; in fact, people often report that they have not been asleep if they are awoken during stage 1 sleep.

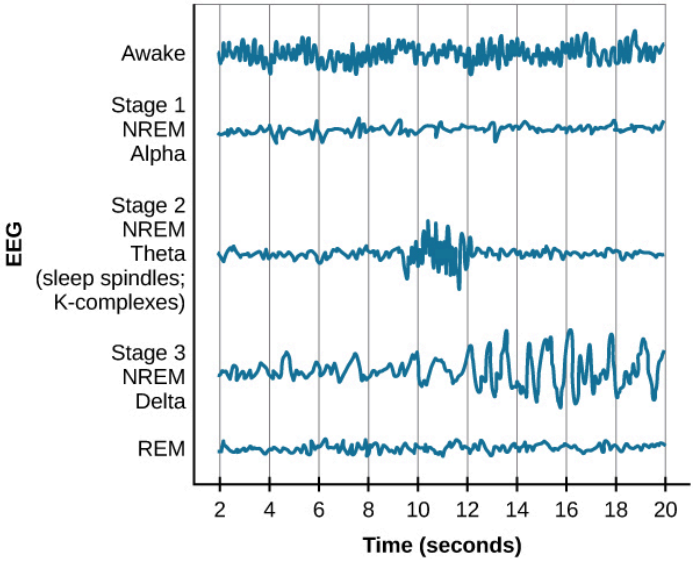


Figure SC.8 Brainwave activity changes dramatically across the different stages of sleep.

As we move into **stage 2 sleep**, the body goes into a state of deep relaxation. Theta waves still dominate the activity of the brain, but they are interrupted by brief bursts of activity known as sleep spindles (Figure SC.9). **A sleep spindle** is a rapid burst of higher frequency brain waves that may be important for learning and memory (Fogel & Smith, 2011; Poe, Walsh, & Bjorness, 2010). In addition, the appearance of K-complexes is often associated with stage 2 sleep. A **K-complex** is a very high amplitude pattern of brain activity that may in some cases occur in response to environmental stimuli. Thus, K-complexes might serve as a bridge to higher levels of

arousal in response to what is going on in our environments (Halász, 1993; Steriade & Amzica, 1998).

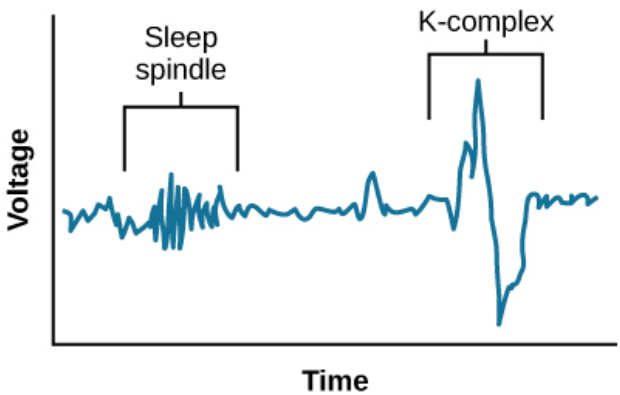


Figure SC.9 Stage 2 sleep is characterized by the appearance of both sleep spindles and K-complexes.

Stage 3 is often referred to as deep sleep or slow-wave sleep because this stage is characterized by low frequency (less than 3 Hz), high amplitude **delta waves** (Figure SC.10). During this time, an individual's heart rate and respiration slow dramatically. It is much more difficult to awaken someone from sleep during stage 3 than during earlier stages. Interestingly, individuals who have increased levels of alpha brain wave activity (more often associated with wakefulness and transition into stage 1 sleep) during stage 3 often report that they do not feel refreshed upon waking, regardless of how long they slept (Stone, Taylor, McCrae, Kalsekar, & Lichstein, 2008). It is worth noting that sometimes you may see slow-

wave sleep divided into two stages, rather than just one. Previously, researchers distinguished between these two stages as being characterized by increased delta waves. However, it is now accepted as a single stage, Stage 3, known as slow-wave sleep.

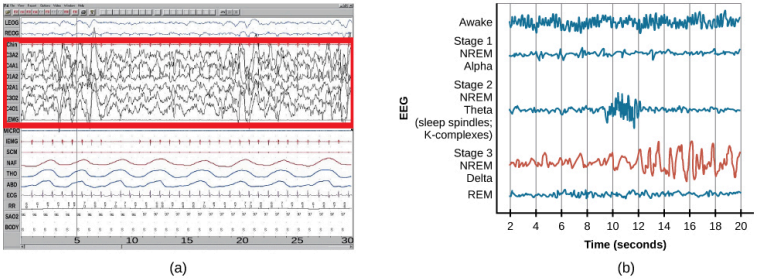


Figure SC.10 (a) Delta waves, which are low frequency and high amplitude, characterize (b) slow-wave stage 3 sleep.

REM Sleep

As mentioned earlier, REM sleep is marked by rapid movements of the eyes. The brain waves associated with this stage of sleep are very similar to those observed when a person is awake, as shown in Figure SC.11, and this is the period of sleep in which dreaming occurs. It is also associated with paralysis of muscle systems in the body with the exception of those that make circulation and respiration possible. Therefore, no movement of voluntary muscles occurs during REM sleep in a normal individual; REM sleep is often referred

to as paradoxical sleep because of this combination of high brain activity and lack of muscle tone. Like NREM sleep, REM has been implicated in various aspects of learning and memory (Wagner, Gais, & Born, 2001; Siegel, 2001).

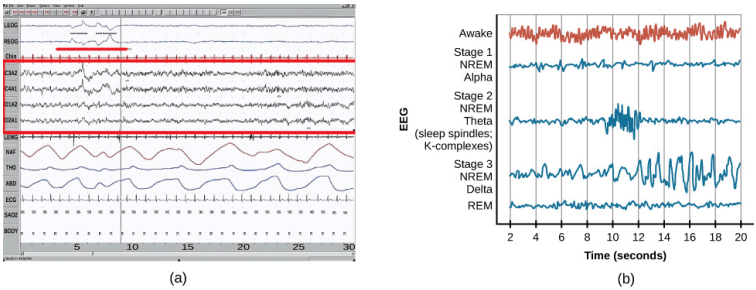


Figure SC.11 (a) A period of rapid eye movement is marked by the short red line segment. The brain waves associated with REM sleep, outlined in the red box in (a), look very similar to those seen (b) during wakefulness.

If people are deprived of REM sleep and then allowed to sleep without disturbance, they will spend more time in REM sleep in what would appear to be an effort to recoup the lost time in REM. This is known as the REM rebound, and it suggests that REM sleep is also homeostatically regulated. Aside from the role that REM sleep may play in processes related to learning and memory, REM sleep may also be involved in emotional processing and regulation. In such instances, REM rebound may actually represent an adaptive response to stress in nondepressed individuals by suppressing the emotional salience of aversive events that occurred in wakefulness (Suchecki, Tiba, & Machado, 2012). Sleep deprivation in

general is associated with a number of negative consequences (Brown, 2012). The hypnogram below (Figure SC.12) shows a person's passage through the stages of sleep.

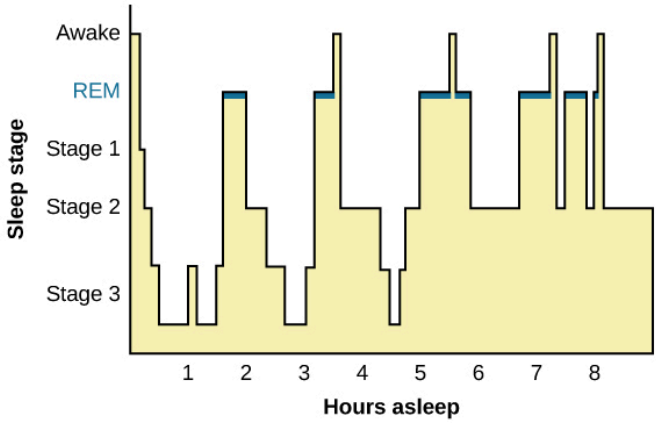


Figure SC.12 A hypnogram is a diagram of the stages of sleep as they occur during a period of sleep. This hypnogram illustrates how an individual moves through the various stages of sleep.

TRICKY TOPIC: RHYTHMIC NATURE OF SLEEP

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cbua.pressbooks.pub/intropsychneuro/?p=437#oembed-1

NOTE: In the image shown first at 4:32, slow-wave sleep is depicted as two separate stages (Stage 3 and 4), these two stages are now combined and referred to as Stage 3 only in this text.

If the video above does not load, click here: https://youtu.be/Oy3mKhQIeDk

For a full transcript of this video, click here

Dreams

Dreams and their associated meanings vary across different cultures and periods of time. By the late 19th century, German psychiatrist Sigmund Freud had become convinced that dreams represented an opportunity to gain access to the unconscious. By analyzing dreams, Freud thought people could increase self-awareness and gain valuable insight to help them deal with the problems they faced in their lives. Freud made distinctions between the manifest content and the latent content of dreams. **Manifest content** is the actual content, or storyline, of a dream. **Latent conten**t, on the other hand, refers to the hidden meaning of a dream. For instance, if a woman dreams about being chased by a snake, Freud might

have argued that this represents the woman's fear of sexual intimacy, with the snake serving as a symbol of a man's penis.

Freud was not the only theorist to focus on the content of dreams. The 20th century Swiss psychiatrist Carl Jung believed that dreams allowed us to tap into the collective unconscious. The **collective unconscious**, as described by Jung, is a theoretical repository of information he believed to be shared by everyone. According to Jung, certain symbols in dreams reflected universal archetypes with meanings that are similar for all people regardless of culture or location.

The sleep and dreaming researcher Rosalind Cartwright, however, believes that dreams simply reflect life events that are important to the dreamer. Unlike Freud and Jung, Cartwright's ideas about dreaming have found empirical support. For example, she and her colleagues published a study in which women going through divorce were asked several times over a five month period to report the degree to which their former spouses were on their minds. These same women were awakened during REM sleep in order to provide a detailed account of their dream content. There was a significant positive correlation between the degree to which women thought about their former spouses during waking hours and the number of times their former spouses appeared as characters in their dreams (Cartwright, Agargun, Kirkby, & Friedman, 2006). Recent research (Horikawa, Tamaki, Miyawaki, & Kamitani, 2013) has uncovered new techniques by which researchers may effectively detect and classify the

visual images that occur during dreaming by using fMRI for neural measurement of brain activity patterns, opening the way for additional research in this area.

Alan Hobson, a neuroscientist, is credited for developing activation-synthesis theory of dreaming. Early versions of this theory proposed that dreams were not the meaning-filled representations of angst proposed by Freud and others, but were rather the result of our brain attempting to make sense of ("synthesize") the neural activity ("activation") that was happening during REM sleep. Recent adaptations (e.g., Hobson, 2002) continue to update the theory based on accumulating evidence. For example, Hobson (2009) suggests that dreaming may represent a state of protoconsciousness. In other words, dreaming involves constructing a virtual reality in our heads that we might use to help us during wakefulness. Among a variety of neurobiological evidence, John Hobson cites research on lucid dreams as an opportunity to better understand dreaming in general. Lucid dreams are dreams in which certain aspects of wakefulness are maintained during a dream state. In a lucid dream, a person becomes aware of the fact that they are dreaming, and as such, they can control the dream's content (LaBerge, 1990).

42.

SLEEP PROBLEMS AND DISORDERS

Learning Objectives

By the end of this section, you will be able to:

- Describe the symptoms and treatments of insomnia
- Recognize the symptoms of several parasomnias
- Describe the symptoms and treatments for sleep apnea
- Describe the symptoms and treatments for narcolepsy

Many people experience disturbances in their sleep at some point in their lives. Depending on the population and sleep disorder being studied, between 30% and 50% of the population suffers from a sleep disorder at some point in their lives (Bixler, Kales, Soldatos, Kaels, & Healey, 1979; Hossain & Shapiro, 2002; Ohayon, 1997, 2002; Ohayon & Roth, 2002). This section will describe several sleep disorders as well as some of their treatment options.

Insomnia

Insomnia, a consistent difficulty in falling or staying asleep, is the most common of the sleep disorders. Individuals with insomnia often experience long delays between the times that they go to bed and actually fall asleep. In addition, these individuals may wake up several times during the night only to find that they have difficulty getting back to sleep. As mentioned earlier, one of the criteria for insomnia involves experiencing these symptoms for at least three nights a week for at least one month's time (Roth, 2007).

It is not uncommon for people suffering from insomnia to experience increased levels of anxiety about their inability to fall asleep. This becomes a self-perpetuating cycle because increased anxiety leads to increased arousal, and higher levels of arousal make the prospect of falling asleep even more unlikely. Chronic insomnia is almost always associated with feeling overtired and may be associated with symptoms of depression.

There may be many factors that contribute to insomnia, including age, drug use, exercise, mental status, and bedtime routines. Not surprisingly, insomnia treatment may take one of several different approaches. People who suffer from insomnia might limit their use of stimulant drugs (such as caffeine) or increase their amount of physical exercise during the day. Some people might turn to over-the-counter (OTC) or prescribed sleep medications to help them sleep, but this should be done sparingly because many sleep medications result in dependence and alter the nature of the sleep cycle, and they can increase insomnia over time. Those who continue to have insomnia, particularly if it affects their quality of life, should seek professional treatment.

Some forms of psychotherapy, such as cognitive-behavioural therapy, can help sufferers of insomnia. **Cognitive-behavioural therapy** is a type of psychotherapy that focuses on cognitive processes and problem behaviours. The treatment of insomnia likely would include stress management techniques and changes in problematic behaviours that could contribute to insomnia (e.g., spending more waking time in bed). Cognitive-behavioural therapy has been demonstrated to be quite effective in treating insomnia (Savard, Simard, Ivers, & Morin, 2005; Williams, Roth, Vatthauer, & McCrae, 2013).

Parasomnias

A **parasomnia** is one of a group of sleep disorders in which unwanted, disruptive motor activity and/or experiences during sleep play a role. Parasomnias can occur in either REM or NREM phases of sleep. Sleepwalking, restless leg syndrome, and night terrors are all examples of parasomnias (Mahowald & Schenck, 2000).

Sleepwalking

In **sleepwalking**, or somnambulism, the sleeper engages in relatively complex behaviours ranging from wandering about to driving an automobile. During periods of sleepwalking, sleepers often have their eyes open, but they are not responsive to attempts to communicate with them. Sleepwalking most often occurs during slow-wave sleep, but it can occur at any time during a sleep period in some affected individuals (Mahowald & Schenck, 2000).

Historically, somnambulism has been treated with a variety of pharmacotherapies ranging from benzodiazepines to antidepressants. However, the success rate of such treatments is questionable. Guilleminault et al. (2005) found that sleepwalking was not alleviated with the use of benzodiazepines. However, all of their somnambulistic patients who also suffered from sleep-related breathing problems showed a marked decrease in sleepwalking when their breathing problems were effectively treated.

REM Sleep Behaviour Disorder (RBD)

REM sleep behaviour disorder (RBD) occurs when the muscle paralysis associated with the REM sleep phase does not occur. Individuals who suffer from RBD have high levels of physical activity during REM sleep, especially during disturbing dreams. These behaviours vary widely, but they can include kicking, punching, scratching, yelling, and behaving like an animal that has been frightened or attacked. People who suffer from this disorder can injure themselves or their sleeping partners when engaging in these behaviours. Furthermore, these types of behaviours ultimately disrupt sleep, although affected individuals have no memories that these behaviours have occurred (Arnulf, 2012).

This disorder is associated with a number of neurodegenerative diseases such as Parkinson's disease. In fact, this relationship is so robust that some view the presence of RBD as a potential aid in the diagnosis and treatment of a number of neurodegenerative diseases (Ferini-Strambi, 2011). Clonazepam, an anti-anxiety medication with sedative properties, is most often used to treat RBD. It is administered alone or in conjunction with doses of melatonin (the hormone secreted by the pineal gland). As part of treatment, the sleeping environment is often modified to make it a safer place for those suffering from RBD (Zangini, Calandra-Buonaura, Grimaldi, & Cortelli, 2011).

Other Parasomnias

A person with **restless leg syndrome** has uncomfortable

sensations in the legs during periods of inactivity or when trying to fall asleep. This discomfort is relieved by deliberately moving the legs, which, not surprisingly, contributes to difficulty in falling or staying asleep. Restless leg syndrome is quite common and has been associated with a number of other medical diagnoses, such as chronic kidney disease and diabetes (Mahowald & Schenck, 2000). There are a variety of drugs that treat restless leg syndrome: benzodiazepines, opiates, and anticonvulsants (Restless Legs Syndrome Foundation, n.d.).

Night terrors result in a sense of panic in the sufferer and are often accompanied by screams and attempts to escape from the immediate environment (Mahowald & Schenck, 2000). Although individuals suffering from night terrors appear to be awake, they generally have no memories of the events that occurred, and attempts to console them are ineffective. Typically, individuals suffering from night terrors will fall back asleep again within a short time. Night terrors apparently occur during the NREM phase of sleep (Provini, Tinuper, Bisulli, & Lagaresi, 2011). Generally, treatment for night terrors is unnecessary unless there is some underlying medical or psychological condition that is contributing to the night terrors (Mayo Clinic, n.d.).

Sleep Apnea

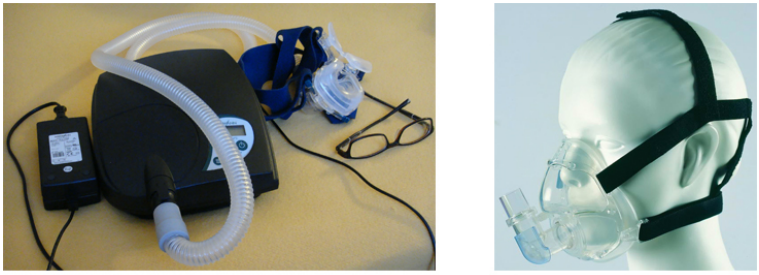
Sleep apnea is defined by episodes during which a sleeper's breathing stops. These episodes can last 10–20 seconds or

longer and often are associated with brief periods of arousal. While individuals suffering from sleep apnea may not be aware of these repeated disruptions in sleep, they do experience increased levels of fatigue. Many individuals diagnosed with sleep apnea first seek treatment because their sleeping partners indicate that they snore loudly and/or stop breathing for extended periods of time while sleeping (Henry & Rosenthal, 2013). Sleep apnea is much more common in overweight people and is often associated with loud snoring. Surprisingly, sleep apnea may exacerbate cardiovascular disease (Sánchez-de-la-Torre, Campos-Rodriguez, & Barbé, 2012). While sleep apnea is less common in thin people, anyone, regardless of their weight, who snores loudly or gasps for air while sleeping, should be checked for sleep apnea.

While people are often unaware of their sleep apnea, they are keenly aware of some of the adverse consequences of insufficient sleep. Consider a patient who believed that as a result of his sleep apnea he "had three car accidents in six weeks. They were ALL my fault. Two of them I didn't even know I was involved in until afterwards" (Henry & Rosenthal, 2013, p. 52). It is not uncommon for people suffering from undiagnosed or untreated sleep apnea to fear that their careers will be affected by the lack of sleep, illustrated by this statement from another patient, "I'm in a job where there's a premium on being mentally alert. I was really sleepy… and having trouble concentrating.… It was getting to the point where it was kind of scary" (Henry & Rosenthal, 2013, p. 52).

There are two types of sleep apnea: obstructive sleep apnea and central sleep apnea. **Obstructive sleep apnea** occurs when an individual's airway becomes blocked during sleep, and air is prevented from entering the lungs. In **central sleep apnea**, disruption in signals sent from the brain that regulate breathing cause periods of interrupted breathing (White, 2005).

One of the most common treatments for sleep apnea involves the use of a special device during sleep. A **continuous positive airway pressure (CPAP)** device includes a mask that fits over the sleeper's nose and mouth, which is connected to a pump that pumps air into the person's airways, forcing them to remain open, as shown in Figure SC.13. Some newer CPAP masks are smaller and cover only the nose. This treatment option has proven to be effective for people suffering from mild to severe cases of sleep apnea (McDaid et al., 2009). However, alternative treatment options are being explored because consistent compliance by users of CPAP devices is a problem. Recently, a new EPAP (expiratory positive air pressure) device has shown promise in double-blind trials as one such alternative (Berry, Kryger, & Massie, 2011).



(a) (b)

Figure SC.13 (a) A typical CPAP device used in the treatment of sleep apnea is (b) affixed to the head with straps, and a mask that covers the nose and mouth.

Narcolepsy

Unlike the other sleep disorders described in this section, a person with **narcolepsy** cannot resist falling asleep at inopportune times. These sleep episodes are often associated with **cataplexy**, which is a lack of muscle tone or muscle weakness, and in some cases involves complete paralysis of the voluntary muscles. This is similar to the kind of paralysis experienced by healthy individuals during REM sleep (Burgess & Scammell, 2012; Hishikawa & Shimizu, 1995; Luppi et al., 2011). Narcoleptic episodes take on other features of REM sleep. For example, around one third of individuals diagnosed with narcolepsy experience vivid, dream-like hallucinations during narcoleptic attacks (Chokroverty, 2010).

Surprisingly, narcoleptic episodes are often triggered by states of heightened arousal or stress. The typical episode can

last from around a minute to half an hour. Once awakened from a narcoleptic attack, people report that they feel refreshed (Chokroverty, 2010). Obviously, regular narcoleptic episodes could interfere with the ability to perform one's job or complete schoolwork, and in some situations, narcolepsy can result in significant harm and injury (e.g., driving a car or operating machinery or other potentially dangerous equipment).

Generally, narcolepsy is treated using psychomotor stimulant drugs, such as amphetamines (Mignot, 2012). These drugs promote increased levels of neural activity. Narcolepsy is associated with reduced levels of the signalling molecule hypocretin in some areas of the brain (De la Herrán-Arita & Drucker-Colín, 2012; Han, 2012), and the traditional stimulant drugs do not have direct effects on this system. Therefore, it is quite likely that new medications that are developed to treat narcolepsy will be designed to target the hypocretin system.

There is a tremendous amount of variability among sufferers, both in terms of how symptoms of narcolepsy manifest and the effectiveness of currently available treatment options. This is illustrated by McCarty's (2010) case study of a 50-year-old woman who sought help for the excessive sleepiness during normal waking hours that she had experienced for several years. She indicated that she had fallen asleep at inappropriate or dangerous times, including while eating, while socializing with friends, and while driving her car.

During periods of emotional arousal, the woman complained that she felt some weakness in the right side of her body. Although she did not experience any dream-like hallucinations, she was diagnosed with narcolepsy as a result of sleep testing. In her case, the fact that her cataplexy was confined to the right side of her body was quite unusual. Early attempts to treat her condition with a stimulant drug alone were unsuccessful. However, when a stimulant drug was used in conjunction with a popular antidepressant, her condition improved dramatically.

43.

DRUGS AND ALTERED CONSCIOUSNESS

Learning Objectives

By the end of this section, you will be able to:

- Describe the relationship between drug tolerance and withdraw
- Identify the neurotransmitter systems impacted by various categories of drugs
- Describe how different categories of drugs affect behaviour and experience

While we all experience altered states of consciousness in the form of sleep on a regular basis, some people use drugs and

other substances that result in altered states of consciousness as well. This section will present information relating to the use of various psychoactive drugs and their influence on physical and psychological states. This will be followed by brief descriptions of the effects of some of the more well-known drugs commonly used today.

Drug Effects

Drugs exert their effects on both physical and psychological bodily functions. **Physical dependence** involves changes in normal bodily functions—the user will experience withdrawal from the drug upon cessation of use. In contrast, a person who has **psychological dependence** has an emotional, rather than physical, need for the drug and may use the drug to relieve psychological distress. **Tolerance** is linked to physiological dependence, and it occurs when a person requires more and more drug to achieve effects previously experienced at lower doses. Tolerance can cause the user to increase the amount of drug used to a dangerous level—even to the point of overdose and death.

Drug withdrawal includes a variety of negative symptoms experienced when drug use is discontinued. These symptoms usually are opposite of the effects of the drug. For example, withdrawal from sedative drugs often produces unpleasant arousal and agitation. In addition to withdrawal, many individuals who are diagnosed with substance use disorders

will also develop tolerance to these substances. Psychological dependence, or drug craving, is a recent addition to the diagnostic criteria for substance use disorder in DSM-5. This is an important factor because we can develop tolerance and experience withdrawal from any number of drugs that we do not abuse. In other words, physical dependence in and of itself is of limited utility in determining whether or not someone has a substance use disorder.

Drug Categories

The effects of all psychoactive drugs occur through their interactions with our endogenous neurotransmitter systems. Many of these drugs, and their relationships, are shown in Table SC.2. As you have learned, drugs can act as agonists or antagonists of a given neurotransmitter system. An agonist facilitates the activity of a neurotransmitter system, and antagonists impede neurotransmitter activity.

Table SC.2 Drugs and Their Effects

Class of Drug	Examples	Effects on the Body	Effects When Used	Psyc Add
Stimulants	Cocaine, amphetamines (including some ADHD medications such as Adderall), methamphetamines, MDMA ("Ecstasy" or "Molly")	Increased heart rate, blood pressure, body temperature	Increased alertness, mild euphoria, decreased appetite in low doses. High doses increase agitation, paranoia, can cause hallucinations. Some can cause heightened sensitivity to physical stimuli. High doses of MDMA can cause brain toxicity and death.	Yes

Table SC.2 Drugs and Their Effects

Class of Drug	Examples	Effects on the Body	Effects When Used	Psyc Add
Sedative-Hypnotics ("Depressants")	Alcohol, barbiturates (e.g., secobarbital, pentobarbital), Benzodiazepines (e.g., Xanax)	Decreased heart rate, blood pressure	Low doses increase relaxation, decrease inhibitions. High doses can induce sleep, cause motor disturbance, memory loss, decreased respiratory function, and death.	Yes
Opiates	Opium, Heroin, Fentanyl, Morphine, Oxycodone, Vicoden, methadone, and other prescription pain relievers	Decreased pain, pupil dilation, decreased gut motility, decreased respiratory function	Pain relief, euphoria, sleepiness. High doses can cause death due to respiratory depression.	Yes

Table SC.2 Drugs and Their Effects

Class of Drug	Examples	Effects on the Body	Effects When Used	Psyc Add
Hallucinogens	Marijuana, LSD, Peyote, mescaline, DMT, dissociative anesthetics including ketamine and PCP	Increased heart rate and blood pressure that may dissipate over time	Mild to intense perceptual changes with high variability in effects based on strain, method of ingestion, and individual differences	Yes

Link to Learning

Mouse Party

The Genetic Science Learning Centre at the University of Utah, created an interactive (simplified) overview of the mechanism and effects of several common drugs. You can access and interact with Mouse Party here: https://learn.genetics.utah.edu/

content/addiction/mouse/ Note that this activity requires the Flash Player plug-in. For individuals who cannot view this activity, we have created a walkthrough video to show each of the mice and the drug effects and mechanisms.

One or more interactive elements has been excluded from this version of the text. You can view them online here: https://caul-cbua.pressbooks.pub/intropsychneuro/?p=439#oembed-1

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Depressants

A **depressant** is a drug that tends to suppress central nervous system activity (Figure SC.15). Some depressants include alcohol, barbiturates and benzodiazepines. These drugs share in common their ability to serve as agonists of the gamma-Aminobutyric acid (GABA) neurotransmitter system. Because GABA has a quieting effect on the brain, GABA

agonists also have a quieting effect; these types of drugs are often prescribed to treat both anxiety and insomnia.

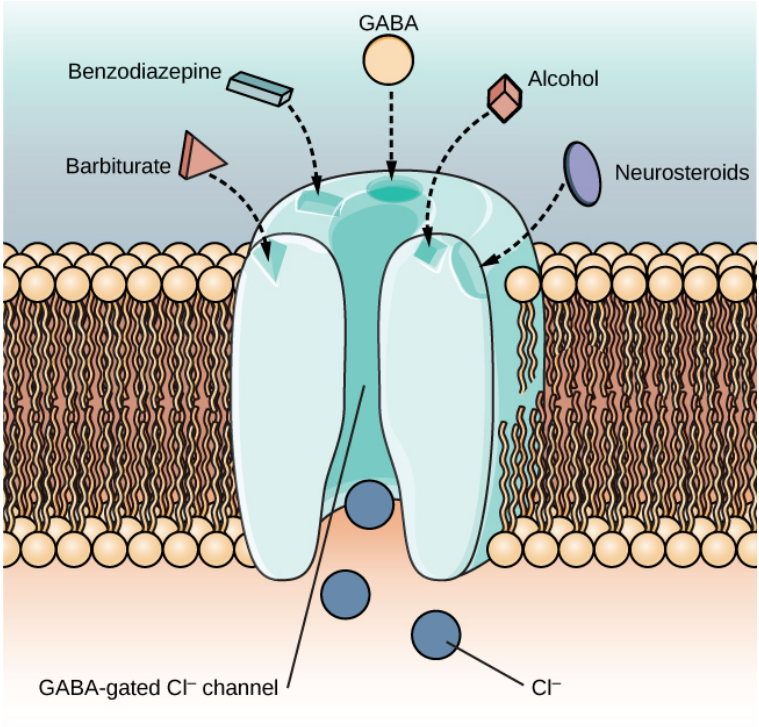

Figure SC.15 The GABA-gated chloride (Cl–) channel is embedded in the cell membrane of certain neurones. The channel has multiple receptor sites where alcohol, barbiturates, and benzodiazepines bind to exert their effects. The binding of these molecules opens the chloride channel, allowing negatively-charged chloride ions (Cl–) into the neurone's cell body. Changing its charge in a negative direction pushes the neurone away from firing; thus, activating a GABA neurone has a quieting effect on the brain.

Ethanol, which we commonly refer to as alcohol, is in a class of psychoactive drugs known as depressants. Acute alcohol administration results in a variety of changes to consciousness. At rather low doses, alcohol use is associated with feelings of euphoria. As the dose increases, people report feeling sedated. Generally, alcohol is associated with decreases in reaction time and visual acuity, lowered levels of alertness, and reduction in behavioural control. With excessive alcohol use, a person might experience a complete loss of consciousness and/or difficulty remembering events that occurred during a period of intoxication (McKim & Hancock, 2013). In addition, if a pregnant woman consumes alcohol, her infant may be born with a cluster of birth defects and symptoms collectively called fetal alcohol spectrum disorder (FASD) or fetal alcohol syndrome (FAS). With repeated use of many central nervous system depressants, such as alcohol, a person becomes physically dependent upon the substance and will exhibit signs of both tolerance and withdrawal. Psychological dependence on these drugs is also possible. Therefore, the abuse potential of central nervous system depressants is relatively high. Drug withdrawal is usually an aversive experience, and it can be a life-threatening process in individuals who have a long history of very high doses of alcohol and/or barbiturates. This is of such concern that people who are trying to overcome addiction to these substances should only do so under medical supervision.

Stimulants

Stimulants are drugs that tend to increase overall levels of neural activity. Many of these drugs act as agonists of the dopamine neurotransmitter system. Dopamine activity is often associated with reward and craving; therefore, drugs that affect dopamine neurotransmission often have abuse liability. Drugs in this category include cocaine, amphetamines (including methamphetamine), cathinones (i.e., bath salts), MDMA (ecstasy), nicotine, and caffeine. Cocaine can be taken in multiple ways. While many users snort cocaine, intravenous injection and inhalation (smoking) are also common. The freebase version of cocaine, known as crack, is a potent, smokable version of the drug. Like many other stimulants, cocaine agonizes the dopamine neurotransmitter system by blocking the reuptake of dopamine in the neuronal synapse.

Methamphetamine

Methamphetamine in its smokable form, often called "crystal meth" due to its resemblance to rock crystal formations, is highly addictive. The smokable form reaches the brain very quickly to produce an intense euphoria that dissipates almost as fast as it arrives, prompting users to continuing taking the drug. Users often consume the drug every few hours across days-long binges called "runs," in which the user forgoes food and sleep. In the wake of the

opiate epidemic, many drug cartels in Mexico are shifting from producing heroin to producing highly potent but inexpensive forms of methamphetamine. The low cost coupled with lower risk of overdose than with opiate drugs is making crystal meth a popular choice among drug users today (NIDA, 2019). Using crystal meth poses a number of serious long-term health issues, including dental problems (often called "meth mouth"), skin abrasions caused by excessive scratching, memory loss, sleep problems, violent behaviour, paranoia, and hallucinations. Methamphetamine addiction produces an intense craving that is difficult to treat.

Amphetamines have a mechanism of action quite similar to cocaine in that they block the reuptake of dopamine in addition to stimulating its release (Figure SC.16). While amphetamines are often abused, they are also commonly prescribed to children diagnosed with attention deficit hyperactivity disorder (ADHD). It may seem counterintuitive that stimulant medications are prescribed to treat a disorder that involves hyperactivity, but the therapeutic effect comes from increases in neurotransmitter activity within certain areas of the brain associated with impulse control. These brain areas include the prefrontal cortex and basal ganglia.

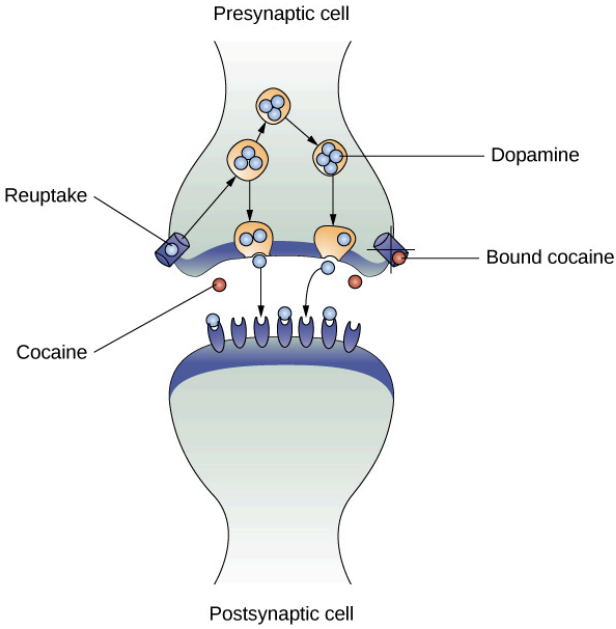

Figure SC.16 As one of their mechanisms of action, cocaine and amphetamines block the reuptake of dopamine from the synapse into the presynaptic cell.

In recent years, methamphetamine (meth) use has become increasingly widespread. Methamphetamine is a type of amphetamine that can be made from ingredients that are readily available (e.g., medications containing pseudoephedrine, a compound found in many over-the-counter cold and flu remedies). Despite recent changes in laws designed to make obtaining pseudoephedrine more difficult, methamphetamine continues to be an easily accessible and relatively inexpensive drug option (Shukla, Crump, & Chrisco, 2012).

Stimulant users seek a **euphoric high**, feelings of intense elation and pleasure, especially in those users who take the drug via intravenous injection or smoking. MDMA (3.4-methelynedioxy-methamphetamine, commonly known as "ecstasy" or "Molly") is a mild stimulant with perception-altering effects. It is typically consumed in pill form. Users experience increased energy, feelings of pleasure, and emotional warmth. Repeated use of these stimulants can have significant adverse consequences. Users can experience physical symptoms that include nausea, elevated blood pressure, and increased heart rate. In addition, these drugs can cause feelings of anxiety, hallucinations, and paranoia (Fiorentini et al., 2011). Normal brain functioning is altered after repeated use of these drugs. For example, repeated use can lead to overall depletion among the monoamine neurotransmitters (dopamine, norepinephrine, and serotonin). Depletion of certain neurotransmitters can lead to mood dysphoria, cognitive problems, and other factors. This can lead to people compulsively using stimulants such as cocaine and amphetamines, in part to try to reestablish the person's physical and psychological pre-use baseline. (Jayanthi & Ramamoorthy, 2005; Rothman, Blough, & Baumann, 2007).

Caffeine is another stimulant drug. While it is probably the most commonly used drug in the world, the potency of this particular drug pales in comparison to the other stimulant drugs described in this section. Generally, people use caffeine to maintain increased levels of alertness and arousal. Caffeine is

found in many common medicines (such as weight loss drugs), beverages, foods, and even cosmetics (Herman & Herman, 2013). While caffeine may have some indirect effects on dopamine neurotransmission, its primary mechanism of action involves antagonizing adenosine activity (Porkka-Heiskanen, 2011). Adenosine is a neurotransmitter that promotes sleep. Caffeine is an adenosine antagonist, so caffeine inhibits the adenosine receptors, thus decreasing sleepiness and promoting wakefulness.While caffeine is generally considered a relatively safe drug, high blood levels of caffeine can result in insomnia, agitation, muscle twitching, nausea, irregular heartbeat, and even death (Reissig, Strain, & Griffiths, 2009; Wolt, Ganetsky, & Babu, 2012). In 2012, Kromann and Nielson reported on a case study of a 40-year-old woman who suffered significant ill effects from her use of caffeine. The woman used caffeine in the past to boost her mood and to provide energy, but over the course of several years, she increased her caffeine consumption to the point that she was consuming three litres of soda each day. Although she had been taking a prescription antidepressant, her symptoms of depression continued to worsen and she began to suffer physically, displaying significant warning signs of cardiovascular disease and diabetes. Upon admission to an outpatient clinic for treatment of mood disorders, she met all of the diagnostic criteria for substance dependence and was advised to dramatically limit her caffeine intake. Once she was able to limit her use to less than 12 ounces of soda a day, both

her mental and physical health gradually improved. Despite the prevalence of caffeine use and the large number of people who confess to suffering from caffeine addiction, this was the first published description of soda dependence appearing in scientific literature.

Nicotine is highly addictive, and the use of tobacco products is associated with increased risks of heart disease, stroke, and a variety of cancers. Nicotine exerts its effects through its interaction with acetylcholine receptors. Acetylcholine functions as a neurotransmitter in motor neurones. In the central nervous system, it plays a role in arousal and reward mechanisms. Nicotine is most commonly used in the form of tobacco products like cigarettes or chewing tobacco; therefore, there is a tremendous interest in developing effective smoking cessation techniques. To date, people have used a variety of nicotine replacement therapies in addition to various psychotherapeutic options in an attempt to discontinue their use of tobacco products. In general, smoking cessation programs may be effective in the short term, but it is unclear whether these effects persist (Cropley, Theadom, Pravettoni, & Webb, 2008; Levitt, Shaw, Wong, & Kaczorowski, 2007; Smedslund, Fisher, Boles, & Lichtenstein, 2004). Vaping as a means to deliver nicotine is becoming increasingly popular, especially among teens and young adults. Vaping uses battery-powered devices, sometimes called e-cigarettes, that deliver liquid nicotine and flavourings as a vapour. Originally reported as a safe alternative to the known

cancer-causing agents found in cigarettes, vaping is now known to be very dangerous and has led to serious lung disease and death in users.

Opioids

An **opioid** is a category of drugs that includes heroin, morphine, methadone, and codeine. Opioids have analgesic properties; that is, they decrease pain. Humans have an endogenous opioid neurotransmitter system—the body makes small quantities of opioid compounds that bind to opioid receptors reducing pain and producing euphoria. Thus, opioid drugs, which mimic this endogenous painkilling mechanism, have an extremely high potential for abuse. Natural opioids, called opiates, are derivatives of opium, which is a naturally occurring compound found in the poppy plant. There are now several synthetic versions of opiate drugs (correctly called opioids) that have very potent painkilling effects, and they are often abused. For example, the National Institutes of Drug Abuse has sponsored research that suggests the misuse and abuse of the prescription pain killers hydrocodone and oxycodone are significant public health concerns (Maxwell, 2006). In 2013, the U.S. Food and Drug Administration recommended tighter controls on their medical use.Historically, heroin has been a major opioid drug of abuse (Figure SC.17). Heroin can be snorted, smoked, or injected intravenously. Heroin produces intense feelings of euphoria and pleasure, which are amplified when the heroin is injected

intravenously. Following the initial "rush," users experience 4–6 hours of "going on the nod," alternating between conscious and semiconscious states. Heroin users often shoot the drug directly into their veins. Some people who have injected many times into their arms will show "track marks," while other users will inject into areas between their fingers or between their toes, so as not to show obvious track marks and, like all abusers of intravenous drugs, have an increased risk for contraction of both tuberculosis and HIV.

(a) (b)

Figure SC.17 (a) Common paraphernalia for heroin preparation and use are shown here in a needle exchange kit. (b) Heroin is cooked on a spoon over a candle. (credit a: modification of work by Todd Huffman)

Aside from their utility as analgesic drugs, opioid-like compounds are often found in cough suppressants, anti-nausea, and anti-diarrhea medications. Given that withdrawal from a drug often involves an experience opposite to the effect of the drug, it should be no surprise that opioid withdrawal resembles a severe case of the flu. While opioid withdrawal can be extremely unpleasant, it is not life-threatening (Julien,

2005). Still, people experiencing opioid withdrawal may be given methadone to make withdrawal from the drug less difficult. **Methadone** is a synthetic opioid that is less euphorigenic than heroin and similar drugs. **Methadone clinics** help people who previously struggled with opioid addiction manage withdrawal symptoms through the use of methadone. Other drugs, including the opioid buprenorphine, have also been used to alleviate symptoms of opiate withdrawal.

Codeine is an opioid with relatively low potency. It is often prescribed for minor pain, and it is available over-the-counter in some other countries. Like all opioids, codeine does have abuse potential. In fact, abuse of prescription opioid medications is becoming a major concern worldwide (Aquina, Marques-Baptista, Bridgeman, & Merlin, 2009; Casati, Sedefov, & Pfeiffer-Gerschel, 2012).

Everyday Connection

The Opioid Crisis

Few people in Canada and the United States remain untouched by the recent opioid epidemic. It seems like everyone knows a friend, family member, or neighbour who has died of an overdose. Opioid addiction reached crisis levels in the United States such that by 2019, an average of 130 people died *each day* of an opioid overdose (NIDA, 2019). The crisis actually began in the 1990s, when pharmaceutical companies began mass-marketing pain-relieving opioid drugs like OxyContin with the promise (now known to be false) that they were non-addictive. Increased prescriptions led to greater rates of misuse, along with greater incidence of addiction, even among patients who used these drugs as prescribed. Physiologically, the body can become addicted to opiate drugs in less than a week, including when taken as prescribed. Withdrawal from opioids includes pain, which

patients often misinterpret as pain caused by the problem that led to the original prescription, and which motivates patients to continue using the drugs. The FDA's 2013 recommendation for tighter controls on opiate prescriptions left many patients addicted to prescription drugs like OxyContin unable to obtain legitimate prescriptions. This created a black market for the drug, where prices soared to $80 or more for a single pill. To prevent withdrawal, many people turned to cheaper heroin, which could be bought for $5 a dose or less. To keep heroin affordable, many dealers began adding more potent synthetic opioids including fentanyl and carfentanyl to increase the effects of heroin. These synthetic drugs are so potent that even small doses can cause overdose and death. Large-scale public health campaigns by the National Institutes of Health and the National Institute of Drug Abuse have led to recent declines in the opioid crisis. These initiatives include increasing access to treatment and recovery services, increasing access to overdose-reversal drugs like Naloxone, and implementing better public health monitoring systems (NIDA, 2019).

Hallucinogens

A **hallucinogen** is one of a class of drugs that results in profound alterations in sensory and perceptual experiences (Figure SC.18). In some cases, users experience vivid visual hallucinations. It is also common for these types of drugs to cause hallucinations of body sensations (e.g., feeling as if you are a giant) and a skewed perception of the passage of time.

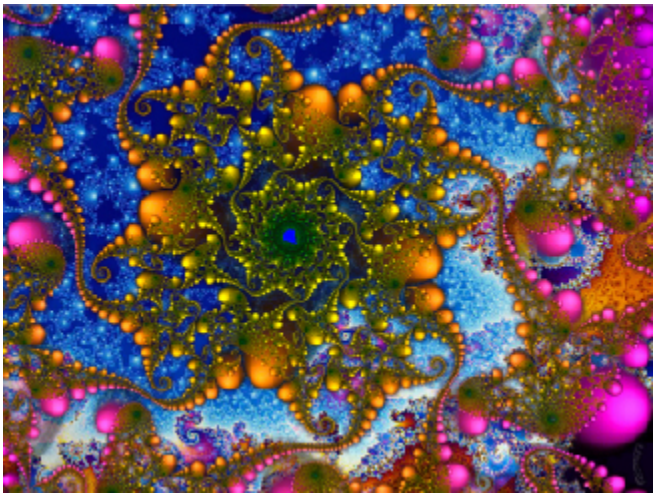

Figure SC.18 Psychedelic images like this are often associated with hallucinogenic compounds. (credit: modification of work by "new 1lluminati"/Flickr)

As a group, hallucinogens are incredibly varied in terms of the neurotransmitter systems they affect. Mescaline and LSD are serotonin agonists, and PCP (angel dust) and ketamine (an animal anesthetic) act as antagonists of the NMDA glutamate receptor. In general, these drugs are not thought to possess the

same sort of abuse potential as other classes of drugs discussed in this section.

Link to Learning

To learn more about some of the most commonly abused drugs, check out the Commonly Abused Drugs Chart and the Commonly Abused Prescription Drugs Chart, both from the National Institute on Drug Abuse.

TRICKY TOPIC: DRUG MECHANISMS

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44.

OTHER STATES OF CONSCIOUSNESS

Learning Objectives

By the end of this section, you will be able to:

- Define hypnosis and meditation
- Understand the similarities and differences of hypnosis and meditation

Our states of consciousness change as we move from wakefulness to sleep. We also alter our consciousness through the use of various psychoactive drugs. This final section will consider hypnotic and meditative states as additional examples

of altered states of consciousness experienced by some individuals.

Hypnosis

Hypnosis is a state of extreme self-focus and attention in which minimal attention is given to external stimuli. In the therapeutic setting, a clinician may use relaxation and suggestion in an attempt to alter the thoughts and perceptions of a patient. Hypnosis has also been used to draw out information believed to be buried deeply in someone's memory. For individuals who are especially open to the power of suggestion, hypnosis can prove to be a very effective technique, and brain imaging studies have demonstrated that hypnotic states are associated with global changes in brain functioning (Del Casale et al., 2012; Guldenmund, Vanhaudenhuyse, Boly, Laureys, & Soddu, 2012).

Historically, hypnosis has been viewed with some suspicion because of its portrayal in popular media and entertainment (Figure SC.19). Therefore, it is important to make a distinction between hypnosis as an empirically based therapeutic approach versus as a form of entertainment. Contrary to popular belief, individuals undergoing hypnosis usually have clear memories of the hypnotic experience and are in control of their own behaviours. While hypnosis may be useful in enhancing memory or a skill, such enhancements are very modest in nature (Raz, 2011).

Figure SC.19 Popular portrayals of hypnosis have led to some widely-held misconceptions.

How exactly does a hypnotist bring a participant to a state of hypnosis? While there are variations, there are four parts

that appear consistent in bringing people into the state of suggestibility associated with hypnosis (National Research Council, 1994). These components include:

- The participant is guided to focus on one thing, such as the hypnotist's words or a ticking watch.
- The participant is made comfortable and is directed to be relaxed and sleepy.
- The participant is told to be open to the process of hypnosis, trust the hypnotist and let go.
- The participant is encouraged to use his or her imagination.

These steps are conducive to being open to the heightened suggestibility of hypnosis.

People vary in terms of their ability to be hypnotized, but a review of available research suggests that most people are at least moderately hypnotizable (Kihlstrom, 2013). Hypnosis in conjunction with other techniques is used for a variety of therapeutic purposes and has shown to be at least somewhat effective for pain management, treatment of depression and anxiety, smoking cessation, and weight loss (Alladin, 2012; Elkins, Johnson, & Fisher, 2012; Golden, 2012; Montgomery, Schnur, & Kravits, 2012).

How does hypnosis work? Two theories attempt to answer this question: One theory views hypnosis as dissociation and the other theory views it as the performance of a social role.

According to the dissociation view, hypnosis is effectively a dissociated state of consciousness, much like our earlier example where you may drive to work, but you are only minimally aware of the process of driving because your attention is focused elsewhere. This theory is supported by Ernest Hilgard's research into hypnosis and pain. In Hilgard's experiments, he induced participants into a state of hypnosis, and placed their arms into ice water. Participants were told they would not feel pain, but they could press a button if they did; while they reported not feeling pain, they did, in fact, press the button, suggesting a dissociation of consciousness while in the hypnotic state (Hilgard & Hilgard, 1994).

Taking a different approach to explain hypnosis, the social-cognitive theory of hypnosis sees people in hypnotic states as performing the social role of a hypnotized person. As you will learn when you study social roles, people's behaviour can be shaped by their expectations of how they should act in a given situation. Some view a hypnotized person's behaviour not as an altered or dissociated state of consciousness, but as their fulfillment of the social expectations for that role (Coe, 2009; Coe & Sarbin, 1966).

TRICKY TOPIC: HYPNOSIS

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Meditation

Meditation is the act of focusing on a single target (such as the breath or a repeated sound) to increase awareness of the moment. While hypnosis is generally achieved through the interaction of a therapist and the person being treated, an individual can perform meditation alone. Often, however, people wishing to learn to meditate receive some training in techniques to achieve a meditative state.

Although there are a number of different techniques in use, the central feature of all meditation is clearing the mind in order to achieve a state of relaxed awareness and focus (Chen et al., 2013; Lang et al., 2012). Mindfulness meditation has recently become popular. In the variation of mindful meditation, the meditator's attention is focused on some

internal process or an external object (Zeidan, Grant, Brown, McHaffie, & Coghill, 2012).

Meditative techniques have their roots in religious practices (Figure SC.20), but their use has grown in popularity among practitioners of alternative medicine. Research indicates that meditation may help reduce blood pressure, and the American Heart Association suggests that meditation might be used in conjunction with more traditional treatments as a way to manage hypertension, although there is not sufficient data for a recommendation to be made (Brook et al., 2013). Like hypnosis, meditation also shows promise in stress management, sleep quality (Caldwell, Harrison, Adams, Quin, & Greeson, 2010), treatment of mood and anxiety disorders (Chen et al., 2013; Freeman et al., 2010; Vøllestad, Nielsen, & Nielsen, 2012), and pain management (Reiner, Tibi, & Lipsitz, 2013).

(a)

(b)

Figure SC.20 (a) This is a statue of a meditating Buddha, representing one of the many religious traditions of which meditation plays a part. (b) People practicing meditation may experience an alternate state of consciousness. (credit a: modification of work by Jim Epler; credit b: modification of work by Caleb Roenigk)

Link to Learning

Interested in trying meditation? Try this 10-minute Meditation for Beginners to take a break and learn more.

Link to Learning

Watch this video about the results of a brain imaging study in individuals who underwent specific mindfulness meditative techniques to learn more.

45.

KEY TERMS OF STATES OF CONSCIOUSNESS

alpha wave
: type of relatively low frequency, relatively high amplitude brain wave that becomes synchronized; characteristic of the beginning of stage 1 sleep

biological rhythm
: internal cycle of biological activity

cataplexy
: lack of muscle tone or muscle weakness, and in some cases complete paralysis of the voluntary muscles

central sleep apnea
: sleep disorder with periods of interrupted breathing due to a disruption in signals sent from the brain that regulate breathing

circadian rhythm
: biological rhythm that occurs over approximately 24 hours

codeine
: opiate with relatively low potency often prescribed for minor pain

cognitive-behavioural therapy

psychotherapy that focuses on cognitive processes and problem behaviours that is sometimes used to treat sleep disorders such as insomnia

collective unconscious

theoretical repository of information shared by all people across cultures, as described by Carl Jung

consciousness

awareness of internal and external stimuli

continuous positive airway pressure (CPAP)

device used to treat sleep apnea; includes a mask that fits over the sleeper's nose and mouth, which is connected to a pump that pumps air into the person's airways, forcing them to remain open

divided attention

the process in which individuals attend to many sources of information at once

delta wave

type of low frequency, high amplitude brain wave characteristic of stage 3 and stage 4 sleep

depressant

drug that tends to suppress central nervous system activity

euphoric high

feelings of intense elation and pleasure from drug use

evolutionary psychology

discipline that studies how universal patterns of behaviour and cognitive processes have evolved over time as a result of natural selection

hallucinogen

one of a class of drugs that results in profound alterations in sensory and perceptual experiences, often with vivid hallucinations

homeostasis

tendency to maintain a balance, or optimal level, within a biological system

hypnosis

state of extreme self-focus and attention in which minimal attention is given to external stimuli

insomnia

consistent difficulty in falling or staying asleep for at least three nights a week over a month's time

jet lag

collection of symptoms brought on by travel from one time zone to another that results from the mismatch between our internal circadian cycles and our environment

K-complex

very high amplitude pattern of brain activity associated with stage 2 sleep that may occur in response to environmental stimuli

latent content

hidden meaning of a dream, per Sigmund Freud's view of the function of dreams

lucid dream

people become aware that they are dreaming and can control the dream's content

manifest content

storyline of events that occur during a dream, per Sigmund Freud's view of the function of dreams

meditation

clearing the mind in order to achieve a state of relaxed awareness and focus

melatonin

hormone secreted by the endocrine gland that serves as an important regulator of the sleep-wake cycle

meta-analysis

study that combines the results of several related studies

methadone

synthetic opioid that is less euphorogenic than heroin and similar drugs; used to manage withdrawal symptoms in opiate users

methadone clinic

uses methadone to treat withdrawal symptoms in opiate users

methamphetamine

type of amphetamine that can be made from pseudoephedrine, an over-the-counter drug; widely

manufactured and abused

narcolepsy

sleep disorder in which the sufferer cannot resist falling to sleep at inopportune times

night terror

sleep disorder in which the sleeper experiences a sense of panic and may scream or attempt to escape from the immediate environment

non-REM (NREM)

period of sleep outside periods of rapid eye movement (REM) sleep

obstructive sleep apnea

sleep disorder defined by episodes when breathing stops during sleep as a result of blockage of the airway

opiate/opioid

one of a category of drugs that has strong analgesic properties; opiates are produced from the resin of the opium poppy; includes heroin, morphine, methadone, and codeine

parinsomnia

one of a group of sleep disorders characterized by unwanted, disruptive motor activity and/or experiences during sleep

physical dependence

changes in normal bodily functions that cause a drug user to experience withdrawal symptoms upon cessation of use

pineal gland

endocrine structure located inside the brain that releases melatonin

psychological dependence

emotional, rather than a physical, need for a drug which may be used to relieve psychological distress

rapid eye movement (REM) sleep

period of sleep characterized by brain waves very similar to those during wakefulness and by darting movements of the eyes under closed eyelids

REM sleep behaviour disorder (RBD)

sleep disorder in which the muscle paralysis associated with the REM sleep phase does not occur; sleepers have high levels of physical activity during REM sleep, especially during disturbing dreams

restless leg syndrome

sleep disorder in which the sufferer has uncomfortable sensations in the legs when trying to fall asleep that are relieved by moving the legs

rotating shift work

work schedule that changes from early to late on a daily or weekly basis

selective attention

the ability to select certain stimuli in the environment to process, while ignoring distracting information

sleep

state marked by relatively low levels of physical activity

and reduced sensory awareness that is distinct from periods of rest that occur during wakefulness

sleep apnea

sleep disorder defined by episodes during which breathing stops during sleep

sleep debt

result of insufficient sleep on a chronic basis

sleep rebound

sleep-deprived individuals will experience shorter sleep latencies during subsequent opportunities for sleep

sleep regulation

brain's control of switching between sleep and wakefulness as well as coordinating this cycle with the outside world

sleep spindle

rapid burst of high frequency brain waves during stage 2 sleep that may be important for learning and memory

sleepwalking

(also, somnambulism) sleep disorder in which the sleeper engages in relatively complex behaviours

stage 1 sleep

first stage of sleep; transitional phase that occurs between wakefulness and sleep; the period during which a person drifts off to sleep

stage 2 sleep

second stage of sleep; the body goes into deep relaxation; characterized by the appearance of sleep spindles

stage 3 sleep

third stage of sleep; deep sleep characterized by low frequency, high amplitude delta waves

stage 4 sleep

fourth stage of sleep; deep sleep characterized by low frequency, high amplitude delta waves

stimulant

drug that tends to increase overall levels of neural activity; includes caffeine, nicotine, amphetamines, and cocaine

suprachiasmatic nucleus (SCN)

area of the hypothalamus in which the body's biological clock is located

theta wave

type of low frequency, high amplitude brain wave characteristic of stage 1 and stage 2 sleep

tolerance

state of requiring increasing quantities of the drug to gain the desired effect

wakefulness

characterized by high levels of sensory awareness, thought, and behaviour

withdrawal

variety of negative symptoms experienced when drug use is discontinued

46.

SUMMARY OF STATES OF CONSCIOUSNESS

SC.1. What Is Consciousness?

States of consciousness vary over the course of the day and throughout our lives. Important factors in these changes are the biological rhythms, and, more specifically, the circadian rhythms generated by the suprachiasmatic nucleus (SCN). Typically, our biological clocks are aligned with our external environment, and light tends to be an important cue in setting this clock. When people travel across multiple time zones or work rotating shifts, they can experience disruptions of their circadian cycles that can lead to insomnia, sleepiness, and decreased alertness. Bright light therapy has shown to be promising in dealing with circadian disruptions. If people go extended periods of time without sleep, they will accrue a sleep debt and potentially experience a number of adverse psychological and physiological consequences.

SC.2 Sleep and Why We Sleep

We devote a very large portion of time to sleep, and our brains have complex systems that control various aspects of sleep. Several hormones important for physical growth and maturation are secreted during sleep. While the reason we sleep remains something of a mystery, there is some evidence to suggest that sleep is very important to learning and memory.

SC.3 Stages of Sleep

The different stages of sleep are characterized by the patterns of brain waves associated with each stage. As a person transitions from being awake to falling asleep, alpha waves are replaced by theta waves. Sleep spindles and K-complexes emerge in stage 2 sleep. Stage 3 and stage 4 are described as slow-wave sleep that is marked by a predominance of delta waves. REM sleep involves rapid movements of the eyes, paralysis of voluntary muscles, and dreaming. Both NREM and REM sleep appear to play important roles in learning and memory. Dreams may represent life events that are important to the dreamer. Alternatively, dreaming may represent a state of protoconsciousness, or a virtual reality, in the mind that helps a person during consciousness.

SC.4 Sleep Problems and Disorders

Many individuals suffer from some type of sleep disorder or disturbance at some point in their lives. Insomnia is a common experience in which people have difficulty falling or staying asleep. Parasomnias involve unwanted motor behavioUr or experiences throughout the sleep cycle and include RBD, sleepwalking, restless leg syndrome, and night terrors. Sleep apnea occurs when individuals stop breathing during their sleep, and in the case of sudden infant death syndrome, infants will stop breathing during sleep and die. Narcolepsy involves an irresistible urge to fall asleep during waking hours and is often associated with cataplexy and hallucination.

SC.5 Drugs and Altered Consciousness

Substance use disorder is defined in DSM-5 as a compulsive pattern of drug use despite negative consequences. Both physical and psychological dependence are important parts of this disorder. Alcohol, barbiturates, and benzodiazepines are central nervous system depressants that affect GABA neurotransmission. Cocaine, amphetamine, cathinones, and MDMA are all central nervous stimulants that agonize dopamine neurotransmission, while nicotine and caffeine affect acetylcholine and adenosine, respectively. Opiate drugs serve as powerful analgesics through their effects on the

endogenous opioid neurotransmitter system, and hallucinogenic drugs cause pronounced changes in sensory and perceptual experiences. The hallucinogens are variable with regards to the specific neurotransmitter systems they affect.

SC.6 Other States of Consciousness

Hypnosis is a focus on the self that involves suggested changes of behaviour and experience. Meditation involves relaxed, yet focused, awareness. Both hypnotic and meditative states may involve altered states of consciousness that have potential application for the treatment of a variety of physical and psychological disorders.

47.

REVIEW QUESTIONS FOR STATES OF CONSCIOUSNESS

Click here for Answer Key

Multiple Choice Questions

1. The body's biological clock is located in the _____.

a. hippocampus
b. thalamus
c. hypothalamus
d. pituitary gland

2. _____ occurs when there is a chronic deficiency in sleep.

a. jet lag
b. rotating shift work
c. circadian rhythm
d. sleep debt

3. _____ cycles occur roughly once every 24 hours.

a. biological
b. circadian
c. rotating
d. conscious

4. _____ is one way in which people can help reset their biological clocks.

a. Light-dark exposure
b. coffee consumption
c. alcohol consumption
d. napping

5. Growth hormone is secreted by the _____ while we sleep.

a. pineal gland
b. thyroid
c. pituitary gland
d. pancreas

6. The _____ plays a role in controlling slow-wave sleep.

a. hypothalamus
b. thalamus
c. pons

d. both a and b

7. _____ is a hormone secreted by the pineal gland that plays a role in regulating biological rhythms and immune function.

a. growth hormone
b. melatonin
c. LH
d. FSH

8. _____ appears to be especially important for enhanced performance on recently learned tasks.

a. melatonin
b. slow-wave sleep
c. sleep deprivation
d. growth hormone

9. _____ is(are) described as slow-wave sleep.

a. stage 1
b. stage 2
c. stage 3 and stage 4
d. REM sleep

10. Sleep spindles and K-complexes are most often associated with _____ sleep.

a. stage 1
b. stage 2
c. stage 3 and stage 4
d. REM

11. The _____ content of a dream refers to the true meaning of the dream.

a. latent
b. manifest
c. collective unconscious
d. important

12. _____ is loss of muscle tone or control that is often associated with narcolepsy.

a. RBD
b. CPAP
c. cataplexy
d. insomnia

13. An individual may suffer from _____ if there is a disruption in the brain signals that are sent to the muscles that regulate breathing.

a. central sleep apnea
b. obstructive sleep apnea

c. narcolepsy
d. SIDS

14. _____ is another word for sleepwalking.

a. insomnia
b. somnambulism
c. cataplexy
d. narcolepsy

15. _____ occurs when a drug user requires more and more of a given drug in order to experience the same effects of the drug.

a. withdrawal
b. psychological dependence
c. tolerance
d. reuptake

16. Cocaine blocks the reuptake of _____.

a. GABA
b. glutamate
c. acetylcholine
d. dopamine

17. _____ refers to drug craving.

a. psychological dependence
b. antagonism
c. agonism
d. physical dependence

18. LSD affects _____ neurotransmission.

a. dopamine
b. serotonin
c. acetylcholine
d. norepinephrine

19. _____ is most effective in individuals that are very open to the power of suggestion.

a. hypnosis
b. meditation
c. mindful awareness
d. cognitive therapy

20. _____ has its roots in religious practice.

a. hypnosis
b. meditation
c. cognitive therapy
d. behavioural therapy

21. Meditation may be helpful in _____.

a. pain management
b. stress control
c. treating the flu
d. both a and b

22. Research suggests that cognitive processes, such as learning, may be affected by _____.

a. hypnosis
b. meditation
c. mindful awareness
d. progressive relaxation

Critical Thinking Questions

23. Healthcare professionals often work rotating shifts. Why is this problematic? What can be done to deal with potential problems?
24. Generally, humans are considered diurnal which means we are awake during the day and asleep during the night. Many rodents, on the other hand, are nocturnal. Why do you think different animals have such different sleep-wake cycles?
25. If theories that assert sleep is necessary for restoration and recovery from daily energetic demands are correct, what do you predict about the relationship that would exist between individuals' total sleep duration and their level of activity?
26. How could researchers determine if given areas of the brain are involved in the regulation of sleep?

27. Differentiate the evolutionary theories of sleep and make a case for the one with the most compelling evidence.
28. Freud believed that dreams provide important insight into the unconscious mind. He maintained that a dream's manifest content could provide clues into an individual's unconscious. What potential criticisms exist for this particular perspective?
29. Some people claim that sleepwalking and talking in your sleep involve individuals acting out their dreams. Why is this particular explanation unlikely?
30. One of the recommendations that therapists will make to people who suffer from insomnia is to spend less waking time in bed. Why do you think spending waking time in bed might interfere with the ability to fall asleep later?
31. How is narcolepsy with cataplexy similar to and different from REM sleep?
32. The negative health consequences of both alcohol and tobacco products are well-documented. A drug like marijuana, on the other hand, is generally considered to be as safe, if not safer than these legal drugs. Why do you think marijuana use continues to be illegal in many parts of the United States?
33. Why are programs designed to educate people about the dangers of using tobacco products just as important as developing tobacco cessation programs?
34. What advantages exist for researching the potential health benefits of hypnosis?

35. What types of studies would be most convincing regarding the effectiveness of meditation in the treatment for some type of physical or mental disorder?

Personal Application Questions

36. We experience shifts in our circadian clocks in the fall and spring of each year with time changes associated with daylight saving time. Is springing ahead or falling back easier for you to adjust to, and why do you think that is?
37. What do you do to adjust to the differences in your daily schedule throughout the week? Are you running a sleep debt when daylight saving time begins or ends?
38. Have you (or someone you know) ever experienced significant periods of sleep deprivation because of simple insomnia, high levels of stress, or as a side effect from a medication? What were the consequences of missing out on sleep?
39. Researchers believe that one important function of sleep is to facilitate learning and memory. How does knowing this help you in your college studies? What changes could you make to your study and sleep habits to maximize your mastery of the material covered in class?
40. What factors might contribute to your own experiences with insomnia?
41. Many people experiment with some sort of psychoactive substance at some point in their lives. Why do you think

people are motivated to use substances that alter consciousness?

42. Under what circumstances would you be willing to consider hypnosis and/or meditation as a treatment option? What kind of information would you need before you made a decision to use these techniques?

48.

ACKNOWLEDGEMENTS & ATTRIBUTIONS

CHAPTER VI
MEMORY

49.

INTRODUCTION TO MEMORY

Chapter Outline

- How Memory Functions
- Spatial Memory
- Forgetting and Memory Errors
- Memory and the Brain
- Ways to Enhance Memory

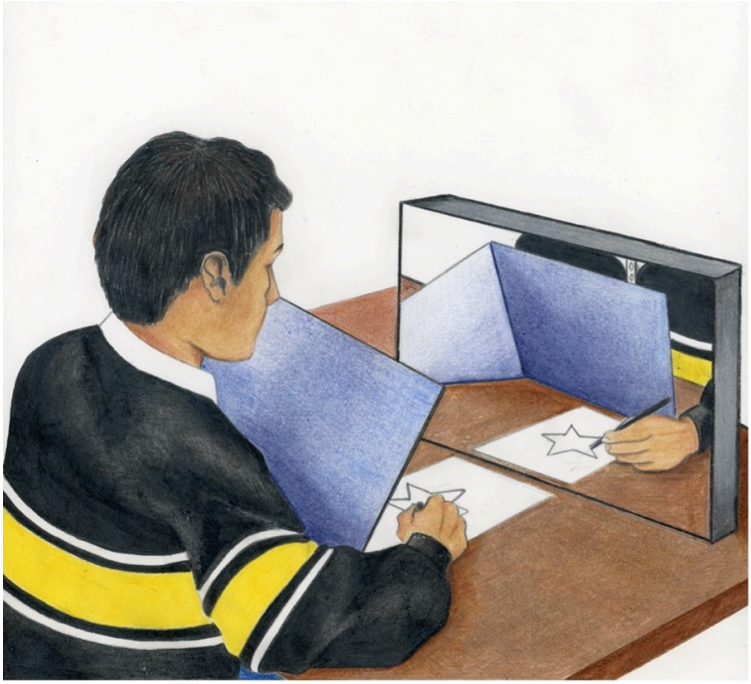

Figure M.1 Participant performing the mirror drawing task. Marks outside of the borders of the image are counted as errors. (Artwork: Rebecca St. James)

Most of us would agree that memory is one of our most valuable assets. Our lives would be empty if we couldn't store new information and our ability to access past experiences is a big part of who we are. Our nervous systems are bombarded with information that the brain continually sorts, organizes, stores, and retrieves throughout our lifetimes. Unlike physical storage devices, the brain can't add another filing cabinet or hard drive. Instead, there are many different neural systems that overlap and influence each other to create and retrieve

memories, which makes it complicated to study. As a result, scientists combine techniques that allow the study of areas in isolation with techniques that allow the study of memory systems.

One way to study an isolated region is to intentionally damage or remove it, a technique called ablation or lesioning. If the subject shows impaired performance on a memory task after lesioning, then the damaged area was likely involved in that task. Because it would be unethical to create lesions in healthy human subjects, lesion experiments are performed in non-human animals, often to create a model of human systems. This technique allows scientists to assess memory before damage occurs, ensuring that changes in performance are a result of the lesion. Experimental lesions are also specific in location, which isn't often the case with naturally occurring brain injury. In contrast, studies of brain damage in humans rely on individuals who already have brain damage, or who are having brain regions removed for medical purposes. In these cases, we can't be sure which effects result from the damage, or which specific regions are responsible.

Still, people with rare brain injuries can provide unique information about the nature of memory systems by examining the abilities that they lost. One famous case study of memory comes from a man named Henry Molaison, known as patient HM, and his collaboration with researcher, Brenda Milner. HM had severe seizures originating in his temporal lobes which were unresponsive to high doses of

anticonvulsants, so he underwent an experimental neurosurgery in the care of Dr. William Scoville in 1955. During the surgery, Dr. Scoville removed portions of the medial temporal lobes, specifically, the anterior hippocampus, the parahippocampal gyrus, and the amygdala. Later however, it was discovered that the lesion was smaller than originally thought (Annese *et* al., 2014). After the surgery, HM's epilepsy was controlled, but he showed profound and unexpected impairments in memory (Milner, 2005).

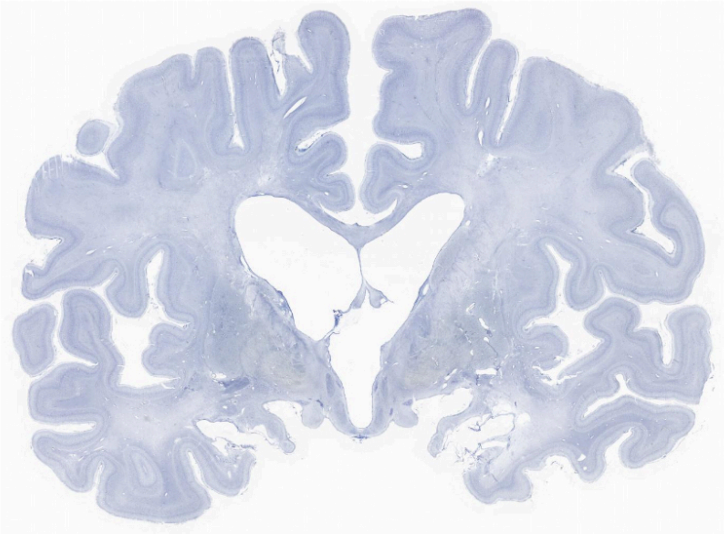

Figure M.2: One of 2041 ultra-thin slices of HM's brain, sectioned by Annese et. al after HM's death in 2008. Missing portions are visible on the inner portions of the temporal lobes.

HM's personality was unchanged, and he even scored higher on the Weschler IQ test, likely because his seizures had stopped. He still had early-life memories and retained semantic or fact-based knowledge from the years before the surgery, but he lacked specific, personal memories of that time. Strikingly, he couldn't remember Dr. Scoville himself, whom he'd known for many years. His most severe impairment however, was an inability to form new, conscious memories.(Milner, 2005; Scoville 1954). At any given moment, HM described his world as being "clear" but said he felt like he was always waking up from a dream (Milner, 2005). After surgery, HM was able to gradually learn some new information with repeated exposure, like the existence of space travel, but this was effortful. For example, it took about five years to navigate the inside of the house he moved to after his operation (Milner, 1970). He was also able to remember small chunks of information if he could continuously repeat it to himself, a process called maintenance rehearsal (Annese et. al, 2014).

Given the unexpected results of HM's surgery, Scoville invited Brenda Milner, a researcher from the Montreal Neurological Institute with expertise in the function of the medial temporal lobes (Milner, 2005). To test HM's short term or working memory, Milner adapted a spatial task that asked participants to discover the correct route through a digital maze along a series of "stepping stones". The participant selects a stone, and if the stone is correct they are given feedback and allowed to continue. If it isn't correct, they

must go back to the start and try again. Most people can remember enough correct steps to make it through the maze after about 20 trials, but HM failed to remember anything after 215 attempts (Milner, 1966; Milner 2005). Milner later trained him on a much shorter version of the maze with only six choice points. Although it took 155 trials and a lot of effort, HM was eventually able to complete three errorless runs through the maze, and even remembered some of the correct pathways two years later (Milner et al., 1968; Milner, 2005).

This digital maze study revealed two key points. First, HM was able to remember the pathway once the stepping stones were reduced to six, so he had some capacity for immediate memory. This indicates that his immediate memory functioned normally even though he couldn't form longer-term memories. Second, he kept the memories that he *was* able to create for years, which suggests that *forming* memories and *keeping* memories could require different processes. Because HM was missing his medial temporal lobes, we can assume that this area of the brain is important for forming memories, but not necessarily storing them. This case demonstrates a study of memory *systems*, as HM's surgery affected multiple areas contributing memory processes. With careful study design, we can make links between brain areas and the behaviours they're involved in, even if the damaged area is not specific.

By observing what HM *was not* able to do, Milner and her team could determine what the medial temporal lobe *did*

control. Milner was also able to determine which parts of memory *were not* controlled by the medial temporal lobes through her discovery of HM's capacity for implicit learning, the act of gaining new skills without conscious awareness. First, he completed a motor task where he had to copy a drawing by only looking at a reflection of his hand through a mirror (Figure M.1, above). After 30 trials over three days, he had no conscious awareness of doing the task before, but his performance improved significantly (Corkin 1968; Milner, 1970; Milner, 2005). For the second task, HM had to identify an object shown as multiple incomplete line drawings, each differing in its level of completion (Figure M.3, below). It was nearly impossible for him to identify objects from the most incomplete drawings, but with practice he needed fewer cues to name the items (Gollin, 1960; Milner, 1970; Milner 2005). These studies showed that the medial temporal lobes were not required for these types of memory tasks.

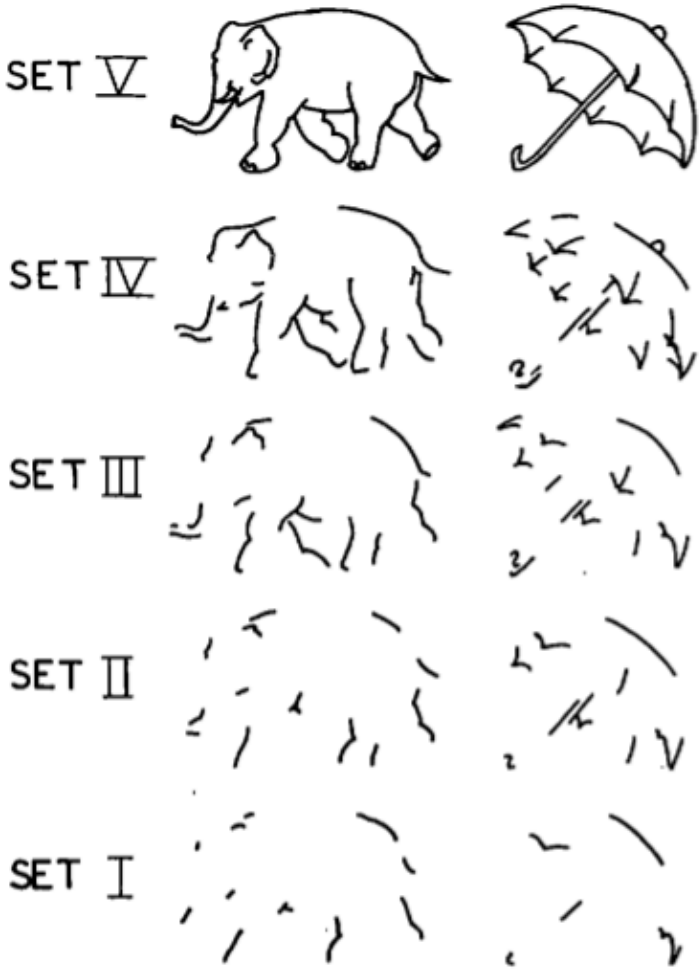

FIG. 1. Examples of the materials used in the experiments

Figure M.3 Line drawings used for object recognition task. (credit: Gollin, E. S. (1960) original drawing)

Thanks to Brenda Milner's work, we've learned a lot from HM

himself. After dedicating 30 years of his life to the research of memory, Henry Molaison also donated his brain for further study upon his death in 2008 (*New York times,* 2009), and 2041 high resolution images of his brain sections are now compiled in a virtual brain atlas available to researchers online (Annese *et* al., 2014) . Despite his contributions to science, it was only after his death that HM became known by his full name, Henry Molaison, rather than his initials. His collaboration with Brenda Milner is now one of the most influential in neuroscience, helping to link the medial temporal lobe with specific memory function and aiding in distinguishing different types of memory.

Link to Learning

To learn more about HM's life and the research that grew from this case study, visit the Brain Observatory's Project HM: https://www.thebrainobservatory.org/projecthm

HM's case provided crucial information in early neuroscience,

but we must note that his brain was atypical because of his epilepsy. In fact, post-mortem examination revealed a number of non-surgical lesions that could have contributed to his impairments (Annese et. al, 2014). In the decades following, we have continued to develop techniques for the study of memory. We can now observe memory processes and systems in real time using functional imaging techniques, and even create 'virtual' lesions by temporarily interfering with activity in specific brain regions using Transcranial Magnetic Stimulation to study the function of isolated areas (Brem et. al, 2013). Using combinations of these techniques with non-human animal models, as well as other unique cases of brain injury, we can continue to identify the functions of specific areas while also refining our understanding of how they work together.

50.

HOW MEMORY FUNCTIONS

Learning Objectives

By the end of this section, you will be able to:

- Discuss the three basic functions of memory
- Describe the three stages of memory storage
- Describe and distinguish between procedural and declarative memory and semantic and episodic memory

Memory is an information processing system; therefore, we often compare it to a computer. **Memory** is the set of

processes used to encode, store, and retrieve information over different periods of time (Figure M.4).

Figure M.4 Encoding involves the input of information into the memory system. Storage is the retention of the encoded information. Retrieval, or getting the information out of memory and back into awareness, is the third function.

Link to Learning

Watch this fun Crash Course video for a quick and engaging overview of How We Make Memories.

Encoding

We get information into our brains through a process called **encoding**, which is the input of information into the memory system. Once we receive sensory information from

the environment, our brains label or code it. We organize the information with other similar information and connect new concepts to existing concepts. Encoding information occurs through automatic processing and effortful processing.

If someone asks you what you ate for lunch today, more than likely you could recall this information quite easily. This is known as automatic processing, or the encoding of details like time, space, frequency, and the meaning of words. **Automatic processing** is usually done without any conscious awareness. Recalling the last time you studied for a test is another example of automatic processing. But what about the actual test material you studied? It probably required a lot of work and attention on your part in order to encode that information. This is known as **effortful processing** (Figure M.5).

Figure M.5 When you first learn new skills such as driving a car, you have to put forth effort and attention to encode information about how to start a car, how to brake, how to handle a turn, and so on. Once you know how to drive, you can encode additional information about this skill automatically. (credit: Robert Couse-Baker)

What are the most effective ways to ensure that important memories are well encoded? Even a simple sentence is easier to recall when it is meaningful (Anderson, 1984). Read the following sentences (Bransford & McCarrell, 1974), then look away and count backwards from 30 by threes to zero, and then try to write down the sentences (no peeking back at this page!).

1. The notes were sour because the seams split.
2. The voyage wasn't delayed because the bottle shattered.
3. The haystack was important because the cloth ripped.

How well did you do? By themselves, the statements that you wrote down were most likely confusing and difficult for you to recall. Now, try writing them again, using the following prompts: bagpipe, ship christening, and parachutist. Next count backwards from 40 by fours, then check yourself to see how well you recalled the sentences this time. You can see that the sentences are now much more memorable because each of the sentences was placed in context. Material is far better encoded when you make it meaningful.

There are three types of encoding. The encoding of words and their meaning is known as **semantic encoding**. It was first demonstrated by William Bousfield (1935) in an experiment in which he asked people to memorize words. The 60 words were actually divided into 4 categories of meaning, although the participants did not know this because the words were randomly presented. When they were asked to remember the words, they tended to recall them in categories, showing that they paid attention to the meanings of the words as they learned them.

Visual encoding is the encoding of images, and **acoustic encoding** is the encoding of sounds, words in particular. To see how visual encoding works, read over this list of words: *car, level, dog, truth, book, value*. If you were asked later to recall the words from this list, which ones do you think you'd most likely remember? You would probably have an easier time recalling the words *car, dog,* and *book*, and a more difficult time recalling the words *level, truth,* and *value*. Why is this? Because you can

recall images (mental pictures) more easily than words alone. When you read the words *car, dog,* and *book* you created images of these things in your mind. These are concrete, high-imagery words. On the other hand, abstract words like *level, truth,* and *value* are low-imagery words. High-imagery words are encoded both visually and semantically (Paivio, 1986), thus building a stronger memory.

Now let's turn our attention to acoustic encoding. You are driving in your car and a song comes on the radio that you haven't heard in at least 10 years, but you sing along, recalling every word. In the Canada, children often learn the alphabet through song. This is easy to remember because of acoustic encoding. We encode the sounds the words make. This is one of the reasons why much of what we teach young children is done through song, rhyme, and rhythm.

Which of the three types of encoding do you think would give you the best memory of verbal information? Some years ago, psychologists Fergus Craik and Endel Tulving (1975) conducted a series of experiments to find out. Participants were given words along with questions about them. The questions required the participants to process the words at one of the three levels. The visual processing questions included such things as asking the participants about the font of the letters. The acoustic processing questions asked the participants about the sound or rhyming of the words, and the semantic processing questions asked the participants about the meaning of the words. After participants were presented with

the words and questions, they were given an unexpected recall or recognition task.

Words that had been encoded semantically were better remembered than those encoded visually or acoustically. Semantic encoding involves a deeper level of processing than the shallower visual or acoustic encoding. Craik and Tulving concluded that we process verbal information best through semantic encoding, especially if we apply what is called the self-reference effect. The **self-reference effect** is the tendency for an individual to have better memory for information that relates to oneself in comparison to material that has less personal relevance (Rogers, Kuiper, & Kirker, 1977). Could semantic encoding be beneficial to you as you attempt to memorize the concepts in this chapter?

Storage

Once the information has been encoded, we have to somehow retain it. Our brains take the encoded information and place it in storage. **Storage** is the creation of a permanent record of information. In order for a memory to go into storage (i.e., long-term memory), it has to pass through three distinct stages: Sensory Memory, Short-Term Memory, and finally Long-Term Memory. These stages were first proposed by Richard Atkinson and Richard Shiffrin (1968). Their model of human memory (Figure M.6), called Atkinson and Shiffrin's model, is based on the belief that we process

memories in the same way that a computer processes information.

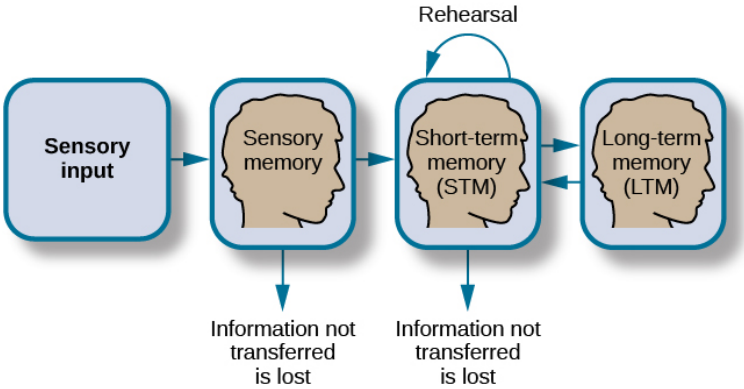

Figure M.6 According to the Atkinson-Shiffrin model of memory, information passes through three distinct stages in order for it to be stored in long-term memory.

TRICKY TOPIC: ATKINSON-SHIFFRIN MODEL OF MEMORY

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For a full transcript of this video, click here

Atkinson and Shiffrin's model is not the only model of memory. Baddeley and Hitch (1974) proposed a working memory model in which short-term memory has different forms. In their model, storing memories in short-term memory is like opening different files on a computer and adding information. The working memory files hold a limited amount of information. The type of short-term memory (or computer file) depends on the type of information received. There are memories in visual-spatial form, as well as memories of spoken or written material, and they are stored in three short-term systems: a visuospatial sketchpad, an episodic buffer (Baddeley, 2000), and a phonological loop. According to Baddeley and Hitch, a central executive part of memory supervises or controls the flow of information to and from the three short-term systems, and the central executive is responsible for moving information into long-term memory.

TRICKY TOPIC: BADDELEY'S MODEL OF WORKING MEMORY

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Sensory Memory

In the Atkinson-Shiffrin model, stimuli from the environment are processed first in **sensory memory**: storage of brief sensory events, such as sights, sounds, and tastes. It is very brief storage—up to a couple of seconds. We are constantly bombarded with sensory information. We cannot absorb all of it, or even most of it. And most of it has no impact on our lives. For example, what was your professor wearing the last class period? Well as long as it wasn't offensive to others, it does not really matter what they were wearing. Sensory information about sights, sounds, smells, and even textures, which we do not view as valuable information, we discard. If we view something as valuable, the information will move into our short-term memory system.

Short-Term Memory

Short-term memory (STM) is a temporary storage system that processes incoming sensory memory. The terms short-term and working memory are sometimes used interchangeably, but they are not exactly the same. Short-term memory is more accurately described as a component of working memory. Short-term memory takes information from sensory memory and sometimes connects that memory to something already in long-term memory. Short-term memory storage lasts 15 to 30 seconds. Think of it as the information you have displayed on your computer screen, such as a document, spreadsheet, or website. Then, information in STM goes to long-term memory (you save it to your hard drive), or it is discarded (you delete a document or close a web browser).

Rehearsal moves information from short-term memory to long-term memory. Active rehearsal is a way of attending to information to move it from short-term to long-term memory. During active rehearsal, you repeat (practice) the information to be remembered. If you repeat it enough, it may be moved into long-term memory. For example, this type of active rehearsal is the way many children learn their ABCs by singing the alphabet song. Alternatively, elaborative rehearsal is the act of linking new information you are trying to learn to existing information that you already know. For example, if you meet someone at a party and your phone is dead but you want

to remember his phone number, which starts with area code 203, you might remember that your uncle Abdul lives in Connecticut and has a 203 area code. This way, when you try to remember the phone number of your new prospective friend, you will easily remember the area code. Craik and Lockhart (1972) proposed the levels of processing hypothesis that states the deeper you think about something, the better you remember it.

You may find yourself asking, "How much information can our memory handle at once?" To explore the capacity and duration of your short-term memory, have a partner read the strings of random numbers (Figure M.7) out loud to you, beginning each string by saying, "Ready?" and ending each by saying, "Recall," at which point you should try to write down the string of numbers from memory.

9754	68259	913825	5316842	86951372	719384273
6419	67148	648327	5963827	51739826	163875942

Figure M.7 Work through this series of numbers using the recall exercise explained above to determine the longest string of digits that you can store.

Note the longest string at which you got the series correct. For most people, the capacity will probably be close to 7 plus or minus 2. In 1956, George Miller reviewed most of the research on the capacity of short-term memory and found that people can retain between 5 and 9 items, so he reported the capacity of

short-term memory was the "magic number" 7 plus or minus 2. Generally, recall is somewhat better for random numbers than for random letters (Jacobs, 1887) and also often slightly better for information we hear (acoustic encoding) rather than information we see (visual encoding) (Anderson, 1969).

Memory trace decay and interference are two factors that affect short-term memory retention. Peterson and Peterson (1959) investigated short-term memory using the three letter sequences called trigrams (e.g., CLS) that had to be recalled after various time intervals between 3 and 18 seconds. Participants remembered about 80% of the trigrams after a 3-second delay, but only 10% after a delay of 18 seconds, which caused them to conclude that short-term memory decayed in 18 seconds. During decay, the memory trace becomes less activated over time, and the information is forgotten. So, we can say that without rehearsal, information is lost from working memory after 18 seconds. However, Keppel and Underwood (1962) examined only the first trials of the trigram task and found that proactive interference also affected short-term memory retention. During proactive interference, previously learned information interferes with the ability to learn new information. Both memory trace decay and proactive interference affect short-term memory. Once the information reaches long-term memory, it has to be consolidated at both the synaptic level, which takes a few hours, and into the memory system, which can take weeks or longer.

Long-term Memory

Long-term memory (LTM) is the continuous storage of information. Unlike short-term memory, long-term memory storage capacity is believed to be unlimited. It encompasses all the things you can remember that happened more than just a few minutes ago. One cannot really consider long-term memory without thinking about the way it is organized. Really quickly, what is the first word that comes to mind when you hear "peanut butter"? Did you think of jelly? If you did, you probably have associated peanut butter and jelly in your mind. It is generally accepted that memories are organized in semantic (or associative) networks (Collins & Loftus, 1975). A semantic network consists of concepts, and as you may recall from what you've learned about memory, concepts are categories or groupings of linguistic information, images, ideas, or memories, such as life experiences. Although individual experiences and expertise can affect concept arrangement, concepts are believed to be arranged hierarchically in the mind (Anderson & Reder, 1999; Johnson & Mervis, 1997, 1998; Palmer, Jones, Hennessy, Unze, & Pick, 1989; Rosch, Mervis, Gray, Johnson, & Boyes-Braem, 1976; Tanaka & Taylor, 1991). Related concepts are linked, and the strength of the link depends on how often two concepts have been associated.

Semantic networks differ depending on personal experiences. Importantly for memory, activating any part of

a semantic network also activates the concepts linked to that part to a lesser degree. The process is known as spreading activation (Collins & Loftus, 1975). If one part of a network is activated, it is easier to access the associated concepts because they are already partially activated. When you remember or recall something, you activate a concept, and the related concepts are more easily remembered because they are partially activated. However, the activations do not spread in just one direction. When you remember something, you usually have several routes to get the information you are trying to access, and the more links you have to a concept, the better your chances of remembering.

There are two types of long-term memory: *explicit* and *implicit* (Figure M.8). Understanding the difference between explicit memory and implicit memory is important because aging, particular types of brain trauma, and certain disorders can impact explicit and implicit memory in different ways. **Explicit memories** are those we consciously try to remember, recall, and report. For example, if you are studying for your chemistry exam, the material you are learning will be part of your explicit memory. In keeping with the computer analogy, some information in your long-term memory would be like the information you have saved on the hard drive. It is not there on your desktop (your short-term memory), but most of the time you can pull up this information when you want it. Not all long-term memories are strong memories, and some memories can only be recalled

using prompts. For example, you might easily recall a fact, such as the capital of the United States, but you might struggle to recall the name of the restaurant at which you had dinner when you visited a nearby city last summer. A prompt, such as that the restaurant was named after its owner, might help you recall the name of the restaurant. Explicit memory is sometimes referred to as declarative memory, because it can be put into words. Explicit memory is divided into episodic memory and semantic memory.

Episodic memory is information about events we have personally experienced (i.e., an episode). For instance, the memory of your last birthday is an episodic memory. Usually, episodic memory is reported as a story. The concept of episodic memory was first proposed about in the 1970s (Tulving, 1972). Since then, Tulving and others have reformulated the theory, and currently scientists believe that episodic memory is memory about happenings in particular places at particular times—the what, where, and when of an event (Tulving, 2002). It involves recollection of visual imagery as well as the feeling of familiarity (Hassabis & Maguire, 2007). **Semantic memory** is knowledge about words, concepts, and language-based knowledge and facts. Semantic memory is typically reported as facts. Semantic means having to do with language and knowledge about language. For example, answers to the following questions like "what is the definition of psychology" and "who was the first

Prime Minister of Canada" are stored in your semantic memory.

Implicit memories are long-term memories that are not part of our consciousness. Although implicit memories are learned outside of our awareness and cannot be consciously recalled, implicit memory is demonstrated in the performance of some task (Roediger, 1990; Schacter, 1987). Implicit memory has been studied with cognitive demand tasks, such as performance on artificial grammars (Reber, 1976), word memory (Jacoby, 1983; Jacoby & Witherspoon, 1982), and learning unspoken and unwritten contingencies and rules (Greenspoon, 1955; Giddan & Eriksen, 1959; Krieckhaus & Eriksen, 1960). Returning to the computer metaphor, implicit memories are like a program running in the background, and you are not aware of their influence. Implicit memories can influence observable behaviours as well as cognitive tasks. In either case, you usually cannot put the memory into words that adequately describe the task. There are several types of implicit memories, including procedural, priming, and emotional conditioning.

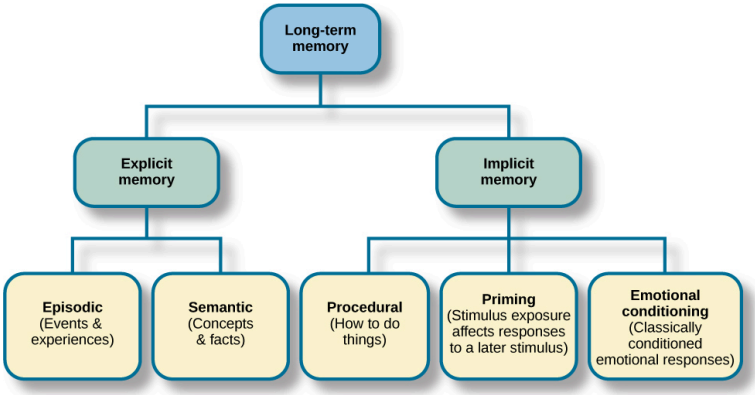

Figure M.8 There are two components of long-term memory: explicit and implicit. Explicit memory includes episodic and semantic memory. Implicit memory includes procedural memory and things learned through conditioning.

Link to Learning

Watch this video that explores the difference between short- and long-term memory and how they're stored.

Implicit **procedural memory** is often studied using observable behaviours (Adams, 1957; Lacey & Smith, 1954; Lazarus & McCleary, 1951). Implicit procedural memory stores information about the way to do something, and it is the memory for skilled actions, such as brushing your teeth, riding a bicycle, or driving a car. You were probably not that good at riding a bicycle or driving a car the first time you tried, but you were much better after doing those things for a year. Your improved bicycle riding was due to learning balancing abilities. You likely *thought* about staying upright in the beginning, but now you just *do* it. Moreover, you probably are good at staying balanced, but cannot tell someone the exact way you do it. Similarly, when you first learned to drive, you probably thought about a lot of things that you just do now without much thought. When you first learned to do these tasks, someone may have told you how to do them, but everything you learned since those instructions that you cannot readily explain to someone else as the way to do it is implicit memory.

Implicit priming is another type of implicit memory (Schacter, 1992). During priming exposure to a stimulus affects the response to a later stimulus. Stimuli can vary and may include words, pictures, and other stimuli to elicit a response or increase recognition. For instance, some people really enjoy picnics. They love going into nature, spreading a blanket on the ground, and eating a delicious meal. Now, unscramble the following letters to make a word.

AETPL

What word did you come up with? Chances are good that it was "plate."

Had you read, "Some people really enjoy growing flowers. They love going outside to their garden, fertilizing their plants, and watering their flowers," you probably would have come up with the word "petal" instead of plate.

Do you recall the earlier discussion of semantic networks? The reason people are more likely to come up with "plate" after reading about a picnic is that plate is associated (linked) with picnic. Plate was primed by activating the semantic network. Similarly, "petal" is linked to flower and is primed by flower. Priming is also the reason you probably said jelly in response to peanut butter.

Implicit emotional conditioning is the type of memory involved in classically conditioned emotion responses (Olson & Fazio, 2001). These emotional relationships cannot be reported or recalled but can be associated with different stimuli. For example, specific smells can cause specific emotional responses for some people. If there is a smell that makes you feel positive and nostalgic, and you don't know where that response comes from, it is an implicit emotional response. Similarly, most people have a song that causes a specific emotional response. That song's effect could be an implicit emotional memory (Yang, Xu, Du, Shi, & Fang, 2011).

Everyday Connection

Can You Remember Everything You Ever Did or Said?

Episodic memories are also called autobiographical memories. Let's quickly test your autobiographical memory. What were you wearing exactly five years ago today? What did you eat for lunch on April 10, 2009? You probably find it difficult, if not impossible, to answer these questions. Can you remember every event you have experienced over the course of your life—meals, conversations, clothing choices, weather conditions, and so on? Most likely none of us could even come close to answering these questions; however, American actress Marilu Henner, best known for the television show *Taxi,* can remember. She has an amazing and highly superior autobiographical memory (Figure M.9).

Figure M.9 Marilu Henner's super autobiographical memory is known as hyperthymesia. (credit: Mark Richardson)

Very few people can recall events in this way; right now, fewer than 20 have been identified as having this ability, and only a few have been studied (Parker, Cahill & McGaugh 2006). And although hyperthymesia normally appears in adolescence, two children in the United States appear to have memories from well before their tenth birthdays.

Link to Learning

Watch this video about superior autobiographical memory from the show *60 Minutes*, to learn more.

Retrieval

So you have worked hard to encode (via effortful processing) and store some important information for your upcoming final exam. How do you get that information back out of storage when you need it? The act of getting information out of memory storage and back into conscious awareness is known as **retrieval**. This would be similar to finding and opening a paper you had previously saved on your computer's hard drive. Now it's back on your desktop, and you can work with it again. Our ability to retrieve information from long-term memory is vital to our everyday functioning. You must be able to retrieve information from memory in order to do everything from knowing how to brush your hair and teeth, to driving to work, to knowing how to perform your job once you get there.

There are three ways you can retrieve information out of your long-term memory storage system: recall, recognition, and relearning. **Recall** is what we most often think about when we talk about memory retrieval: it means you can access information without cues. For example, you would use recall for an essay test. **Recognition** happens when you identify information that you have previously learned after encountering it again. It involves a process of comparison. When you take a multiple-choice test, you are relying on recognition to help you choose the correct answer. Here is another example. Let's say you graduated from high school 10 years ago, and you have returned to your hometown for your 10-year reunion. You may not be able to recall all of your classmates, but you recognize many of them based on their yearbook photos.

The third form of retrieval is **relearning**, and it's just what it sounds like. It involves learning information that you previously learned. Jaylin took French in high school, but after high school they did not have the opportunity to speak French. Jaylin is now 31, and the company they work for has offered Jaylin an opportunity to work in their Montreal office. In order to prepare, Jaylin enrolls in a French course at the local community centre. Jaylin is surprised at how quickly they're able to pick up the language after not speaking it for 13 years; this is an example of relearning.

51.

SPATIAL MEMORY

Learning Objectives

By the end of this section, you will be able to:

- Define spatial memory and discuss its function
- Describe how spatial memory techniques can enhance memorization
- Describe strategies used to study spatial memory in humans and non-human animals

An important job of our memory systems is to keep track of locations where our experiences happen; they act as anchors for our personal memories. Consider this: all of your cherished personal memories happened in a particular place and it's

difficult to imagine the event without it. In order to recall a location later, it must be encoded quickly at the time an event is happening, along with many other details you'll need in order to recall the experience later. Because we're mobile creatures, the places where memories happen are constantly changing so our memory systems are designed to create mental maps quickly. Not only is spatial memory encoded quickly, it's also quite accurate. The image below was drawn from memory by Shanawdithit, an Indigenous woman who was the last known survivor of the Beothuk peoples, an Indigenous population who formerly inhabited territory now known as Newfoundland and Labrador (Canada; Figure M.10). Although Shanawdithit had no prior experience with pen and paper, she was able to recreate the physical space with detailed accuracy using her memory.

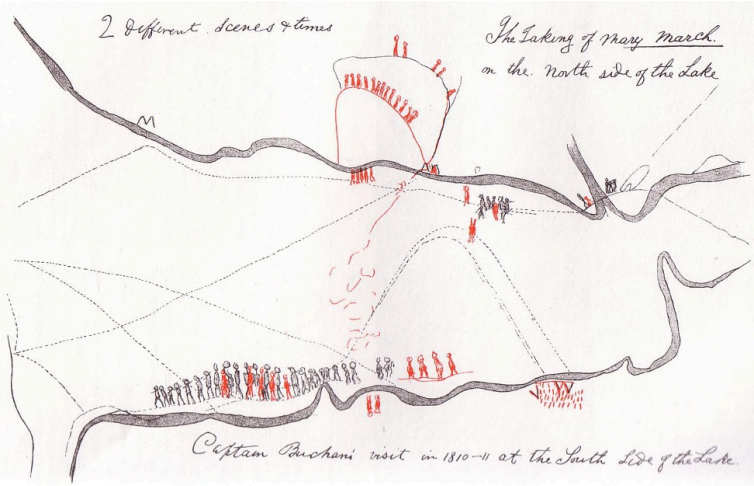

Figure M.10 Depiction of the kidnapping of Indigenous (Beothuk) woman Demasduwit (Mary March) in 1829, drawn by her niece Shanawdithit (Nancy April) in territory now known as Newfoundland and Labrador (Canada). Note that her captors refer to this event as the "taking" of Demasduwit with no mention that her husband was murdered in the altercation. (Image credit: Shanawdithit, Vanished Peoples: The Archaic Dorset & Beothuk People of Newfoundland, Peter Such. ISBN 0919600840)

Our cognitive map-making abilities are the basis of some tried and true memory enhancing techniques. The method of loci approach, or memory palace, was used by the ancient Greeks and Romans to remember long speeches. To do this, the individual forms mental images of words or objects and places them in specific locations along a familiar route. To retrieve this information, the individual takes a mental stroll through the familiar space. Memory contest champions use this

technique, which can be easily mastered with some practice. In fact, after covering the American Memory Championship as a journalist, Joshua Foer practiced this and other memory techniques and returned to win the competition the following year (Foer, 2011). A study of undergraduates showed an improvement in word list recall after they learned the memory palace technique from Foer's book as part of the course (McCabe, 2015).

An even older spatial memory technique used by Indigenous populations living in Australia (i.e., Aboriginal peoples living in Australia) involves creating a story in an actual physical space, using elements in the environment as part of the narrative. Among Aboriginal populations living in Australia, these stories tend to remarkably remain consistent over decades and centuries. Likely, because the stories are diligently learned, protected and "passed down" by Aboriginal Elders (Sveiby & Skuthorpe, 2006). One study compared this Aboriginal spatial memory technique to the memory palace technique as a way for medical students to learn the cellular reactions of the tricarboxylic acid cycle (Reser et al., 2021). Students who were guided by an Indigenous Educator through a landscape-based narrative outperformed those who were taught the memory palace technique and untrained controls (Figure M.11). These results show that the incorporation of spatial memory skills into education could help improve memorization, because they take advantage of

our natural ability for encoding and storing spatial information.

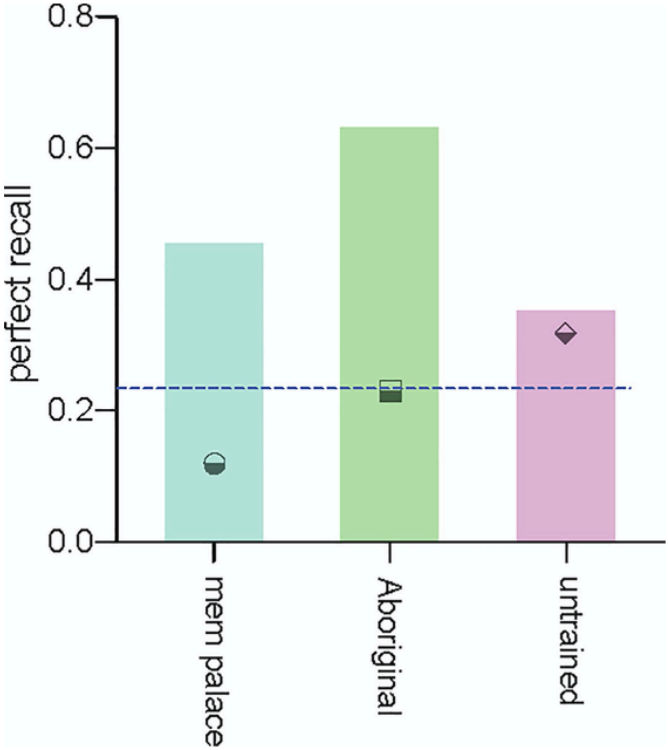

Figure M.11 Proportion of participants with perfect recall after learning the memory palace, Aboriginal place-based narrative, or untrained controls. The dashed lined indicates baseline performance. (From Reser et al., 2021).

Non-human animals also rely on spatial memory for their survival, tasks like finding food and escaping dangers are critically dependent upon knowledge of the physical environment. Edward Tolman and colleagues demonstrated

the existence of mental maps in rats in the 1930's with a simple experiment. They tested performance on a complex maze every day for three weeks under three different conditions: no food reward, food reward, and food reward after day 10. On day 11, the rats who received food for the first time showed performance similar to those rewarded food every day (Figure M.12). These findings suggest that, even though these rats were not rewarded from days 1-10, they created a mental map of space that they could use when needed, a phenomenon known as *latent learning* (Tolman, 1948). Although this latent learning task was useful in showing that rodents use mental maps, other tests are better suited to measuring spatial learning and memory in animals.

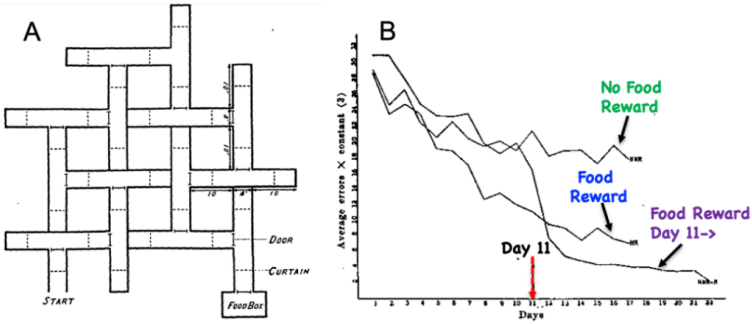

Figure M.12 A) Complex maze used in Tolman's latent learning experiment. B) Average errors per day over for rats given no food reward, food reward, and delayed food reward. (From Tolman, 1948)

The most commonly used measure of spatial memory in laboratory rodents is the Morris Water Maze, developed by

Scottish neuroscientist Richard Morris. It's simply a pool filled with opaque water with a platform just underneath the surface. Rodents don't like swimming, so they instinctively search for a way out and eventually find the platform to escape from the water. On subsequent trials, they usually swim straight to the location of the platform. Spatial learning can be measured by escape time or path length, with shorter times and distances indicating better performance (Vorhees & Williams, 2014l; Figure M.13). This test has been crucial in revealing factors that inhibit spatial memory, like brain injuries or drugs like alcohol, and those that enhance memory, such as exercise and environmental enrichment. Laboratory mice living in enriched conditions with nesting materials, toys, and running wheels show shorter swim paths than those housed under standard laboratory conditions (Kempermann et al, 1997, Figure X.X).

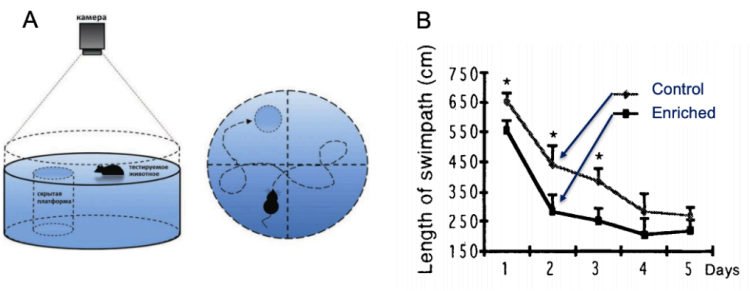

Figure M.13 A) Morris water maze used to test spatial learning and memory in laboratory rodents. B) Mice living in enriched environments show shorter swim paths to a hidden platform compared to controls (from Kempermann et al, 1997).

TRICKY TOPIC: SPATIAL MEMORY

One or more interactive elements has been excluded from this version of the text. You can view them online here: https://caul-cbua.pressbooks.pub/intropsychneuro/?p=453#oembed-1

If the video above does not load, click here: https://youtu.be/7IV3ySuJ8mQ
For a full transcript of this video, click here

52.

FORGETTING AND MEMORY ERRORS

Learning Objectives

By the end of this section, you will be able to:

- Compare and contrast different types of amnesia
- Discuss factors that affect the reliability of eyewitness testimony
- Discuss encoding failure
- Discuss the various memory errors
- Compare and contrast the different types of interference

"I've a grand memory for forgetting," quipped author Robert Louis Stevenson. **Forgetting** refers to loss of information from long-term memory. In 1885, German psychologist Hermann Ebbinghaus studied forgetting by memorizing lists of nonsense syllables and measuring how many words he remembered when he attempted to relearn each list. He compared memory performance over different delay periods, from 20 minutes to 30 days later. The result is his famous forgetting curve (Figure M.14) showing that information fades with the passage of time. An average person will lose 50% of the memorized information after 20 minutes and 70% after 24 hours (Ebbinghaus, 1885-1964). Memory for new information decays quickly and then eventually levels out. But why do we forget? To answer this question, we will look at several perspectives on forgetting.

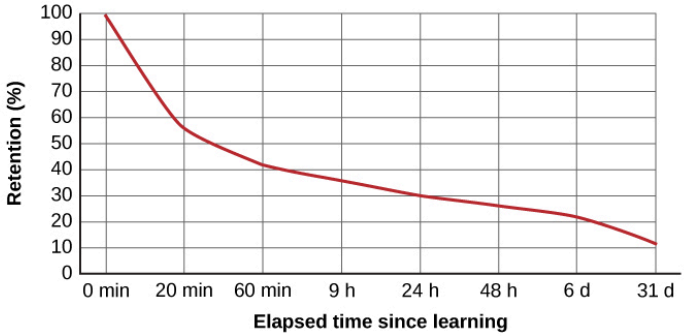

Figure M.14 The Ebbinghaus forgetting curve shows how quickly memory for new information decays.

Schacter and the Seven Sins of Memory

There are many theories explaining different types of memory, but there aren't as many theories about types of forgetting. Memory researcher Daniel Schacter attempted to organize memory errors into a unified framework in his book, The Seven Sins of Memory (2001). Schacter presents these as a list of seven "sins," falling into one of two categories: errors of omission, involving failures of recall, and errors of commission, where recall is distorted or unwanted (Table M.1).

Table M.1 Schacter's Seven Sins of Memory

Sin	Type	Description	Example
Transience	Forgetting	Accessibility of memory decreases over time	Forget events that occurred long ago
absentmindedness	Forgetting	Forgetting caused by lapses in attention	Forget where your phone is
Blocking	Forgetting	Accessibility of information is temporarily blocked	Tip of the tongue
Misattribution	Distortion	Source of memory is confused	Recalling a dream memory as a waking memory
Suggestibility	Distortion	False memories	Result from leading questions
Bias	Distortion	Memories distorted by current belief system	Align memories to current beliefs
Persistence	Intrusion	Inability to forget undesirable memories	Traumatic events

Let's look at the first sin: **transience**, which means that memories can fade over time, as demonstrated by Ebbinghaus'

forgetting curve for nonsense syllables (Figure M.13). Information that's stored but not used is vulnerable to this type of forgetting. Consider this real life example: Nathan's English teacher has assigned students to read the novel *To Kill a Mockingbird*. He tells his mom he has to read this book for class and she says, "Oh, I loved that book!" Nathan asks her what the book is about, and after some hesitation she says, "Well, I know I read the book in high school, and I remember that one of the main characters is named Scout, and her father is an lawyer, but I honestly don't remember anything else." Nathan wonders if his mother actually read the book, and his mother is surprised she can't recall the plot. What is going on here is *storage decay*: unused information tends to fade with the passage of time.

Are you constantly losing your phone? Have you ever returned home to make sure you locked the door? Have you ever walked into a room for something but forgotten what it was? You probably answered yes to at least one, if not all, these examples—but don't worry, you are not alone. We are all prone to committing the memory error known as **absentmindedness**, which describes lapses in memory caused by breaks in attention or our focus being elsewhere. Insufficient attention when we are first learning something can result in encoding failure. We can't remember something if we never stored it in our memory in the first place. For some types of information, we use effortful encoding in order to remember something, where we pay attention to the details

and actively work to process the information. However, many times we don't do this. Think of how many times in your life you've seen a Canadian one-dollar coin. Can you accurately recall what the front of a Loonie looks like? Can you sketch it accurately? Probably not and the most likely reason is due to an **encoding failure**. Most of us never encode the details of the coin, we only encode enough information to be able to distinguish it from other coins. If we don't encode the information, then it's not in our long-term memory, so we will not be able to remember it.

Schachter's third sin of omission is **blocking**: an inability to access stored information. "I just streamed this movie called Oblivion, and it had that famous actor in it. Oh, what's his name? He's been in all of those movies, like The Shawshank Redemption and The Dark Knight trilogy. I think he's even won an Oscar. Oh gosh, I can picture his face in my mind, and hear his distinctive voice, but I just can't think of his name! This is going to bother me until I can remember it!" This particular error can be so frustrating because you have the information right on the tip of your tongue. (Figure M.15).

Figure M.15 Blocking is also known as tip-of-the-tongue (TOT) phenomenon. The memory is right there, but you can't seem to recall it, just like not being able to remember the name of that very famous actor, Morgan Freeman. (credit: modification

of work by D. Miller)

Now let's take a look at the errors of commission: **misattribution** happens when you confuse the source of your information. Let's say Alejandra was dating Lucia and they saw the first Hobbit movie together. Then they broke up and Alejandra saw the second Hobbit movie with someone else. Later that year, Alejandra and Lucia get back together. One day, they are discussing how the Hobbit books and movies are different and Alejandra says to Lucia, "I loved watching the second movie with you and seeing you jump out of your seat during that super scary part." When Lucia responded with a puzzled look, Alejandra realized she'd committed the error of misattribution.

Schachter's second error of commission is **suggestibility**, when inaccurate information is incorporated into the memory during recall. This is similar to misattribution, since it also involves memory distortion, however with misattribution you create a false memory entirely on your own, while with suggestibility, it comes from outside the individual. From time to time, we're all vulnerable to the power of suggestion, in fact the way a question is asked can alter the memory of the requested information. For example, imagine you are in elementary school and you just witnessed a fight outside between two of your male classmates. After hearing of the incident, a teacher asks you questions such as: "How hard did he hit him? Who swung first? Did either of them try to run

away?" Notice the use of descriptive language as the teacher is asking the student questions. This is important as descriptive language can influence the way in which memories are recalled.

Bias is when our current beliefs distort memory of past events. There are several types of bias:

- **Stereotypical bias** involves racial and gender biases. For example, when Asian American and European American research participants were presented with a list of names, they more frequently incorrectly remembered typical African American names such as Jamal and Tyrone to be associated with the occupation basketball player, and they more frequently incorrectly remembered typical Caucasian names such as Greg and Howard to be associated with the occupation of politician (Payne, Jacoby, & Lambert, 2004).
- **Egocentric bias** involves enhancing our memories of the past (Payne et al., 2004). Imagine you are playing in the final game of the national championship with your soccer team. The score is tied up with only a minute left on the clock. You have the ball and are running down the wing, taking a shot outside the box and you score the goal, top-corner. After the game you brag about your game-winning shot to your brother who wasn't at the game, and he says: "Huh? My friend told me it was actually a lucky goal as it deflected off a player and the wind caught it." This is an example of egocentric bias

since the individual who scored enhanced the memory of the goal compared to the reality of the goal.

- **Hindsight bias** happens when we think an outcome was inevitable after the fact. This is the "I knew it all along" phenomenon. The reconstructive nature of memory contributes to hindsight bias (Carli, 1999). We remember untrue events that seem to confirm that we knew the outcome all along. An experiment by Fischhoff and Beyth (1975) asked participants to estimate the probabilities of outcomes occurring prior to Richard Nixon's trip to China and the U.S.S.R. in 1972. Later, participants were asked to complete the same questionnaire remembering the probability they had given while also answering whether the outcome in question had occurred or not. They found that following events, participants were rarely surprised by the outcomes which they reported had occurred and that this effect was larger the more time had passed. Studies such as this demonstrate how we tend to overestimate our ability to make predictions about whether given events will occur.

Have you ever had a song play over and over in your head? How about a memory of a traumatic event, something you really do not want to think about? When you keep remembering something, to the point where you can't "get it out of your head" and it interferes with your ability to

concentrate on other things, it is called **persistence**, Schacter's seventh and last memory error. It's a failure of our memory system because we involuntarily recall unwanted memories, particularly unpleasant ones (Figure M.16). For instance, you witness a horrific car accident on the way to work one morning, and you can't concentrate on work because you keep remembering the scene.

Figure M.16 Many veterans of military conflicts involuntarily recall unwanted, unpleasant memories. (credit: Department of Defense photo by U.S. Air Force Tech. Sgt. Michael R. Holzworth)

Memory Construction and Reconstruction

The formulation of new memories is sometimes

called **construction**, and the process of bringing up old memories is called **reconstruction**. Yet as we retrieve our memories, we also tend to alter and modify them. A memory pulled from long-term storage into short-term memory is flexible. New events can be added, and we can change what we think we remember about past events, resulting in inaccuracies and distortions. People may not intend to distort facts, but it can happen in the process of retrieving old memories and combining them with new memories (Roediger & DeSoto, 2015).

Eyewitness Testimony

Police officers, prosecutors, and the courts often rely on eyewitness identification and testimony in the prosecution of criminals. However, faulty eyewitness identification and testimony can lead to wrongful convictions (Figure M.17).

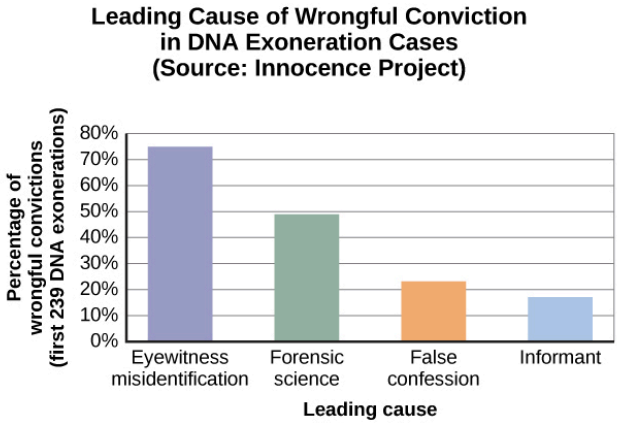

Figure M.17 In studying cases where DNA evidence has exonerated people from crimes, the Innocence Project discovered that eyewitness misidentification is the leading cause of wrongful convictions (Benjamin N. Cardozo School of Law, Yeshiva University, 2009).

Dig Deeper

Preserving Eyewitness Memory: The Elizabeth Smart Case

When Elizabeth Smart was 14 years old and fast asleep in her bed at home, she was abducted at

knifepoint. Her nine-year-old sister, Mary Katherine, was sleeping in the same bed and watched, terrified, as her beloved older sister was abducted. Mary Katherine was the sole eyewitness to this crime and was very fearful. In the coming weeks, the Salt Lake City police and the FBI proceeded with caution with Mary Katherine. They did not want to implant any false memories or mislead her in any way. They did not show her police line-ups or push her to do a composite sketch of the abductor. They knew if they corrupted her memory, Elizabeth might never be found. For several months, there was little or no progress on the case. Then, about 4 months after the kidnapping, Mary Katherine first recalled that she had heard the abductor's voice prior to that night (he had worked exactly one day as a handyman at the family's home) and then she was able to name the person whose voice it was. The family contacted the press and others recognized him—after a total of nine months, the suspect was caught and Elizabeth Smart was returned to her family.

The Misinformation Effect

Cognitive psychologist Elizabeth Loftus has conducted

extensive research on memory. She has studied **false memories** and developed the **misinformation** effect paradigm, which holds that after exposure to additional and possibly inaccurate information, a person may misremember the original event.

According to Loftus, an eyewitness's memory of an event is very flexible due to the misinformation effect. To test this theory, Loftus and John Palmer (1974) asked 45 U.S. college students to estimate the speed of cars using different forms of questions (Figure M.18). The participants were shown films of car accidents and were asked to play the role of the eyewitness and describe what happened. They were asked, "About how fast were the cars going when they (smashed, collided, bumped, hit, contacted) each other?" The participants estimated the speed of the cars based on the verb used.

Participants who heard the word "smashed" estimated that the cars were traveling at a much higher speed than participants who heard the word "contacted." The implied information about speed, based on the verb they heard, had an effect on the participants' memory of the accident. In a follow-up one week later, participants were asked if they saw any broken glass (none was shown in the accident pictures). Participants who had been in the "smashed" group were more than twice as likely to indicate that they did remember seeing glass. Loftus and Palmer demonstrated that a leading question encouraged them to not only remember the cars were going faster, but to also falsely remember that they saw broken glass.

False memories like these can be influenced by question wording without us even realizing it. For instance,"What shade of pink was the dress in the window?" presupposes that there was a dress in the window AND it was pink. When asked a retrieval question like this, one's memory is biased towards these "facts."

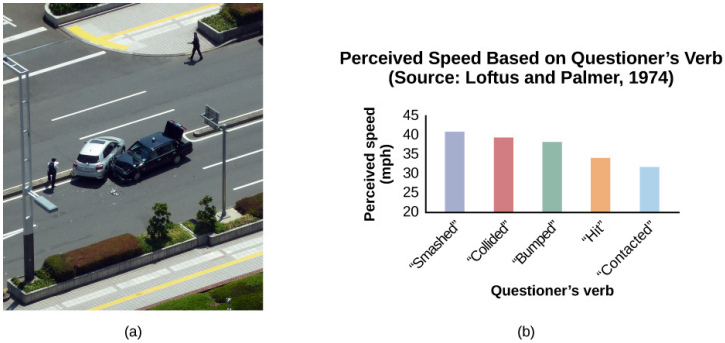

Figure M.18 When people are asked leading questions about an event, their memory of the event may be altered. (credit a: modification of work by Rob Young)

Ever since Loftus published her first studies on the suggestibility of eyewitness testimony in the 1970s, social scientists, police officers, therapists, and legal practitioners have been aware of the flaws in interview practices. Consequently, steps have been taken to decrease suggestibility of witnesses. One way is to modify how witnesses are questioned. When interviewers use neutral and less leading

language, children more accurately recall what happened and who was involved (Goodman, 2006; Pipe, 1996; Pipe, Lamb, Orbach, & Esplin, 2004). Another change is in how police lineups are conducted. It's recommended that a blind photo lineup be used. This way the person administering the lineup doesn't know which photo belongs to the suspect, minimizing the possibility of giving leading cues. Additionally, judges in some American states now inform jurors about the possibility of misidentification. Judges can also suppress eyewitness testimony if they deem it unreliable.

Interference

Sometimes information is stored in our memory but for some reason it is inaccessible. This is known as interference and there are two types: **proactive interference** and **retroactive interference** (Figure M.19). Have you ever gotten a new phone number or moved to a new address but yet continue to give people the old (and wrong) phone number or address? When the new year starts do you find you accidentally write the previous year? These are examples of proactive interference: when old information hinders the recall of newly learned information. Retroactive interference happens when information learned more recently hinders the recall of older information. For example, this week you are studying about memory and learn about the Ebbinghaus forgetting curve. Next week you study lifespan development and learn about

Erikson's theory of psychosocial development but thereafter have trouble remembering Ebbinghaus's work because you can only remember Erickson's theory.

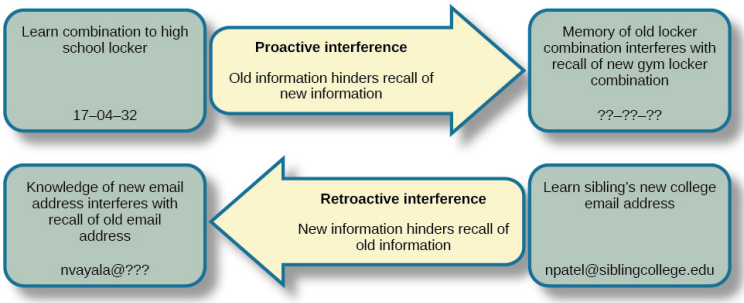

Figure M.19 Sometimes forgetting is caused by a failure to retrieve information. This can be due to interference, either retroactive or proactive.

Amnesia

Amnesia is the loss of long-term memory that occurs as the result of disease, injury, or trauma. Endel Tulving (2002) and his colleagues at the University of Toronto studied patient K.C., who suffered a traumatic head injury in a motorcycle accident. Tulving writes:

> "The outstanding fact about K.C.'s mental make-up is his utter inability to remember any events, circumstances, or situations from his own life. His episodic amnesia covers his whole life, from birth to the present. The only

exception is the experiences that, at any time, he has had in the last minute or two." (Tulving, 2002, p. 14)

Figure M.20 This diagram illustrates the timeline of retrograde and anterograde amnesia. Memory problems that extend back in time before the injury and prevent retrieval of information previously stored in long-term memory are known as retrograde amnesia. Conversely, memory problems that extend forward in time from the point of injury and prevent the formation of new memories are called anterograde amnesia.

The first type of amnesia is **anterograde amnesia** (Figure M.20), which refers to the inability to remember new information, although you can remember information and events that happened prior to your injury. Many people with this form of amnesia are unable to form new episodic or semantic memories but are still able to form new procedural (remember implicit) memories (Bayley & Squire, 2002). This was true of patient H.M. as the brain damage caused by his surgery resulted in anterograde amnesia. H.M. would read the same magazine over and over, having no memory of ever reading it—it was always new to him. He also could not remember people he had met after his surgery. If you were

introduced to H.M. and then you left the room for a few minutes, he would not know you upon your return and would introduce himself to you again. However, when presented the same puzzle several days in a row, although he did not remember having seen the puzzle before, his speed at solving it became faster each day (because of relearning) (Corkin, 1965; 1968).

Retrograde amnesia is loss of memory for events that occurred prior to the trauma. People with retrograde amnesia often have difficulty remembering their past episodic memories. What if you woke up in the hospital one day and there were people surrounding your bed claiming to be your spouse, your children, and your parents but you don't recognize any of them? You were in a car accident, suffered a head injury, and now have retrograde amnesia and don't remember anything about your life before waking up in the hospital. Hollywood has been fascinated with the amnesia plot for nearly a century, going all the way back to the film *Garden of Lies* from 1915 to more recent movies such as the Jason Bourne spy thrillers. However, for real-life sufferers of retrograde amnesia, like former NFL football player Scott Bolzan, the story is not a Hollywood movie. Bolzan fell, hit his head, and deleted 46 years of his life in an instant. He is now living with one of the most extreme cases of retrograde amnesia on record.

Link to Learning

Watch this story about Scott Bolzan's amnesia and his attempts to get his life back, to learn more.

53.

MEMORY AND THE BRAIN

Learning Objectives

By the end of this section, you will be able to:

- Describe the role of brain regions in different types of memory
- Describe how neurons store memory
- Discuss the role of specific neurotransmitters in memory

Where are memories stored? Karl Lashley began exploring this problem about 100 years ago, by making lesions in the brains of non-human animals. He was searching for evidence of the

engram: the group of neurons that serve as a physical memory trace (Josselyn, 2010). First, Lashley trained rats to find their way through a maze, and then he created lesions in the cerebral cortex to try and erase the memory trace that the rats had of the maze. He didn't find evidence of the engram since the rats were still able to find their way, regardless of the size or location of the lesion. Based on these findings, he formulated the **equipotentiality hypothesis**: if part of one area of the brain involved in memory is damaged, another part of the same area can take over that memory function (Lashley, 1950). Although Lashley failed to find evidence of the engram, he is considered a pioneer in the field of neuroscience.

Since Lashley's research, other scientists have been able to look more closely at the role of the brain in memory. They have argued that memory processes recruit distinct brain areas, and specific neurons can be recognized for their involvement in forming memories. Although the entire brain is involved in memory in some way or another, we'll focus on some key players: the hippocampus, amygdala, cerebellum, and prefrontal cortex (Figure M.21).

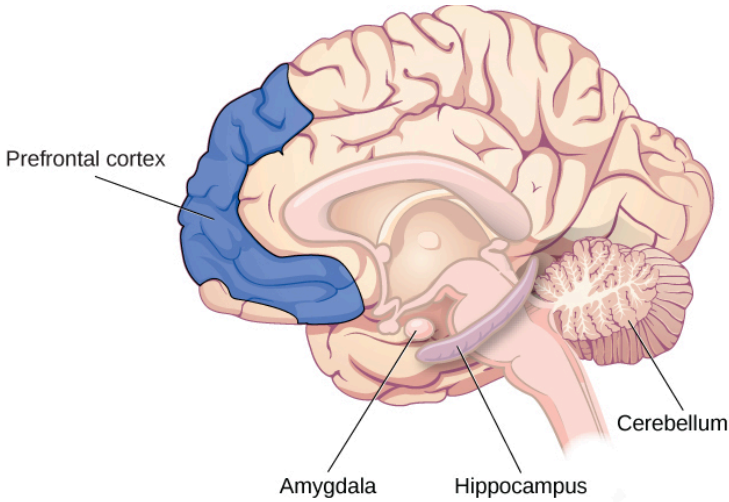

Figure M.21 The amygdala has an important role in emotional memories, the hippocampus is involved in encoding declarative and episodic memory. The cerebellum is important in processing procedural memories, and the prefrontal cortex is important in working memory.

Hippocampus

Experimental surgeries conducted on humans in the 1900s have taught us that memory is indeed tied to discrete brain regions. One famous example is Patient HM, who underwent a temporal lobectomy and had his anterior hippocampus, parahippocampal gyrus, and amygdala removed (for a refresher on HM, check out the Intro section). After his surgery, he couldn't create any new explicit memories but still had his early-life memories and the ability to learn new procedural tasks (Milner, 2005; Scoville, 1954). Thanks to HM, we have

learned that the medial temporal lobes are involved in explicit memory formation but are not involved in implicit learning or memory storage.

Much of what we know about the role of the brain in human memory is the result of studying people with severe brain injuries. However, it is difficult to pinpoint the exact function of a brain region when multiple areas are damaged. Researchers are better able to make precise lesions in non-human animals to understand the role of specific brain areas. However, this presents a challenge: you can't ask a rat to recall facts about their childhood like you can with HM Instead, researchers use tasks like mazes in combination with lesions or sham surgeries to test memory, such as the Morris water maze. A **sham surgery** is when the control group undergoes an imitation of the surgery but does not receive the procedure itself. Researchers first train animals, usually rats or mice, to swim to hidden underwater platforms. Then, they're lesioned in specific areas and retested to see if they can remember the platform's location. They have no issues finding the platform if they learned the location before hippocampal damage but struggle to learn the platform's location if lesioned before training. This shows that the hippocampus is critical in spatial memory formation (Steffenach et al., 2002) (Figure M.22).

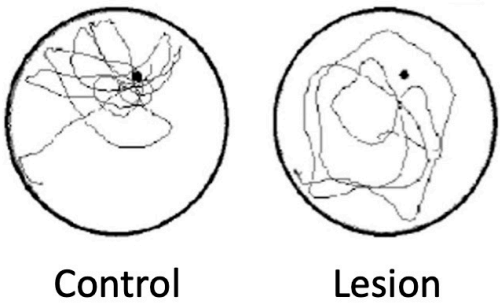

Figure M.22 Impaired memory retention in a Morris water maze after sham surgery (control) or lesion to the hippocampus. If surgery occurred before training, the lesioned animals struggled to find the hidden platform and spent less time in the correct quadrant. The black dot indicates the hidden platform (source Steffenach et al.,2002, altered).

The opportunity to study people like HM is rare since it's unethical to inflict brain damage on humans solely for the purposes of research. Instead, researchers use neuroimaging and spatial memory tasks as techniques to understand the brain. For example, to check that water mazes used with rodents can model the same systems in humans, a research team from McGill University conducted a virtual water maze experiment on ten human patients who had undergone unilateral hippocampal removal surgery to treat incurable epilepsy, like HM. Two control groups were used; healthy people with no surgery history and those who underwent

tumour removal surgery. The tumour removal group had normal, non-damaged hippocampi. First, all volunteers underwent "hidden platform" training, where they could not see the platform and had to practice trying to find it. Then they went through "visible platform training," where they could see the platform and had to swim toward it. In the visible condition, everyone swam toward the platform equally well. However, when the platform was hidden, the hippocampal removal group were slower to find the platform and spent less time in the correct quadrant of the pool (Figure M.23) (Astur et al., 2002).

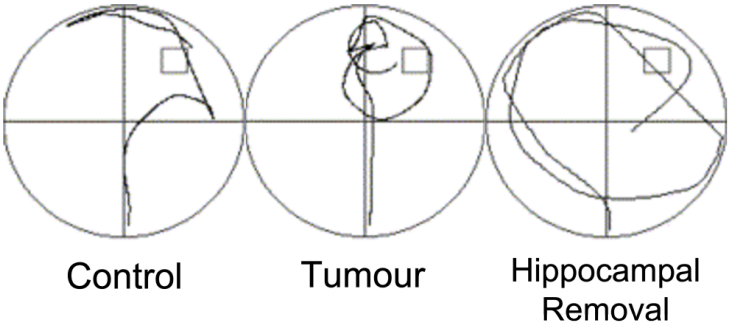

Figure M.23 The average virtual swim path towards the hidden platform after being trained to swim to the visible platform. The small square indicates the hidden platform. (source: Astur et al., 2002, altered)

Substances like cannabis affect the hippocampus and our ability to form spatial memories. For example, long-term, regular cannabis usage in humans has been shown to cause a

decrease in hippocampus size, volume, and integrity (Yucel et al., 2016). In addition, studies in rats have shown that THC, the psychoactive ingredient in cannabis, produces memory impairments similar to the effects of hippocampal lesions, causing poorer performance in tasks that require spatial memory (Hampson & Deadwyler, 1998).

TRICKY TOPIC: HIPPOCAMPUS & MEMORY

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For a full transcript of this video, click here

Amygdala

Why are some types of memory easier to remember than others? For example, why are emotionally arousing memories like your first kiss or your pet passing away easier to remember

than your breakfast last week? Emotions provide a "boost" to our memory, but how? Neuroimaging studies show that the amygdala becomes highly active when viewing emotionally stimulating events. For example, one study had participants watch emotionally negative film clips, such as violent crime, and emotionally neutral ones, like court proceedings. Recall was better for emotional films and was positively correlated with amygdala activation, as measured by PET imaging (Cahill et al., 1996) (Figure M.24).

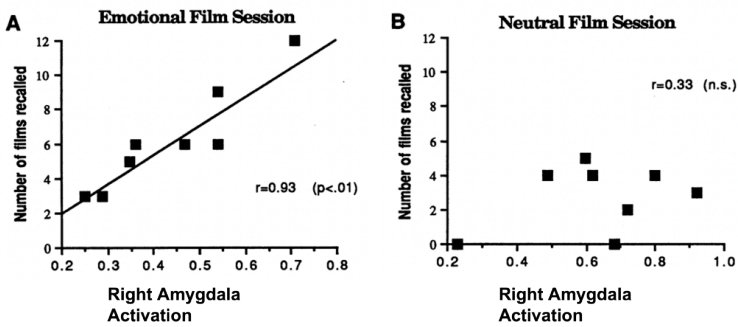

Figure M.24 Scatterplots of right amygdala activation relative to the number of films recalled for both the emotional (A) and neutral film sessions (B). (source: Cahill et al., 1996, altered)

The Cerebellum and Prefrontal Cortex

The hippocampus is important for laying down certain types of explicit memories, but its absence doesn't affect the ability to create implicit memories, such as procedural memory,

motor learning, and classical conditioning, thanks to your cerebellum (Figure M.21). For example, one classical conditioning experiment involves training subjects to blink when given a puff of air to the eye. However, when researchers damaged the cerebellum of rabbits, they discovered that they were not able to learn the conditioned eye-blink response (Steinmetz, 1999; Green & Woodruff-Pak, 2000).

Other researchers have used brain scans, including positron emission tomography (PET) scans, to learn how people process and retain information. From these studies, it seems the prefrontal cortex is involved. For example, in one study, participants had to complete two different tasks: either looking for the letter a in words (considered a perceptual task) or categorizing a noun as either living or non-living (considered a semantic task) (Kapur et al., 1994). Participants were then asked which words they had previously seen. Recall was much better for the semantic task than for the perceptual task. According to PET scans, there was much more activation in the left inferior prefrontal cortex in the semantic task. In another study, encoding was associated with left frontal activity, while information retrieval was associated with the right frontal region (Craik et al., 1999).

TRICKY TOPIC: BIOLOGICAL BASIS OF MEMORY

One or more interactive elements has been excluded from this version of the text. You can view them online here: https://caul-cbua.pressbooks.pub/intropsychneuro/?p=455#oembed-2

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For a full transcript of this video, click here

Neurotransmitters

Why does our memory sometimes fail us? The answer often lies in our neurochemistry. Researchers have found that memory relies heavily on certain neurotransmitters, such as acetylcholine. Degeneration (death) of acetylcholine neurons has been implicated in Alzheimer's disease, a neurodegenerative disease that causes progressive cognitive decline, including severe memory deficits. Drugs that increase synaptic levels of acetylcholine are in development and have been shown to minimally improve cognitive symptoms and enhance the quality of life (Ferreira-Vieira et al.,

2016).Glutamate is the most common excitatory neurotransmitter in the brain, and its action at some receptors in the brain is involved in memory formation. For example, glutamate's action at the NMDA-type receptor is involved in synaptic plasticity through a process called long-term potentiation, or LTP (Bliss & Lomo, 1973; Riedel et al., 2003). In rats, if glutamate's actions are blocked in the hippocampus during a water maze task, LTP is blocked and the rat is unable to form spatial memories (Teather et al., 2001).

54.

WAYS TO ENHANCE MEMORY

Learning Objectives

By the end of this section, you will be able to:

- Recognize and apply memory-enhancing strategies
- Recognize and apply effective study strategies

Most of us suffer from memory failures of one kind or another, and most of us would like to improve our memories so that we don't forget where we put the car keys or, more importantly, the material we need to know for an exam. In this section, we'll

look at some ways to help you remember better, and at some strategies for more effective studying.

Memory-Enhancing Strategies

What are some everyday ways we can improve our memory, including recall? To help make sure information goes from short-term memory to long-term memory, you can use **memory-enhancing strategies**. One strategy is rehearsal, or the conscious repetition of information to be remembered (Craik & Watkins, 1973). Think about how you learned your multiplication tables as a child. You may recall that 6 x 6 = 36, 6 x 7 = 42, and 6 x 8 = 48. Memorizing these facts is rehearsal.

Another strategy is **chunking**: you organize information into manageable bits or chunks (Bodie, Powers, & Fitch-Hauser, 2006). Chunking is useful when trying to remember information like dates and phone numbers. Instead of trying to remember 5205550467, you remember the number as 520-555-0467. So, if you met an interesting person at a party and you wanted to remember his phone number, you would naturally chunk it, and you could repeat the number over and over, which is the rehearsal strategy.

Link to Learning

Try this quick activity that demonstrates a memory-enhancing strategy to learn more.

You could also enhance memory by using **elaborative rehearsal**: a technique in which you think about the meaning of new information and its relation to knowledge already stored in your memory (Tigner, 1999). Elaborative rehearsal involves both linking the information to knowledge already stored and repeating the information. For example, in this case, you could remember that 520 is an area code for Arizona and the person you met is from Arizona. This would help you better remember the 520 prefix. If the information is retained, it goes into long-term memory.

Mnemonic devices are memory aids that help us organize information for encoding (Figure M.25). They are especially useful when we want to recall larger bits of information such as steps, stages, phases, and parts of a system (Bellezza, 1981). Walker needs to learn the order of the planets in the solar system, but is having a hard time remembering the correct

order. Walker's friend Kelly suggests a mnemonic device that will make it easier for Walker to remember. Kelly tells Walker to simply remember the name Mr. VEM J. SUN, and they will be able to easily recall the correct order of the planets: **M**ercury, **V**enus, **E**arth, **M**ars, **J**upiter, **S**aturn, **U**ranus, and **N**eptune. You might use a mnemonic device to help you remember someone's name, a mathematical formula, or the order of mathematical operations.

Figure M.25 This is a knuckle mnemonic to help you remember the number of days in each month. Months with 31 days are represented by the protruding knuckles and shorter months fall in the spots between knuckles. (credit: modification of work by Cory Zanker)

If you have ever watched the television show *Modern Family*, you might have seen Phil Dunphy explain how he remembers names:

> The other day I met this guy named Carl. Now, I might forget that name, but he was wearing a Grateful Dead t-shirt. What's a band like the Grateful Dead? Phish. Where do fish live? The ocean. What else lives in the ocean? Coral. Hello, Co-arl. (Wrubel & Spiller, 2010)

It seems the more vivid or unusual the mnemonic, the easier it is to remember. The key to using any mnemonic successfully is to find a strategy that works for you.

Link to Learning

Josh Foer is a science writer who 'accidentally' won the US Memory Championships. Watch his TED Talk titled, 'Feats of Memory Anyone Can Do', in which he explains a mnemonic device called the memory palace (mentioned earlier in this chapter), to learn more.

For two Canadian examples, check out this article on British Columbia's Braden Adams and Nova Scotia's Don Michael Vickers, who are both headed to the Memory League World Championship in January 2023.

Some other strategies that are used to improve memory include expressive writing and saying words aloud. Expressive writing helps boost your short-term memory, particularly if you write about a traumatic experience in your life. Masao Yogo and Shuji Fujihara (2008) had participants write for 20-minute intervals several times per month. The participants were instructed to write about a traumatic experience, their best possible future selves, or a trivial topic. The researchers found that this simple writing task increased short-term memory capacity after five weeks, but only for the participants who wrote about traumatic experiences. Psychologists can't explain why this writing task works, but it does.

What if you want to remember items you need to pick up at the store? Simply say them out loud to yourself. A series of studies (MacLeod, Gopie, Hourihan, Neary, & Ozubko, 2010) found that saying a word out loud improves your memory for the word because it increases the word's distinctiveness. Feel silly, saying random grocery items aloud? This technique works equally well if you just mouth the words. Using these techniques increased participants' memory for the words by more than 10%. These techniques can also be used to help you study.

How to Study Effectively

Based on the information presented in this chapter, here are some strategies and suggestions to help you hone your study

techniques (Figure M.26). The key with any of these strategies is to figure out what works best for you.

Figure M.26 Memory techniques can be useful when studying for class. (credit: Barry Pousman)

- **Use elaborative rehearsal**: In a famous article, Fergus Craik and Robert Lockhart (1972) discussed their belief that information we process more deeply goes into long-term memory. Their theory is called levels of processing. If we want to remember a piece of information, we should think about it more deeply and link it to other information and memories to make it more meaningful. For example, if we are trying to remember that the hippocampus is involved with memory processing, we

might envision a hippopotamus with excellent memory and then we could better remember the hippocampus.

- **Apply the self-reference effect**: As you go through the process of elaborative rehearsal, it would be even more beneficial to make the material you are trying to memorize personally meaningful to you. In other words, make use of the self-reference effect. Write notes in your own words. Write definitions from the text, and then rewrite them in your own words. Relate the material to something you have already learned for another class, or think how you can apply the concepts to your own life. When you do this, you are building a web of retrieval cues that will help you access the material when you want to remember it.
- **Use distributed practice**: Study across time in short durations rather than trying to cram it all in at once. Memory consolidation takes time, and studying across time allows time for memories to consolidate. In addition, cramming can cause the links between concepts to become so active that you get stuck in a link, and it prevents you from accessing the rest of the information that you learned.
- **Rehearse, rehearse, rehearse**: Review the material over time, in spaced and organized study sessions. Organize and study your notes, and take practice quizzes/exams. Link the new information to other information you already know well.

- **Study efficiently**: Students are great highlighters, but highlighting is not very efficient because students spend too much time studying the things they already learned. Instead of highlighting, use index cards. Write the question on one side and the answer on the other side. When you study, separate your cards into those you got right and those you got wrong. Study the ones you got wrong and keep sorting. Eventually, all your cards will be in the pile you answered correctly.
- **Be aware of interference**: To reduce the likelihood of interference, study during a quiet time without interruptions or distractions (like television or music).
- **Keep moving**: Of course you already know that exercise is good for your body, but did you also know it's also good for your mind? Research suggests that regular aerobic exercise (anything that gets your heart rate elevated) is beneficial for memory (van Praag, 2008). Aerobic exercise promotes neurogenesis: the growth of new brain cells in the hippocampus, an area of the brain known to play a role in memory and learning.
- **Get enough sleep**: While you are sleeping, your brain is still at work. During sleep the brain organizes and consolidates information to be stored in long-term memory (Abel & Bäuml, 2013).
- **Make use of mnemonic devices**: As you learned earlier in this chapter, mnemonic devices often help us to remember and recall information. There are different

types of mnemonic devices, such as the acronym. An acronym is a word formed by the first letter of each of the words you want to remember. For example, even if you live near one, you might have difficulty recalling the names of all five Great Lakes. What if I told you to think of the word Homes? HOMES is an acronym that represents Huron, Ontario, Michigan, Erie, and Superior: the five Great Lakes. Another type of mnemonic device is an acrostic: you make a phrase of all the first letters of the words. For example, if you are taking a math test and you are having difficulty remembering *the order of operations*, recalling the following sentence will help you: "Please Excuse My Dear Aunt Sally," because the order of mathematical operations is Parentheses, Exponents, Multiplication, Division, Addition, Subtraction. There also are jingles, which are rhyming tunes that contain key words related to the concept, such as *i before e, except after c*.

55.

KEY TERMS FOR MEMORY

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absentmindedness
: lapses in memory that are caused by breaks in attention or our focus being somewhere else

acoustic encoding
: input of sounds, words, and music

amnesia
: loss of long-term memory that occurs as the result of disease, physical trauma, or psychological trauma

anterograde amnesia
: loss of memory for events that occur after the brain trauma

Atkinson-Shiffrin model
: memory model that states we process information through three systems: sensory memory, short-term memory, and long-term memory

automatic processing
: encoding of informational details like time, space, frequency, and the meaning of words

bias

how feelings and view of the world distort memory of past events

blocking

memory error in which you cannot access stored information

chunking

organizing information into manageable bits or chunks

construction

formulation of new memories

declarative memory

type of long-term memory of facts and events we personally experience

effortful processing

encoding of information that takes effort and attention

elaborative rehearsal

thinking about the meaning of new information and its relation to knowledge already stored in your memory

encoding

input of information into the memory system

engram

physical trace of memory

episodic memory

type of declarative memory that contains information about events we have personally experienced, also known as autobiographical memory

equipotentiality hypothesis

some parts of the brain can take over for damaged parts in forming and storing memories

explicit memory

memories we consciously try to remember and recall

false memory syndrome

recall of false autobiographical memories

forgetting

loss of information from long-term memory

implicit memory

memories that are not part of our consciousness

levels of processing

information that is thought of more deeply becomes more meaningful and thus better committed to memory

long-term memory (LTM)

continuous storage of information

lobectomy

a surgical procedure in which a lobe (a portion or in its entirety) is removed from the brain

memory

set of processes used to encode, store, and retrieve information over different periods of time

memory-enhancing strategy

technique to help make sure information goes from short-term memory to long-term memory

misattribution

memory error in which you confuse the source of your information

misinformation effect paradigm

after exposure to additional and possibly inaccurate information, a person may misremember the original event

mnemonic device

memory aids that help organize information for encoding

persistence

failure of the memory system that involves the involuntary recall of unwanted memories, particularly unpleasant ones

proactive interference

old information hinders the recall of newly learned information

procedural memory

type of long-term memory for making skilled actions, such as how to brush your teeth, how to drive a car, and how to swim

recall

accessing information without cues

recognition

identifying previously learned information after encountering it again, usually in response to a cue

reconstruction
: process of bringing up old memories that might be distorted by new information

rehearsal
: repetition of information to be remembered

relearning
: learning information that was previously learned

retrieval
: act of getting information out of long-term memory storage and back into conscious awareness

retroactive interference
: information learned more recently hinders the recall of older information

retrograde amnesia
: loss of memory for events that occurred prior to brain trauma

self-reference effect
: tendency for an individual to have better memory for information that relates to oneself in comparison to material that has less personal relevance

semantic encoding
: input of words and their meaning

semantic memory
: type of declarative memory about words, concepts, and language-based knowledge and facts

sensory memory
: storage of brief sensory events, such as sights, sounds,

and tastes

sham surgery

when the control group undergoes an imitation of the surgery, but does not receive the procedure itself

short-term memory (STM)

holds about seven bits of information before it is forgotten or stored, as well as information that has been retrieved and is being used

storage

creation of a permanent record of information

suggestibility

effects of misinformation from external sources that leads to the creation of false memories

transience

memory error in which unused memories fade with the passage of time

visual encoding

input of images

56.

SUMMARY OF MEMORY

M.1 How Memory Functions

Memory is a system or process that stores what we learn for future use. Our memory has three basic functions: encoding, storing, and retrieving information. Encoding is the act of getting information into our memory system through automatic or effortful processing. Storage is retention of the information, and retrieval is the act of getting information out of storage and into conscious awareness through recall, recognition, and relearning. The idea that information is processed through three memory systems is called the Atkinson-Shiffrin model of memory. First, environmental stimuli enter our sensory memory for a period of less than a second to a few seconds. Those stimuli that we notice and pay attention to then move into short-term memory. According to the Atkinson-Shiffrin model, if we rehearse this information, then it moves into long-term memory for permanent storage. Other models like that of Baddeley and Hitch suggest there is more of a feedback loop between short-term memory and long-term memory. Long-term memory has a practically

limitless storage capacity and is divided into implicit and explicit memory.

M.2 Parts of the Brain Involved with Memory

Beginning with Karl Lashley, researchers and psychologists have been searching for the engram, which is the physical trace of memory. Lashley did not find the engram, but he did suggest that memories are distributed throughout the entire brain rather than stored in one specific area. Now we know that three brain areas do play significant roles in the processing and storage of different types of memories: cerebellum, hippocampus, and amygdala. The cerebellum's job is to process procedural memories; the hippocampus is where new memories are encoded; the amygdala helps determine what memories to store, and it plays a part in determining where the memories are stored based on whether we have a strong or weak emotional response to the event. Strong emotional experiences can trigger the release of neurotransmitters, as well as hormones, which strengthen memory, so that memory for an emotional event is usually stronger than memory for a non-emotional event. This is shown by what is known as the flashbulb memory phenomenon: our ability to remember significant life events. However, our memory for life events (autobiographical memory) is not always accurate.

M.3 Problems with Memory

All of us at times have felt dismayed, frustrated, and even embarrassed when our memories have failed us. Our memory is flexible and prone to many errors, which is why eyewitness testimony has been found to be largely unreliable. There are several reasons why forgetting occurs. In cases of brain trauma or disease, forgetting may be due to amnesia. Another reason we forget is due to encoding failure. We can't remember something if we never stored it in our memory in the first place. Schacter presents seven memory errors that also contribute to forgetting. Sometimes, information is actually stored in our memory, but we cannot access it due to interference. Proactive interference happens when old information hinders the recall of newly learned information. Retroactive interference happens when information learned more recently hinders the recall of older information.

M.4 Ways to Enhance Memory

There are many ways to combat the inevitable failures of our memory system. Some common strategies that can be used in everyday situations include mnemonic devices, rehearsal, self-referencing, and adequate sleep. These same strategies also can help you to study more effectively.

57.

REVIEW QUESTIONS FOR MEMORY

Click here for Answer Key

Multiple-Choice Questions

1. _____ is a memory store with a phonological loop, visuospatial sketchpad, episodic buffer, and a central executive.

a. sensory memory
b. episodic memory
c. working memory
d. implicit memory

2. The storage capacity of long-term memory is _____.

a. one or two bits of information
b. seven bits, plus or minus two
c. limited
d. essentially limitless

3. The three functions of memory are _____.

a. automatic processing, effortful processing, and storage
b. encoding, processing, and storage
c. automatic processing, effortful processing, and retrieval
d. encoding, storage, and retrieval

4. This physical trace of memory is known as the _____.

a. engram
b. Lashley effect
c. Deese-Roediger-McDermott Paradigm
d. flashbulb memory effect

5. An exceptionally clear recollection of an important event is a (an) _____.

a. engram
b. arousal theory
c. flashbulb memory
d. equipotentiality hypothesis

6. _____ is when our recollections of the past are done in a self-enhancing manner.

a. stereotypical bias
b. egocentric bias
c. hindsight bias

d. enhancement bias

7. Tip-of-the-tongue phenomenon is also known as _____.

a. persistence
b. misattribution
c. transience
d. blocking

8. The formulation of new memories is sometimes called _____, and the process of bringing up old memories is called _____.

a. construction; reconstruction
b. reconstruction; construction
c. production; reproduction
d. reproduction; production

9. When you are learning how to play the piano, the statement "Every good boy does fine" can help you remember the notes E, G, B, D, and F for the lines of the treble clef. This is an example of a (an) _____.

a. jingle
b. acronym
c. acrostic

d. acoustic

10. According to a study by Yogo and Fujihara (2008), if you want to improve your short-term memory, you should spend time writing about _____.

a. your best possible future self
b. a traumatic life experience
c. a trivial topic
d. your grocery list

11. The self-referencing effect refers to _____.

a. making the material you are trying to memorize personally meaningful to you
b. making a phrase of all the first letters of the words you are trying to memorize
c. making a word formed by the first letter of each of the words you are trying to memorize
d. saying words you want to remember out loud to yourself

12. Memory aids that help organize information for encoding are _____.

a. mnemonic devices
b. memory-enhancing strategies
c. elaborative rehearsal

d. effortful processing

Critical Thinking Questions

13. Compare and contrast implicit and explicit memory.
14. According to the Atkinson-Shiffrin model, name and describe the three stages of memory.
15. Compare and contrast the two ways in which we encode information.
16. What might happen to your memory system if you sustained damage to your hippocampus?
17. Compare and contrast the two types of interference.
18. Compare and contrast the two types of amnesia.
19. What is the self-reference effect, and how can it help you study more effectively?
20. You and your roommate spent all of last night studying for your psychology test. You think you know the material; however, you suggest that you study again the next morning an hour prior to the test. Your roommate asks you to explain why you think this is a good idea. What do you tell her?

Personal Application Questions

21. Describe something you have learned that is now in your procedural memory. Discuss how you learned this information.
22. Describe something you learned in high school that is now in your semantic memory.
23. Describe a flashbulb memory of a significant event in your life.

24. Which of the seven memory errors presented by Schacter have you committed? Provide an example of each one.
25. Jurors place a lot of weight on eyewitness testimony. Imagine you are an attorney representing a defendant who is accused of robbing a convenience store. Several eyewitnesses have been called to testify against your client. What would you tell the jurors about the reliability of eyewitness testimony?
26. Create a mnemonic device to help you remember a term or concept from this chapter.
27. What is an effective study technique that you have used? How is it similar to/different from the strategies suggested in this chapter?

58.

ACKNOWLEDGEMENTS & ATTRIBUTIONS

Introduction to Memory

Rebecca St. James wrote the chapter opener, highlighting contributions of Brenda Milner and patient HM on our understanding of the medial temporal lobe's role in memory. Rebecca also drew the mirror-drawing task illustration featured at the top of the section.

Spatial Memory

Dr. Jennifer Stamp created and wrote this full section, including creating a new Tricky Topic video. This section highlights our understanding and use of spatial memory across history and cultures, and incorporates a hand-drawn map by Shanawdithit, depicting the kidnapping of her aunt, Demasduwit.

Forgetting and Memory Errors

Evan Matthews helped to reorganize and condense this section, with the aim of improving overall clarity and flow.

Memory and the Brain

Jessica Telizyn helped to re-write this section by adding content focusing on human and non-human animal research. This section outlines the role of the hippocampus and amygdala in memory.

CHAPTER VII
LEARNING

59.

INTRODUCTION TO LEARNING

Chapter Outline

- What Is Learning?
- Classical Conditioning
- Operant Conditioning
- Observational Learning (Modelling)

Figure L.1 Loggerhead sea turtle hatchlings are born knowing how to find the ocean and how to swim. Unlike the sea turtle, humans must learn how to swim (and surf). (credit "turtle": modification of work by Becky Skiba, USFWS; credit "surfer": modification of work by Mike Baird)

The summer sun shines brightly on a deserted stretch of beach. Suddenly, a tiny grey head emerges from the sand, then another and another. Soon the beach is teeming with loggerhead sea turtle hatchlings (Figure L.1). Although only minutes old, the hatchlings know exactly what to do. Their flippers are not very efficient for moving across the hot sand, yet they continue onward, instinctively. Some are quickly snapped up by gulls circling overhead and others become lunch for hungry ghost crabs that dart out of their holes. Despite these dangers, the hatchlings are driven to leave the safety of their nest and find the ocean.

Not far down this same beach, Yao and their kid, Naomi, paddle out into the ocean on surfboards. A wave approaches. Naomi crouches on their board, then jumps up and rides the wave for a few seconds before losing their balance. Then,

Naomi emerges from the water in time to watch Yao ride the face of the wave.

Unlike baby sea turtles, which know how to find the ocean and swim with no help from their parents, we are not born knowing how to swim (or surf). Yet we humans pride ourselves on our ability to learn. In fact, over thousands of years and across cultures, we have created institutions devoted entirely to learning. But have you ever asked yourself how exactly it is that we learn? What processes are at work as we come to know what we know? This chapter focuses on the primary ways in which learning occurs.

60.

WHAT IS LEARNING?

Learning Objectives

By the end of this section, you will be able to:

- Explain how learned behaviours are different from instincts and reflexes
- Define learning
- Recognize and define three basic forms of learning—classical conditioning, operant conditioning, and observational learning

Birds build nests and migrate as winter approaches. Infants suckle at their parent's breast. Dogs shake water off wet fur. Salmon swim upstream to spawn, and spiders spin intricate webs. What do these seemingly unrelated behaviours have in

common? They all are unlearned behaviours. Both instincts and reflexes are innate (unlearned) behaviours that organisms are born with. **Reflexes** are a motor or neural reaction to a specific stimulus in the environment. They tend to be simpler than instincts, involve the activity of specific body parts and systems (e.g., the knee-jerk reflex and the contraction of the pupil in bright light), and involve more primitive centres of the central nervous system (e.g., the spinal cord and the medulla). In contrast, **instincts** are innate behaviours that are triggered by a broader range of events, such as maturation and the change of seasons. They are more complex patterns of behaviour, involve movement of the organism as a whole (e.g., sexual activity and migration), and involve higher brain centres.

Both reflexes and instincts help an organism adapt to its environment and do not have to be learned. For example, every healthy human baby has a sucking reflex, present at birth. Babies are born knowing how to suck on a nipple, whether artificial (from a bottle) or human. Nobody teaches the baby to suck, just as no one teaches a sea turtle hatchling to move toward the ocean. Learning, like reflexes and instincts, allows an organism to adapt to its environment. But unlike instincts and reflexes, learned behaviours involve change and experience: **learning** is a relatively permanent change in behaviour or knowledge that results from experience. In contrast to the innate behaviours discussed above, learning involves acquiring knowledge and skills through experience. Looking back at our

surfing scenario, Naomi will have to spend much more time training with their surfboard before he learns how to ride the waves like his parent, Yao.

Learning to surf, as well as any complex learning process (e.g., learning about the discipline of psychology), involves a complex interaction of conscious and unconscious processes. Learning has traditionally been studied in terms of its simplest components—the associations our minds automatically make between events. Our minds have a natural tendency to connect events that occur closely together or in sequence. **Associative learning** occurs when an organism makes connections between stimuli or events that occur together in the environment. You will see that associative learning is central to all three basic learning processes discussed in this chapter; classical conditioning tends to involve unconscious processes, operant conditioning tends to involve conscious processes, and observational learning adds social and cognitive layers to all the basic associative processes, both conscious and unconscious. These learning processes will be discussed in detail later in the chapter, but it is helpful to have a brief overview of each as you begin to explore how learning is understood from a psychological perspective.

In classical conditioning, also known as Pavlovian conditioning, organisms learn to associate events—or stimuli—that repeatedly happen together. We experience this process throughout our daily lives. For example, you might see a flash of lightning in the sky during a storm and then hear a

loud boom of thunder. The sound of the thunder naturally makes you jump (loud noises have that effect by reflex). Because lightning reliably predicts the impending boom of thunder, you may associate the two and jump when you see lightning. Psychological researchers study this associative process by focusing on what can be seen and measured—behaviours. Researchers ask if one stimulus triggers a reflex, can we train a different stimulus to trigger that same reflex? In operant conditioning, organisms learn, again, to associate events—a behaviour and its consequence (reinforcement or punishment). A pleasant consequence encourages more of that behaviour in the future, whereas a punishment deters the behaviour. Imagine you are teaching your dog, Hodor, to sit. You tell Hodor to sit, and give them a treat when they do. After repeated experiences, Hodor begins to associate the act of sitting with receiving a treat. Hodor learns that the consequence of sitting is that he gets a doggie biscuit (Figure L.2). Conversely, if the dog is punished when exhibiting a behaviour, it becomes conditioned to avoid that behaviour (e.g., receiving a small shock when crossing the boundary of an invisible electric fence).

Figure L.2 In operant conditioning, a response is associated with a consequence. This dog has learned that certain behaviours result in receiving a treat. (credit: Crystal Rolfe)

Observational learning extends the effective range of both classical and operant conditioning. In contrast to classical and operant conditioning, in which learning occurs only through direct experience, observational learning is the process of watching others and then imitating what they do. A lot of learning among humans and other animals comes from observational learning. To get an idea of the extra effective range that observational learning brings, consider Yao and their kid Naomi from the introduction. How might observation help Naomi learn to surf, as opposed to learning by trial and error alone? By watching their parent, Naomi can imitate the moves that bring success and avoid the moves that

lead to failure. Can you think of something you have learned how to do after watching someone else?

All of the approaches covered in this chapter are part of a particular tradition in psychology, called behaviourism, which we discuss in the next section. However, these approaches do not represent the entire study of learning. Separate traditions of learning have taken shape within different fields of psychology, such as memory and cognition, so you will find that other chapters will round out your understanding of the topic. Over time these traditions tend to converge. For example, in this chapter you will see how cognition has come to play a larger role in behaviourism, whose more extreme adherents once insisted that behaviours are triggered by the environment with no intervening thought.

61.

CLASSICAL CONDITIONING

Learning Objectives

By the end of this section, you will be able to:

- Explain how classical conditioning occurs
- Summarize the processes of acquisition, extinction, spontaneous recovery, generalization, and discrimination

Does the name Ivan Pavlov ring a bell? Even if you are new to the study of psychology, chances are that you have heard of Pavlov and his famous dogs.

Pavlov (1849–1936), a Russian scientist, performed

extensive research on dogs and is best known for his experiments in classical conditioning (Figure L.3). As we discussed briefly in the previous section, **classical conditioning** is a process by which we learn to associate stimuli and, consequently, to anticipate events.

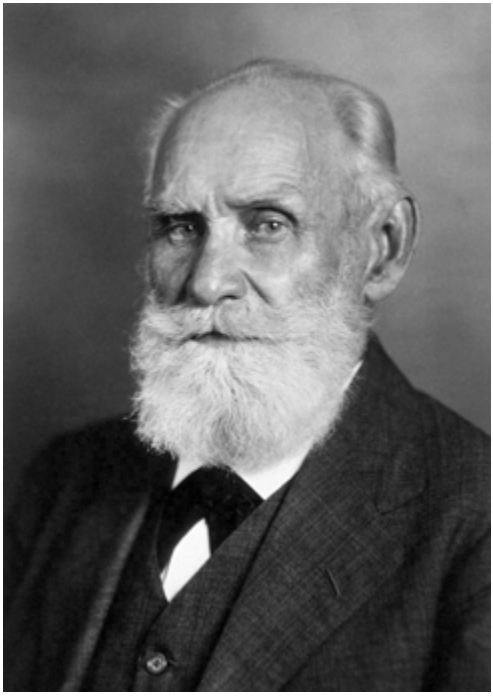

Figure L.3 Ivan Pavlov's research on the digestive system of dogs unexpectedly led to his discovery of the learning process now known as classical conditioning.

Pavlov came to his conclusions about how learning occurs completely by accident. Pavlov was a physiologist, not a

psychologist. Physiologists study the life processes of organisms, from the molecular level to the level of cells, organ systems, and entire organisms. Pavlov's area of interest was the digestive system (Hunt, 2007). In his studies with dogs, Pavlov measured the amount of saliva produced in response to various foods. Over time, Pavlov (1927) observed that the dogs began to salivate not only at the taste of food, but also at the sight of food, at the sight of an empty food bowl, and even at the sound of the laboratory assistants' footsteps. Salivating to food in the mouth is reflexive, so no learning is involved. However, dogs don't naturally salivate at the sight of an empty bowl or the sound of footsteps.

These unusual responses intrigued Pavlov, and he wondered what accounted for what he called the dogs' "psychic secretions" (Pavlov, 1927). To explore this phenomenon in an objective manner, Pavlov designed a series of carefully controlled experiments to see which stimuli would cause the dogs to salivate. He was able to train the dogs to salivate in response to stimuli that clearly had nothing to do with food, such as the sound of a bell, a light, and a touch on the leg. Through his experiments, Pavlov realized that an organism has two types of responses to its environment: (1) unconditioned (unlearned) responses, or reflexes, and (2) conditioned (learned) responses.

In Pavlov's experiments, the dogs salivated each time meat powder was presented to them. The meat powder in this situation was an unconditioned stimulus (US): a stimulus that

elicits a reflexive response in an organism. The dogs' salivation was an unconditioned response (UCR): a natural (unlearned) reaction to a given stimulus. Before conditioning, think of the dogs' stimulus and response like this:

Meat powder (US) → Salivation (UCR)

In classical conditioning, a neutral stimulus is presented immediately before an unconditioned stimulus. Pavlov would sound a tone (like ringing a bell) and then give the dogs the meat powder (Figure L.4). The tone was the neutral stimulus (NS), which is a stimulus that does not naturally elicit a response. Prior to conditioning, the dogs did not salivate when they just heard the tone because the tone had no association for the dogs.

Tone (NS) + Meat Powder (US) → Salivation (UCR)

When Pavlov paired the tone with the meat powder over and over again, the previously neutral stimulus (the tone) also began to elicit salivation from the dogs. Thus, the neutral stimulus became the conditioned stimulus (CS), which is a stimulus that elicits a response after repeatedly being paired with an unconditioned stimulus. Eventually, the dogs began to salivate to the tone alone, just as they previously had salivated at the sound of the assistants' footsteps. The behaviour caused by the conditioned stimulus is called the conditioned response (CR). In the case of Pavlov's dogs, they had learned to associate

the tone (CS) with being fed, and they began to salivate (CR) in anticipation of food.

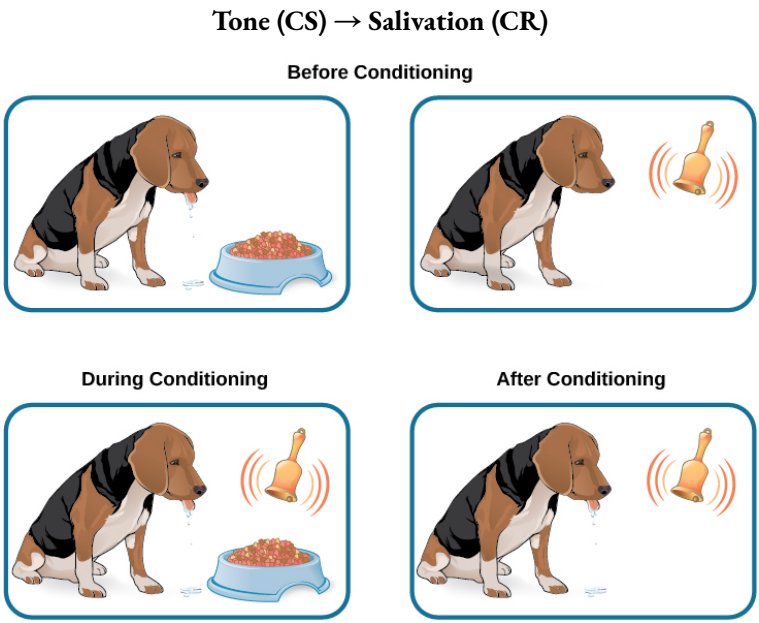

Figure L.4 Before conditioning, an unconditioned stimulus (food) produces an unconditioned response (salivation), and a neutral stimulus (bell) does not produce a response. During conditioning, the unconditioned stimulus (food) is presented repeatedly just after the presentation of the neutral stimulus (bell). After conditioning, the neutral stimulus alone produces a conditioned response (salivation), thus becoming a conditioned stimulus.

TRICKY TOPIC: CLASSICAL

CONDITIONING

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If the video above does not load, click here: https://youtu.be/n6gsY0_F4rw
For a full transcript of this video, click here

Link to Learning

View this video about Pavlov and his dogs to learn more.

Real World Application of Classical Conditioning

How does classical conditioning work in the real world? Consider the case of Farah, who was diagnosed with cancer. When Farah received their first chemotherapy treatment, they vomited shortly after the chemicals were injected. In fact, every trip to the doctor for chemotherapy treatment shortly after the drugs were injected, Farah vomited. Farah's treatment was a success and their cancer went into remission. Now, when Farah visits their oncologist's office every 6 months for a check-up, they become nauseous. In this case, the chemotherapy drugs are the unconditioned stimulus (US), vomiting is the unconditioned response (UCR), the doctor's office is the conditioned stimulus (CS) after being paired with the US, and nausea is the conditioned response (CR). Let's assume that the chemotherapy drugs that Farah takes are given through a syringe injection. After entering the doctor's office, Farah sees a syringe, and then gets their medication. In addition to the doctor's office, Farah will learn to associate the syringe will the medication and will respond to syringes with nausea. This is an example of higher-order (or second-order) conditioning, when the conditioned stimulus (the doctor's office) serves to condition another stimulus (the syringe). It is hard to achieve anything above second-order conditioning. For example, if someone rang a bell every time Farah received a syringe

injection of chemotherapy drugs in the doctor's office, Farah likely will never get sick in response to the bell.

Consider another example of classical conditioning. Let's say you have a cat named Zelda, who is quite spoiled. You keep Zelda's food in a separate cabinet, and you also have a special electric can opener that you use only to open cans of cat food. For every meal, Zelda hears the distinctive sound of the electric can opener ("zzhzhz") and then gets their food. Zelda quickly learns that when they hear "zzhzhz" that means it's feeding time. What do you think Zelda does when they hear the electric can opener? Zelda will likely get excited and run to where you are preparing their food. This is an example of classical conditioning. In this case, what are the US, CS, UCR, and CR?

What if the cabinet holding Zelda's food becomes squeaky? In that case, Zelda hears "squeak" (the cabinet), "zzhzhz" (the electric can opener), and then they get the food. Zelda will learn to get excited when they hear the "squeak" of the cabinet. Pairing a new neutral stimulus ("squeak") with the conditioned stimulus ("zzhzhz") is called **higher-order conditioning**, or **second-order conditioning**. This means you are using the conditioned stimulus of the can opener to condition another stimulus: the squeaky cabinet (Figure L.5). It is hard to achieve anything above second-order conditioning. For example, if you ring a bell, open the cabinet ("squeak"), use the can opener ("zzhzhz"), and then feed

Zelda, Zelda will likely never get excited when hearing the bell alone.

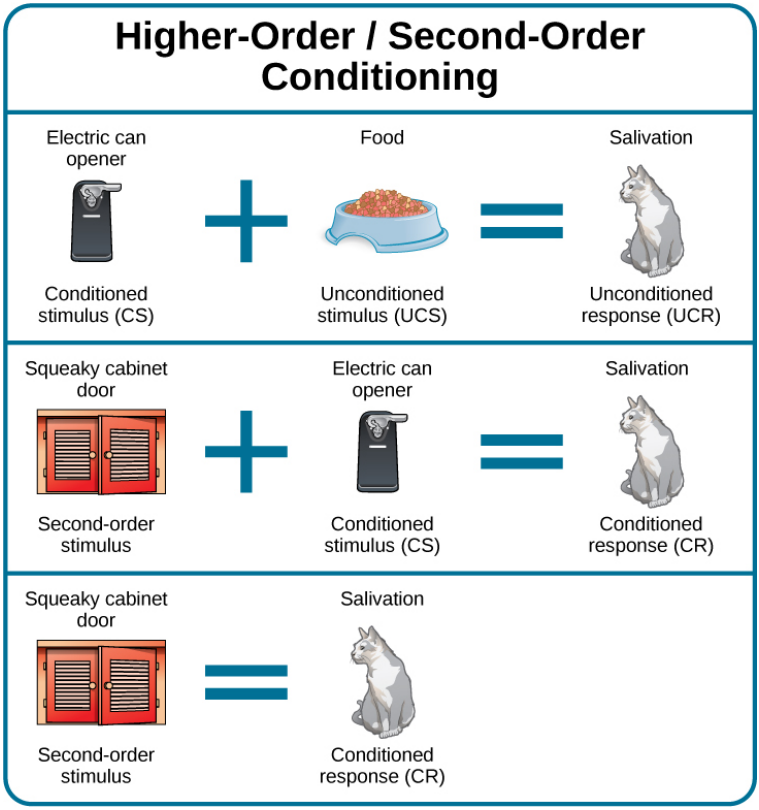

Figure L.5 In higher-order conditioning, an established conditioned stimulus is paired with a new neutral stimulus (the second-order stimulus), so that eventually the new stimulus also elicits the conditioned response, without the initial conditioned stimulus being presented.

Everyday Connection

Classical Conditioning at Stingray City

Kate and her spouse recently vacationed in the Cayman Islands, and booked a boat tour to Stingray City, where they could feed and swim with the southern stingrays. The boat captain explained how the normally solitary stingrays have become accustomed to interacting with humans. About 40 years ago, fishermen began to clean fish and conch (unconditioned stimulus) at a particular sandbar near a barrier reef, and large numbers of stingrays would swim in to eat (unconditioned response) what the fishermen threw into the water; this continued for years. By the late 1980s, word of the large group of stingrays spread among scuba divers, who then started feeding them by hand. Over time, the southern stingrays in the area were classically conditioned much like Pavlov's dogs. When they hear the sound of a boat engine (neutral stimulus

that becomes a conditioned stimulus), they know that they will get to eat (conditioned response).

As soon as they reached Stingray City, over two dozen stingrays surrounded their tour boat. The couple slipped into the water with bags of squid, the stingrays' favourite treat. The swarm of stingrays bumped and rubbed up against their legs like hungry cats (Figure L.6). Kate was able to feed, pet, and even kiss (for luck) these amazing creatures. Then all the squid was gone, and so were the stingrays.

Figure L.6 Kate holds a southern stingray at Stingray City in the Cayman Islands. These stingrays have been classically conditioned to associate the sound of a boat motor with food provided by tourists. (credit: Kathryn Dumper)

Classical conditioning also applies to humans, even babies. For example, Logan buys formula in blue canisters for their six-month-old baby, Reagan. Whenever Logan takes out a formula container, Reagan gets excited, tries to reach toward the food, and most likely salivates. Why does Reagan get excited when they see the formula canister? What are the US, CS, UCR, and CR here?

So far, all of the examples have involved food, but classical conditioning extends beyond the basic need to be fed. Consider our earlier example of a dog whose owners install an invisible electric dog fence. A small electrical shock (unconditioned stimulus) elicits discomfort (unconditioned response). When the unconditioned stimulus (shock) is paired with a neutral stimulus (the edge of a yard), the dog associates the discomfort (unconditioned response) with the edge of the yard (conditioned stimulus) and stays within the set boundaries. In this example, the edge of the yard elicits fear and anxiety in the dog. Fear and anxiety are the conditioned response.

Link to Learning

Watch this clip from the show, The Office, for a funny look at an example of conditioning.

General Processes in Classical Conditioning

Now that you know how classical conditioning works and have seen several examples, let's take a look at some of the general processes involved. In classical conditioning, the initial period of learning is known as **acquisition**, when an organism learns to connect a neutral stimulus and an unconditioned stimulus. During acquisition, the neutral stimulus begins to elicit the conditioned response, and eventually the neutral stimulus becomes a conditioned stimulus capable of eliciting the conditioned response by itself. Timing is important for conditioning to occur. Typically, there should only be a brief interval between presentation of the conditioned stimulus and the unconditioned stimulus. Depending on what is being conditioned, sometimes this interval is as little as five seconds

(Chance, 2009). However, with other types of conditioning, the interval can be up to several hours.

Taste aversion is a type of conditioning in which an interval of several hours may pass between the conditioned stimulus (something ingested) and the unconditioned stimulus (nausea or illness). Here's how it works. Between classes, you and a friend grab a quick lunch from a food cart on campus. You share a dish of chicken curry and head off to your next class. A few hours later, you feel nauseous and become ill. Although your friend is fine and you determine that you have intestinal flu (the food is not the culprit), you've developed a taste aversion; the next time you are at a restaurant and someone orders curry, you immediately feel ill. While the chicken dish is not what made you sick, you are experiencing taste aversion: you've been conditioned to be averse to a food after a single, bad experience.

How does this occur—conditioning based on a single instance and involving an extended time lapse between the event and the negative stimulus? Research into taste aversion suggests that this response may be an evolutionary adaptation designed to help organisms quickly learn to avoid harmful foods (Garcia & Rusiniak, 1980; Garcia & Koelling, 1966). Not only may this contribute to species survival via natural selection, but it may also help us develop strategies for challenges such as helping cancer patients through the nausea induced by certain treatments (Holmes, 1993; Jacobsen et al., 1993; Hutton, Baracos, & Wismer, 2007; Skolin et al., 2006).

Garcia and Koelling (1966) showed not only that taste aversions could be conditioned, but also that there were biological constraints to learning. In their study, separate groups of rats were conditioned to associate either a flavour with illness, or lights and sounds with illness. Results showed that all rats exposed to flavour-illness pairings learned to avoid the flavour, but none of the rats exposed to lights and sounds with illness learned to avoid lights or sounds. This added evidence to the idea that classical conditioning could contribute to species survival by helping organisms learn to avoid stimuli that posed real dangers to health and welfare.

TRICKY TOPIC: CONDITIONED TASTE AVERSION

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For a full transcript of this video, click here

Robert Rescorla demonstrated how powerfully an organism can learn to predict the US from the CS. Take, for example, the following two situations. Tafadawa's family always has dinner on the table every day at 6:00. Hai's family switches it up so that some days they eat dinner at 6:00, some days they eat at 5:00, and other days they eat at 7:00. For Tafadawa, 6:00 reliably and consistently predicts dinner, so Tafadawa will likely start feeling hungry every day right before 6:00, even if he's had a late snack. Hai, on the other hand, will be less likely to associate 6:00 with dinner, since 6:00 does not always predict that dinner is coming. Rescorla, along with his colleague at Yale University, Alan Wagner, developed a mathematical formula that could be used to calculate the probability that an association would be learned given the ability of a conditioned stimulus to predict the occurrence of an unconditioned stimulus and other factors; today this is known as the Rescorla-Wagner model (Rescorla & Wagner, 1972). We also know that conditioning can be unrelated to food. It can also trigger an emotional response, rather than a physical one. For example, if an experimenter sounds a tone just before applying a mild shock to a rat's feet, the tone will elicit fear or anxiety after one or two pairings. Similar **fear conditioning** plays a role in creating many anxiety disorders in humans, such as phobias and panic disorders, where people associate cues (such as closed spaces, or a shopping mall) with panic or other emotional trauma. Here, rather than a physical response (like drooling), the CS triggers an emotion.

Once we have established the connection between the unconditioned stimulus and the conditioned stimulus, how do we break that connection and get the dog, cat, or child to stop responding? In Zelda's case, imagine what would happen if you stopped using the electric can opener for their food and began to use it only for human food. Now, Zelda would hear the can opener, but she would not get food. In classical conditioning terms, you would be giving the conditioned stimulus, but not the unconditioned stimulus. Pavlov explored this scenario in his experiments with dogs: sounding the tone without giving the dogs the meat powder. Soon the dogs stopped responding to the tone. **Extinction** is the decrease in the conditioned response when the unconditioned stimulus is no longer presented with the conditioned stimulus. When presented with the conditioned stimulus alone, the dog, cat, or other organism would show a weaker and weaker response, and finally no response. In classical conditioning terms, there is a gradual weakening and disappearance of the conditioned response.

What happens when learning is not used for a while—when what was learned lies dormant? As we just discussed, Pavlov found that when he repeatedly presented the bell (conditioned stimulus) without the meat powder (unconditioned stimulus), extinction occurred; the dogs stopped salivating to the bell. However, after a couple of hours of resting from this extinction training, the dogs again began to salivate when Pavlov rang the bell. What do you think would happen with

Zelda's behaviour if your electric can opener broke, and you did not use it for several months? When you finally got it fixed and started using it to open Zelda's food again, Zelda would remember the association between the can opener and food—they would get excited and run to the kitchen when they heard the sound. The behaviour of Pavlov's dogs and Zelda illustrates a concept Pavlov called **spontaneous recovery**: the return of a previously extinguished conditioned response following a rest period (Figure L.7).

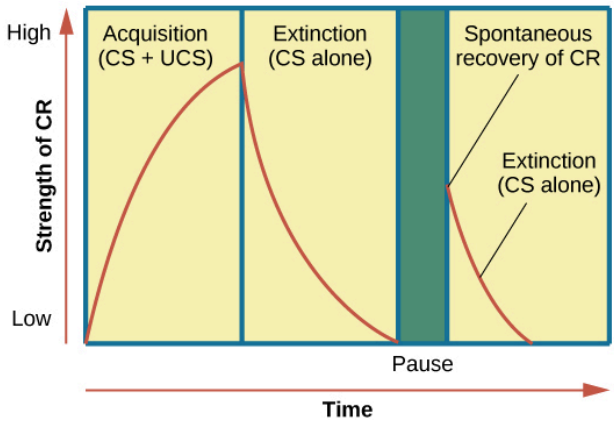


Figure L.7 This is the curve of acquisition, extinction, and spontaneous recovery. The rising curve shows the conditioned response quickly getting stronger through the repeated pairing of the conditioned stimulus and the unconditioned stimulus (acquisition). Then the curve decreases, which shows how the conditioned response weakens when only the conditioned stimulus is presented (extinction). After a break or pause from conditioning, the conditioned response reappears (spontaneous recovery).

Of course, these processes also apply in humans. For example, let's say that every day when you walk to campus, an ice cream truck passes your route. Day after day, you hear the truck's music (neutral stimulus), so you finally stop and purchase a chocolate ice cream bar. You take a bite (unconditioned stimulus) and then your mouth waters (unconditioned response). This initial period of learning is known as acquisition, when you begin to connect the neutral stimulus (the sound of the truck) and the unconditioned stimulus (the taste of the chocolate ice cream in your mouth). During acquisition, the conditioned response gets stronger and stronger through repeated pairings of the conditioned stimulus and unconditioned stimulus. Several days (and ice cream bars) later, you notice that your mouth begins to water (conditioned response) as soon as you hear the truck's musical jingle—even before you bite into the ice cream bar. Then one day you head down the street. You hear the truck's music (conditioned stimulus), and your mouth waters (conditioned response). However, when you get to the truck, you discover that they are all out of ice cream. You leave disappointed. The next few days you pass by the truck and hear the music, but don't stop to get an ice cream bar because you're running late for class. You begin to salivate less and less when you hear the music, until by the end of the week, your mouth no longer waters when you hear the tune. This illustrates extinction. The conditioned response weakens when only the conditioned stimulus (the sound of the truck) is presented, without being

followed by the unconditioned stimulus (chocolate ice cream in the mouth). Then the weekend comes. You don't have to go to class, so you don't pass the truck. Monday morning arrives and you take your usual route to campus. You round the corner and hear the truck again. What do you think happens? Your mouth begins to water again. Why? After a break from conditioning, the conditioned response reappears, which indicates spontaneous recovery.

Acquisition and extinction involve the strengthening and weakening, respectively, of a learned association. Two other learning processes—**stimulus discrimination** and stimulus generalization—are involved in determining which stimuli will trigger learned responses. Animals (including humans) need to distinguish between stimuli—for example, between sounds that predict a threatening event and sounds that do not—so that they can respond appropriately (such as running away if the sound is threatening). When an organism learns to respond differently to various stimuli that are similar, it is called stimulus discrimination. In classical conditioning terms, the organism demonstrates the conditioned response only to the conditioned stimulus. Pavlov's dogs discriminated between the basic tone that sounded before they were fed and other tones (e.g., the doorbell), because the other sounds did not predict the arrival of food. Similarly, Zelda, the cat, discriminated between the sound of the can opener and the sound of the electric mixer. When the electric mixer is going,

Zelda is not about to be fed, so they do not come running to the kitchen looking for food. In our other example, Farah, the cancer patient, discriminated between oncologists and other types of doctors. Farah learned not to feel ill when visiting doctors for other types of appointments, such as their annual physical.

On the other hand, when an organism demonstrates the conditioned response to stimuli that are similar to the condition stimulus, it is called **stimulus generalization**, the opposite of stimulus discrimination. The more similar a stimulus is to the condition stimulus, the more likely the organism is to give the conditioned response. For instance, if the electric mixer sounds very similar to the electric can opener, Zelda may come running after hearing its sound. But if you do not feed Zelda following the electric mixer sound, and you continue to feed them consistently after the electric can opener sound, Zelda will quickly learn to discriminate between the two sounds (provided they are sufficiently dissimilar that she can tell them apart). In our other example, Farah continued to feel ill whenever visiting other oncologists or other doctors in the same building as their oncologist.

Behaviorism

John B. Watson, shown in Figure L.8, is considered the founder of behaviourism. Behaviourism is a school of thought that arose during the first part of the 20th century, which

incorporates elements of Pavlov's classical conditioning (Hunt, 2007). In stark contrast with Freud, who considered the reasons for behaviour to be hidden in the unconscious, Watson championed the idea that all behaviour can be studied as a simple stimulus-response reaction, without regard for internal processes. Watson argued that in order for psychology to become a legitimate science, it must shift its concern away from internal mental processes because mental processes cannot be seen or measured. Instead, he asserted that psychology must focus on outward observable behaviour that can be measured.

Figure L.8 John B. Watson used the principles of classical conditioning in the study of human emotion.

Watson's ideas were influenced by Pavlov's work. According to Watson, human behaviour, just like animal behaviour, is primarily the result of conditioned responses. Whereas Pavlov's work with dogs involved the conditioning of reflexes, Watson believed the same principles could be extended to the conditioning of human emotions (Watson, 1919). Thus began Watson's work with his graduate student Rosalie Rayner and a baby called Little Albert. Through their experiments with

Little Albert, Watson and Rayner (1920) demonstrated how fears can be conditioned.

In 1920, Watson was the chair of the psychology department at Johns Hopkins University. Through his position at the university he came to meet Little Albert's mother, Arvilla Merritte, who worked at a campus hospital (DeAngelis, 2010). Watson offered her a dollar to allow her son to be the subject of his experiments in classical conditioning. Through these experiments, Little Albert was exposed to and conditioned to fear certain things. Initially he was presented with various neutral stimuli, including a rabbit, a dog, a monkey, masks, cotton wool, and a white rat. He was not afraid of any of these things. Then Watson, with the help of Rayner, conditioned Little Albert to associate these stimuli with an emotion—fear. For example, Watson handed Little Albert the white rat, and Little Albert enjoyed playing with it. Then Watson made a loud sound, by striking a hammer against a metal bar hanging behind Little Albert's head, each time Little Albert touched the rat. Little Albert was frightened by the sound—demonstrating a reflexive fear of sudden loud noises—and began to cry. Watson repeatedly paired the loud sound with the white rat. Soon Little Albert became frightened by the white rat alone. In this case, what are the US, CS, UCR, and CR? Days later, Little Albert demonstrated stimulus generalization—he became afraid of other furry things: a rabbit, a furry coat, and even a Santa Claus mask

(Figure L.9). Watson had succeeded in conditioning a fear response in Little Albert, thus demonstrating that emotions could become conditioned responses. It had been Watson's intention to produce a phobia—a persistent, excessive fear of a specific object or situation— through conditioning alone, thus countering Freud's view that phobias are caused by deep, hidden conflicts in the mind. However, there is no evidence that Little Albert experienced phobias in later years. Little Albert's mother moved away, ending the experiment. While Watson's research provided new insight into conditioning, it would be considered unethical by today's standards.

Figure L.9 Through stimulus generalization, Little Albert came to fear furry things, including Watson in a Santa Claus mask.

Link to Learning

View scenes from this video on John Watson's experiment in which "Little Albert" was conditioned to respond in fear to furry objects, to learn more.

62.

OPERANT CONDITIONING

Learning Objectives

By the end of this section, you will be able to:

- Define operant conditioning
- Explain the difference between reinforcement and punishment
- Distinguish between reinforcement schedules
- Define insight and latent learning

The previous section of this chapter focused on the type of associative learning known as classical conditioning. Remember that in classical conditioning, something in the

environment triggers a reflex automatically, and researchers train the organism to react to a different stimulus. Now we turn to the second type of associative learning, **operant conditioning.** In operant conditioning, organisms learn to associate a behaviour and its consequence (Table L.1). A pleasant consequence makes that behaviour more likely to be repeated in the future. For example, Spirit, a dolphin at the National Aquarium in Baltimore, does a flip in the air when Spirit's trainer blows a whistle. The consequence is that Spirit gets a fish.

Table L.1 Classical and Operant Conditioning Compared

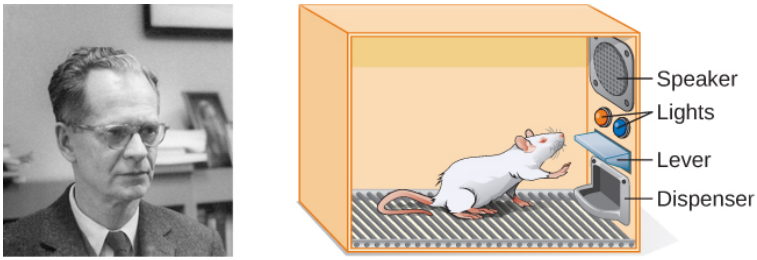
	Classical Conditioning	**Operant Conditioning**
Conditioning approach	An unconditioned stimulus (such as food) is paired with a neutral stimulus (such as a bell). The neutral stimulus eventually becomes the conditioned stimulus, which brings about the conditioned response (salivation).	The target behaviour is followed by reinforcement or punishment to either strengthen or weaken it, so that the learner is more likely to exhibit the desired behaviour in the future.
Stimulus timing	The stimulus occurs immediately before the response.	The stimulus (either reinforcement or punishment) occurs soon after the response.

Psychologist B. F. Skinner saw that classical conditioning is

limited to existing behaviours that are reflexively elicited, and it doesn't account for new behaviours such as riding a bike. He proposed a theory about how such behaviours come about. Skinner believed that behaviour is motivated by the consequences we receive for the behaviour: the reinforcements and punishments. His idea that learning is the result of consequences is based on the law of effect, which was first proposed by psychologist Edward Thorndike. According to the **law of effect**, behaviours that are followed by consequences that are satisfying to the organism are more likely to be repeated, and behaviours that are followed by unpleasant consequences are less likely to be repeated (Thorndike, 1911). Essentially, if an organism does something that brings about a desired result, the organism is more likely to do it again. If an organism does something that does not bring about a desired result, the organism is less likely to do it again. An example of the law of effect is in employment. One of the reasons (and often the main reason) we show up for work is because we get paid to do so. If we stop getting paid, we will likely stop showing up—even if we love our job.

Working with Thorndike's law of effect as his foundation, Skinner began conducting scientific experiments on animals (mainly rats and pigeons) to determine how organisms learn through operant conditioning (Skinner, 1938). He placed these animals inside an operant conditioning chamber, which has come to be known as a "Skinner box" (Figure L.10). A Skinner box contains a lever (for rats) or disk (for pigeons)

that the animal can press or peck for a food reward via the dispenser. Speakers and lights can be associated with certain behaviours. A recorder counts the number of responses made by the animal.



(a) (b)

Figure L.10 (a) B. F. Skinner developed operant conditioning for systematic study of how behaviours are strengthened or weakened according to their consequences. (b) In a Skinner box, a rat presses a lever in an operant conditioning chamber to receive a food reward. (credit a: modification of work by "Silly rabbit"/Wikimedia Commons)

In discussing operant conditioning, we use several everyday words—positive, negative, reinforcement, and punishment—in a specialized manner. In operant conditioning, positive and negative do not mean good and bad. Instead, *positive* means you are adding something, and *negative* means you are taking something away. *Reinforcement* means you are increasing a behaviour, and *punishment* means you are decreasing a behaviour. Reinforcement can be positive or negative, and punishment can also be positive or negative. All reinforcers (positive or

negative) *increase* the likelihood of a behavioural response. All punishers (positive or negative) *decrease* the likelihood of a behavioural response. Now let's combine these four terms: positive reinforcement, negative reinforcement, positive punishment, and negative punishment (Table L.2).

Table L.2 Positive and Negative Reinforcement and Punishment

	Reinforcement	**Punishment**
Positive	Something is *added* to *increase* the likelihood of a behaviour.	Something is *added* to *decrease* the likelihood of a behaviour.
Negative	Something is *removed* to *increase* the likelihood of a behaviour.	Something is *removed* to *decrease* the likelihood of a behaviour.

Reinforcement

The most effective way to teach a person or animal a new behaviour is with positive reinforcement. In **positive reinforcement**, a desirable stimulus is added to increase a behaviour.

For example, you tell your five-year-old kid, Karson, that if they clean their room, they will get a toy. Karson quickly cleans their room because they want a new art set. Let's pause for a moment. Some people might say, "Why should I reward my child for doing what is expected?" But in fact we are constantly and consistently rewarded in our lives. Our paycheques are

rewards, as are high grades and acceptance into our preferred school. Being praised for doing a good job and for passing a driver's test is also a reward. Positive reinforcement as a learning tool is extremely effective. It has been found that one of the most effective ways to increase achievement in school districts with below-average reading scores was to pay the children to read. Specifically, second-grade students in Dallas were paid $2 each time they read a book and passed a short quiz about the book. The result was a significant increase in reading comprehension (Fryer, 2010). What do you think about this program? If Skinner were alive today, he would probably think this was a great idea. He was a strong proponent of using operant conditioning principles to influence students' behaviour at school. In fact, in addition to the Skinner box, he also invented what he called a teaching machine that was designed to reward small steps in learning (Skinner, 1961)—an early forerunner of computer-assisted learning. His teaching machine tested students' knowledge as they worked through various school subjects. If students answered questions correctly, they received immediate positive reinforcement and could continue; if they answered incorrectly, they did not receive any reinforcement. The idea was that students would spend additional time studying the material to increase their chance of being reinforced the next time (Skinner, 1961).

In **negative reinforcement**, an undesirable stimulus is removed to increase a behaviour. For example, car manufacturers use the principles of negative reinforcement in

their seatbelt systems, which go "beep, beep, beep" until you fasten your seatbelt. The annoying sound stops when you exhibit the desired behaviour, increasing the likelihood that you will buckle up in the future. Negative reinforcement is also used frequently in horse training. Riders apply pressure—by pulling the reins or squeezing their legs—and then remove the pressure when the horse performs the desired behaviour, such as turning or speeding up. The pressure is the negative stimulus that the horse wants to remove.

Punishment

Many people confuse negative reinforcement with punishment in operant conditioning, but they are two very different mechanisms. Remember that reinforcement, even when it is negative, always increases a behaviour. In contrast, **punishment** always decreases a behaviour. In **positive punishment**, you add an undesirable stimulus to decrease a behaviour. An example of positive punishment is scolding a student to get the student to stop texting in class. In this case, a stimulus (the reprimand) is added in order to decrease the behaviour (texting in class). In **negative punishment**, you remove a pleasant stimulus to decrease behaviour. For example, when a child misbehaves, a parent can take away a favourite toy. In this case, a stimulus (the toy) is removed in order to decrease the behaviour.

Punishment, especially when it is immediate, is one way

to decrease undesirable behaviour. For example, imagine your four-year-old, Sasha, hit another kid. You have Sasha write 100 times "I will not hit other children" (positive punishment). Chances are Sasha won't repeat this behaviour. While strategies like this are common today, in the past children were often subject to physical punishment, such as spanking. It's important to be aware of some of the drawbacks in using physical punishment on children. First, punishment may teach fear. Sasha may become fearful of the street, but Sasha also may become fearful of the person who delivered the punishment—you, the parent. Similarly, children who are punished by teachers may come to fear the teacher and try to avoid school (Gershoff et al., 2010). Consequently, most schools in the United States have banned corporal punishment. Second, punishment may cause children to become more aggressive and prone to antisocial behaviour and delinquency (Gershoff, 2002). They see their parents resort to spanking when they become angry and frustrated, so, in turn, they may act out this same behaviour when they become angry and frustrated. For example, because you spank Sasha when you are angry with them for misbehaving, Sasha might start hitting their friends when they won't share their toys.

While positive punishment can be effective in some cases, Skinner suggested that the use of punishment should be weighed against the possible negative effects. Today's psychologists and parenting experts favour reinforcement over

punishment—they recommend that you catch your child doing something good and reward them for it.

Shaping

In his operant conditioning experiments, Skinner often used an approach called shaping. Instead of rewarding only the target behaviour, in **shaping,** we reward successive approximations of a target behaviour. Why is shaping needed? Remember that in order for reinforcement to work, the organism must first display the behaviour. Shaping is needed because it is extremely unlikely that an organism will display anything but the simplest of behaviours spontaneously. In shaping, behaviours are broken down into many small, achievable steps. The specific steps used in the process are the following:

1. Reinforce any response that resembles the desired behaviour.
2. Then reinforce the response that more closely resembles the desired behaviour. You will no longer reinforce the previously reinforced response.
3. Next, begin to reinforce the response that even more closely resembles the desired behaviour.
4. Continue to reinforce closer and closer approximations of the desired behaviour.
5. Finally, only reinforce the desired behaviour.

Shaping is often used in teaching a complex behaviour or chain of behaviours. Skinner used shaping to teach pigeons not only such relatively simple behaviours as pecking a disk in a Skinner box, but also many unusual and entertaining behaviours, such as turning in circles, walking in figure eights, and even playing ping pong; the technique is commonly used by animal trainers today. An important part of shaping is stimulus discrimination. Recall Pavlov's dogs—he trained them to respond to the tone of a bell, and not to similar tones or sounds. This discrimination is also important in operant conditioning and in shaping behaviour.

Link to Learning

Watch this video of Skinner's pigeons playing ping pong to learn more.

It's easy to see how shaping is effective in teaching behaviours to animals, but how does shaping work with humans? Let's consider a parent whose goal is to have their child learn to clean their room. The parent shaping to help the child master steps toward the goal. Instead of performing the entire task, they set

up these steps and reinforce each step. First, the child cleans up one toy. Second, the child cleans up five toys. Third, the child chooses whether to pick up ten toys or put their books and clothes away. Fourth, the child cleans up everything except two toys. Finally, the child cleans their entire room.

Primary and Secondary Reinforcers

Rewards such as stickers, praise, money, toys, and more can be used to reinforce learning. Let's go back to Skinner's rats again. How did the rats learn to press the lever in the Skinner box? They were rewarded with food each time they pressed the lever. For animals, food would be an obvious reinforcer.

What would be a good reinforcer for humans? For your child Karson, it was the promise of a toy when they cleaned their room. How about Sydney, the soccer player? If you gave Sydney a piece of candy every time Sydney scored a goal, you would be using a **primary reinforcer.** Primary reinforcers are reinforcers that have innate reinforcing qualities. These kinds of reinforcers are not learned. Water, food, sleep, shelter, sex, and touch, among others, are primary reinforcers. Pleasure is also a primary reinforcer. Organisms do not lose their drive for these things. For most people, jumping in a cool lake on a very hot day would be reinforcing and the cool lake would be innately reinforcing—the water would cool the person off (a physical need), as well as provide pleasure.

A **secondary reinforcer** has no inherent value and only has

reinforcing qualities when linked with a primary reinforcer. Praise, linked to affection, is one example of a secondary reinforcer, as when you called out "Great shot!" every time Sydney made a goal. Another example, money, is only worth something when you can use it to buy other things—either things that satisfy basic needs (food, water, shelter—all primary reinforcers) or other secondary reinforcers. If you were on a remote island in the middle of the Pacific Ocean and you had stacks of money, the money would not be useful if you could not spend it. What about the stickers on the behaviour chart? They also are secondary reinforcers.

Sometimes, instead of stickers on a sticker chart, a token is used. Tokens, which are also secondary reinforcers, can then be traded in for rewards and prizes. Entire behaviour management systems, known as token economies, are built around the use of these kinds of token reinforcers. Token economies have been found to be very effective at modifying behaviour in a variety of settings such as schools, prisons, and mental hospitals. For example, a study by Cangi and Daly (2013) found that use of a token economy increased appropriate social behaviours and reduced inappropriate behaviours in a group of autistic school children. Autistic children tend to exhibit disruptive behaviours such as pinching and hitting. When the children in the study exhibited appropriate behaviour (not hitting or pinching), they received a "quiet hands" token. When they hit or pinched, they lost a

token. The children could then exchange specified amounts of tokens for minutes of playtime.

Everyday Connection

Behaviour Modification in Children

Parents and teachers often use behaviour modification to change a child's behaviour. Behaviour modification uses the principles of operant conditioning to accomplish behaviour change so that undesirable behaviours are switched for more socially acceptable ones. Some teachers and parents create a sticker chart, in which several behaviours are listed (Figure L.11). Sticker charts are a form of token economies, as described in the text. Each time children perform the behaviour, they get a sticker, and after a certain number of stickers, they get a prize, or reinforcer. The goal is to increase acceptable behaviours and decrease misbehaviour. Remember, it is best to reinforce desired behaviours, rather than to use punishment. In the classroom, the

teacher can reinforce a wide range of behaviours, from students raising their hands, to walking quietly in the hall, to turning in their homework. At home, parents might create a behaviour chart that rewards children for things such as putting away toys, brushing their teeth, and helping with dinner. In order for behaviour modification to be effective, the reinforcement needs to be connected with the behaviour; the reinforcement must matter to the child and be done consistently.

Figure L.11 Sticker charts are a form of positive reinforcement and a tool for behaviour modification. Once this child earns a certain number of stickers for demonstrating a desired behaviour, she will be rewarded with a trip to the ice cream parlour. (credit: Abigail Batchelder)

Time-out is another popular technique used in behaviour modification with children. It operates on the principle of negative punishment. When a child demonstrates an undesirable behaviour, she is removed from the desirable activity at hand (Figure L.12). For example, say that Paton and their sibling Bennet are playing with building blocks. Paton throws some blocks at Bennet, so you give Paton a warning that they will go to time-out if they do it again. A few minutes later, Paton throws more blocks at Bennet. You remove Paton from the room for a few minutes. When Paton comes back, they don't throw blocks.

There are several important points that you should know if you plan to implement time-out as a behaviour modification technique. First, make sure the child is being removed from a desirable activity and placed in a less desirable location. If the activity is something undesirable for the child, this technique will backfire because it is more enjoyable for the child to be removed from the activity. Second, the length of the time-out is important. The general rule of thumb is one minute for each year of the child's age. Sophia is five; therefore, she sits in a time-out for five minutes. Setting a timer helps children know how long they have to sit in time-out. Finally, as a

caregiver, keep several guidelines in mind over the course of a time-out: remain calm when directing your child to time-out; ignore your child during time-out (because caregiver attention may reinforce misbehaviour); and give the child a hug or a kind word when time-out is over.

(a) (b)

Figure L.12 Time-out is a popular form of negative punishment used by caregivers. When a child misbehaves, they are removed from a desirable activity in an effort to decrease the unwanted behaviour. For example, (a) a child might be playing on the playground with friends and push another child; (b) the child who misbehaved would then be removed from the activity for a short period of time. (credit a: modification of work by Simone Ramella; credit b: modification of work by "Spring Dew"/Flickr)

TRICKY TOPIC: OPERANT CONDITIONING

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Reinforcement Schedules

Remember, the best way to teach a person or animal a behaviour is to use positive reinforcement. For example, Skinner used positive reinforcement to teach rats to press a lever in a Skinner box. At first, the rat might randomly hit the lever while exploring the box, and out would come a pellet of food. After eating the pellet, what do you think the hungry rat did next? It hit the lever again, and received another pellet of food. Each time the rat hit the lever, a pellet of food came out. When an organism receives a reinforcer each time it displays a behaviour, it is called **continuous reinforcement.** This

reinforcement schedule is the quickest way to teach someone a behaviour, and it is especially effective in training a new behaviour. Let's look back at the dog that was learning to sit earlier in the chapter. Now, each time the dog sits, you give the dog a treat. Timing is important here: you will be most successful if you present the reinforcer immediately after the dog sits, so that the dog can make an association between the target behaviour (sitting) and the consequence (getting a treat).

Link to Learning

Watch this video clip of veterinarian Dr. Sophia Yin shaping a dog's behaviour using the steps outlined above, to learn more.

Once a behaviour is trained, researchers and trainers often turn to another type of reinforcement schedule—**partial reinforcement.** In partial reinforcement, also referred to as intermittent reinforcement, the person or animal does not get reinforced every time they perform the desired behaviour. There are several different types of partial reinforcement

schedules (Table L.3). These schedules are described as either fixed or variable, and as either interval or ratio. *Fixed* refers to the number of responses between reinforcements, or the amount of time between reinforcements, which is set and unchanging. *Variable* refers to the number of responses or amount of time between reinforcements, which varies or changes. *Interval* means the schedule is based on the time between reinforcements, and *ratio* means the schedule is based on the number of responses between reinforcements.

Table L.3 Reinforcement Schedules

Reinforcement Schedule	Description	Result	Example
Fixed interval	Reinforcement is delivered at predictable time intervals (e.g., after 5, 10, 15, and 20 minutes).	Moderate response rate with significant pauses after reinforcement	Hospital patient uses patient-controlled, doctor-timed pain relief
Variable interval	Reinforcement is delivered at unpredictable time intervals (e.g., after 5, 7, 10, and 20 minutes).	Moderate yet steady response rate	Checking Facebook
Fixed ratio	Reinforcement is delivered after a predictable number of responses (e.g., after 2, 4, 6, and 8 responses).	High response rate with pauses after reinforcement	Piecework—factory worker getting paid for every x number of items manufactured
Variable ratio	Reinforcement is delivered after an unpredictable number of responses (e.g., after 1, 4, 5, and 9 responses).	High and steady response rate	Gambling

Now let's combine these four terms. A **fixed interval reinforcement schedule** is when behaviour is rewarded after a set amount of time. For example, June undergoes major surgery in a hospital. During recovery, June is expected to experience pain and will require prescription medications for pain relief. June is given an IV drip with a patient-controlled painkiller. June's doctor sets a limit: one dose per hour. June pushes a button when pain becomes difficult, and they receive a dose of medication. Since the reward (pain relief) only occurs on a fixed interval, there is no point in exhibiting the behaviour when it will not be rewarded.

With a **variable interval reinforcement schedule**, the person or animal gets the reinforcement based on varying amounts of time, which are unpredictable. Say that Tate is the manager at a fast-food restaurant. Every once in a while someone from the quality control division comes to Tate's restaurant. If the restaurant is clean and the service is fast, everyone on that shift earns a $20 bonus. Tate never knows when the quality control person will show up, so they always tries to keep the restaurant clean and ensures that their employees provide prompt and courteous service. Tate's productivity regarding prompt service and keeping a clean restaurant are steady because Tate wants their crew to earn the bonus.

With a **fixed ratio reinforcement schedule**, there are a set number of responses that must occur before the behaviour is

rewarded. Reed sells glasses at an eyeglass store, and earns a commission every time they sell a pair of glasses. Reed always tries to sell people more pairs of glasses, including prescription sunglasses or a backup pair, so they can increase their commission. Reed does not care if the person really needs the prescription sunglasses, they just wants the bonus. The quality of what Reed sells does not matter because Reed's commission is not based on quality; it's only based on the number of pairs sold. This distinction in the quality of performance can help determine which reinforcement method is most appropriate for a particular situation. Fixed ratios are better suited to optimize the quantity of output, whereas a fixed interval, in which the reward is not quantity based, can lead to a higher quality of output.

In a **variable ratio reinforcement schedule**, the number of responses needed for a reward varies. This is the most powerful partial reinforcement schedule. An example of the variable ratio reinforcement schedule is gambling. Imagine that Quinn—generally a smart, thrifty person—visits Las Vegas for the first time. Quinn is not a gambler, but out of curiosity they put a quarter into the slot machine, and then another, and another. Nothing happens. Two dollars in quarters later, Quinn's curiosity is fading, and they are just about to quit. But then, the machine lights up, bells go off, and Quinn gets 50 quarters back. That's more like it! Quinn gets back to inserting quarters with renewed interest, and a few minutes later they have used up all the gains and is $10 in the

hole. Now might be a sensible time to quit. And yet, Quinn keeps putting money into the slot machine because they never know when the next reinforcement is coming. Quinn keeps thinking that with the next quarter they could win $50, or $100, or even more. Because the reinforcement schedule in most types of gambling has a variable ratio schedule, people keep trying and hoping that the next time they will win big. This is one of the reasons that gambling is so addictive—and so resistant to extinction.

In operant conditioning, extinction of a reinforced behaviour occurs at some point after reinforcement stops, and the speed at which this happens depends on the reinforcement schedule. In a variable ratio schedule, the point of extinction comes very slowly, as described above. But in the other reinforcement schedules, extinction may come quickly. For example, if June presses the button for the pain relief medication before the allotted time their doctor has approved, no medication is administered. June is on a fixed interval reinforcement schedule (dosed hourly), so extinction occurs quickly when reinforcement doesn't come at the expected time. Among the reinforcement schedules, variable ratio is the most productive and the most resistant to extinction. Fixed interval is the least productive and the easiest to extinguish (Figure L.13).

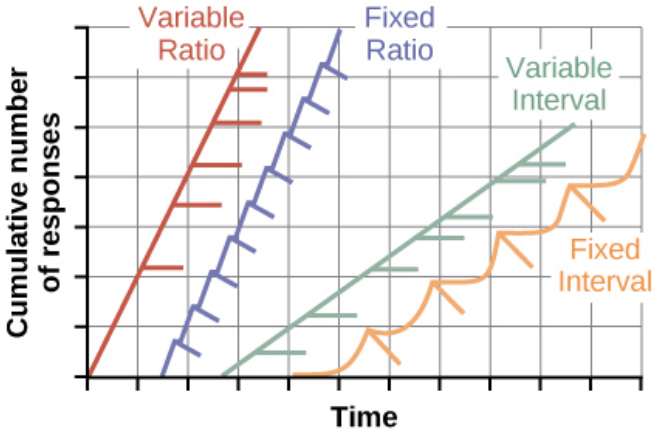

Figure L.13 The four reinforcement schedules yield different response patterns. The variable ratio schedule is unpredictable and yields high and steady response rates, with little if any pause after reinforcement (e.g., gambler). A fixed ratio schedule is predictable and produces a high response rate, with a short pause after reinforcement (e.g., eyeglass saleswoman). The variable interval schedule is unpredictable and produces a moderate, steady response rate (e.g., restaurant manager). The fixed interval schedule yields a scallop-shaped response pattern, reflecting a significant pause after reinforcement (e.g., surgery patient).

Dig Deeper

Gambling and the Brain

Skinner (1953) stated, "If the gambling establishment cannot persuade a patron to turn over money with no return, it may achieve the same effect by returning part of the patron's money on a variable-ratio schedule" (p. 397).

Skinner uses gambling as an example of the power of the variable-ratio reinforcement schedule for maintaining behaviour even during long periods without any reinforcement. In fact, Skinner was so confident in his knowledge of gambling addiction that he even claimed he could turn a pigeon into a pathological gambler ("Skinner's Utopia," 1971). It is indeed true that variable-ratio schedules keep behaviour quite persistent—just imagine the frequency of a child's tantrums if a parent gives in even once to the behaviour. The occasional reward makes it almost impossible to stop the behaviour.

Recent research in rats has failed to support Skinner's idea that training on variable-ratio schedules alone causes pathological gambling (Laskowski et al., 2019). However, other research suggests that gambling does seem to work on the brain in the same way as most addictive drugs, and so there may be some combination of brain chemistry and reinforcement schedule that could lead to problem gambling (Figure L.14). Specifically, modern research shows the connection between gambling and the activation of the reward centres of the brain that use the neurotransmitter (brain chemical) dopamine (Murch & Clark, 2016). Interestingly, gamblers don't even have to win to experience the "rush" of dopamine in the brain. "Near misses," or almost winning but not actually winning, also have been shown to increase activity in the ventral striatum and other brain reward centres that use dopamine (Chase & Clark, 2010). These brain effects are almost identical to those produced by addictive drugs like cocaine and heroin (Murch & Clark, 2016). Based on the neuroscientific evidence showing these similarities, the DSM-5 now considers gambling an addiction, while earlier versions of the DSM classified gambling as an impulse control disorder.

Figure L.14 Some research suggests that pathological gamblers use gambling to compensate for abnormally low levels of the hormone norepinephrine, which is associated with stress and is secreted in moments of arousal and thrill. (credit: Ted Murphy)

In addition to dopamine, gambling also appears to involve other neurotransmitters, including norepinephrine and serotonin (Potenza, 2013). Norepinephrine is secreted when a person feels stress, arousal, or thrill. It may be that pathological gamblers use gambling to increase their levels of this neurotransmitter. Deficiencies in serotonin might also contribute to compulsive behaviour, including a gambling addiction (Potenza, 2013).

It may be that pathological gamblers' brains are

different than those of other people, and perhaps this difference may somehow have led to their gambling addiction, as these studies seem to suggest. However, it is very difficult to ascertain the cause because it is impossible to conduct a true experiment (it would be unethical to try to turn randomly assigned participants into problem gamblers). Therefore, it may be that causation actually moves in the opposite direction—perhaps the act of gambling somehow changes neurotransmitter levels in some gamblers' brains. It also is possible that some overlooked factor, or confounding variable, played a role in both the gambling addiction and the differences in brain chemistry.

TRICKY TOPIC: SCHEDULES OF REINFORCEMENT

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Other Types of Learning

John B. Watson and B. F. Skinner were behaviourists who believed that all learning could be explained by the processes of conditioning—that is, that associations, and associations alone, influence learning. But some kinds of learning are very difficult to explain using only conditioning. Thus, although classical and operant conditioning play a key role in learning, they constitute only a part of the total picture.One type of learning that is not determined only by conditioning occurs when we suddenly find the solution to a problem, as if the idea just popped into our head. This type of learning is known as **insight**, the sudden understanding of a solution to a problem. The German psychologist Wolfgang Köhler (1957-1925) carefully observed what happened when he presented chimpanzees with a problem that was not easy for them to solve, such as placing food in an area that was too high in the

cage to be reached. He found that the chimps first engaged in trial-and-error attempts at solving the problem, but when these failed they seemed to stop and contemplate for a while. Then, after this period of contemplation, they would suddenly seem to know how to solve the problem: for instance, by using a stick to knock the food down or by standing on a chair to reach it. Köhler argued that it was this flash of insight, not the prior trial-and-error approaches, which were so important for conditioning theories, that allowed the animals to solve the problem.

Strict behaviourists like Watson and Skinner focused exclusively on studying behaviour rather than cognition (such as thoughts and expectations). In fact, Skinner was such a staunch believer that cognition didn't matter that his ideas were considered **radical behaviorism**. Skinner considered the mind a "black box"—something completely unknowable—and, therefore, something not to be studied. However, another behaviourist, Edward C. Tolman, had a different opinion. Tolman's experiments with rats demonstrated that organisms can learn even if they do not receive immediate reinforcement (Tolman & Honzik, 1930; Tolman, Ritchie, & Kalish, 1946). This finding was in conflict with the prevailing idea at the time that reinforcement must be immediate in order for learning to occur, thus suggesting a cognitive aspect to learning.

Edward Tolman studied the behaviour of three groups of

rats that were learning to navigate through mazes (Tolman & Honzik, 1930). The first group always received a reward of food at the end of the maze but the second group never received any reward. The third group did not receive any reward for the first 10 days an then began receiving rewards on the 11th day of the experimental period. As you might expect when considering the principles of conditioning, the rats in the first group quickly learned to negotiate the maze, while the rats of the second group seemed to wander aimlessly through it. The rats in the third group, however, although they wandered aimlessly for the first 10 days, quickly learned to navigate to the end of the maze as soon as they received food on day 11. By the next day, the rats in the third group had caught up in their learning to the rats that had been rewarded from the beginning. Tolman argued that this was because as the unreinforced rats explored the maze, they developed a **cognitive map:** a mental picture of the layout of the maze (Figure L.15). As soon as the rats became aware of the food (beginning on the 11th day), they were able to find their way through the maze quickly, just as quickly as the comparison group, which had been rewarded with food all along. This is known as **latent learning**: learning that occurs but is not observable in behaviour until there is a reason to demonstrate it.

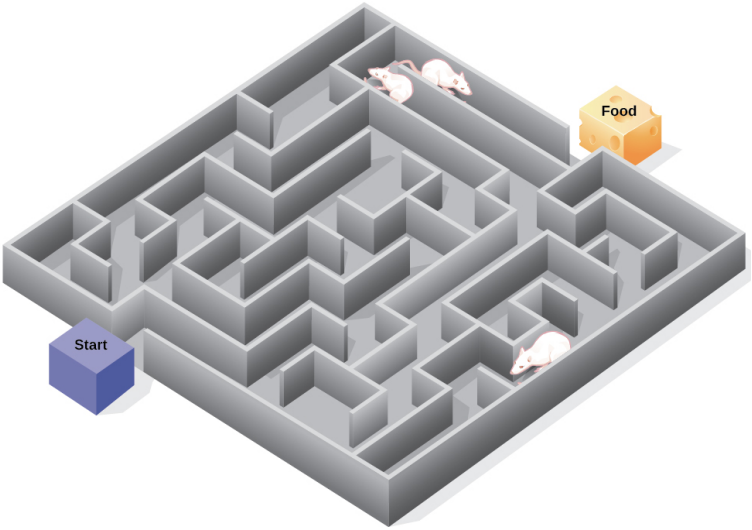

Figure L.15 Psychologist Edward Tolman found that rats use cognitive maps to navigate through a maze. Have you ever worked your way through various levels on a video game? You learned when to turn left or right, move up or down. In that case you were relying on a cognitive map, just like the rats in a maze. (credit: modification of work by "FutUndBeidl"/Flickr)

Latent learning also occurs in humans. Children may learn by watching the actions of their parents but only demonstrate it at a later date, when the learned material is needed. For example, suppose that Zan's parent drives Zan to school every day. In this way, Zan learns the route from their house to their school, but Zan's never driven there themselves, so they have not had a chance to demonstrate that they've learned the way. One morning Zan's parent has to leave early for a meeting, so they can't drive Zan to school. Instead, Zan follows

the same route on their bike that Zan's parent would have taken in the car. This demonstrates latent learning. Zan had learned the route to school, but had no need to demonstrate this knowledge earlier.

63.

OBSERVATIONAL LEARNING

Learning Objectives

By the end of this section, you will be able to:

- Define observational learning
- Discuss the steps in the modelling process
- Explain the prosocial and antisocial effects of observational learning

Previous sections of this chapter focused on classical and operant conditioning, which are forms of associative learning. In **observational learning**, we learn by watching others and then imitating, or modelling, what they do or say. For instance,

have you ever gone to YouTube to find a video showing you how to do something? The individuals performing the imitated behaviour are called **models.** Research suggests that this imitative learning involves a specific type of neurone, called a mirror neurone (Hickock, 2010; Rizzolatti, Fadiga, Fogassi, & Gallese, 2002; Rizzolatti, Fogassi, & Gallese, 2006).

Humans and other animals are capable of observational learning. As you will see, the phrase "monkey see, monkey do" really is accurate (Figure L.16). The same could be said about other animals. For example, in a study of social learning in chimpanzees, researchers gave juice boxes with straws to two groups of captive chimpanzees. The first group dipped the straw into the juice box, and then sucked on the small amount of juice at the end of the straw. The second group sucked through the straw directly, getting much more juice. When the first group, the "dippers," observed the second group, "the suckers," what do you think happened? All of the "dippers" in the first group switched to sucking through the straws directly. By simply observing the other chimps and modelling their behaviour, they learned that this was a more efficient method of getting juice (Yamamoto, Humle, and Tanaka, 2013).

Figure L.16 This spider monkey learned to drink water from a plastic bottle by seeing the behaviour modelled by a human. (credit: U.S. Air Force, Senior Airman Kasey Close)

Like Tolman, whose experiments with rats suggested a cognitive component to learning, psychologist Albert Bandura's ideas about learning were different from those of strict behaviourists. Bandura and other researchers proposed a brand of behaviourism called social learning theory, which took cognitive processes into account. According to Bandura, pure behaviourism could not explain why learning can take place in the absence of external reinforcement. He felt that internal mental states must also have a role in learning and that observational learning involves much more than imitation. In imitation, a person simply copies what the model does. Observational learning is much more complex. According to Lefrançois (2012) there are several ways that observational learning can occur:

1. You learn a new response. After watching your coworker get chewed out by your boss for coming in late, you start leaving home 10 minutes earlier so that you won't be late.
2. You choose whether or not to imitate the model depending on what you saw happen to the model. Remember Naomi and their parent, Yao? When learning to surf, Naomi might watch how Yao pops up successfully on their surfboard and then attempt to do the same thing. On the other hand, Naomi might learn not to touch a hot stove after watching Yao get burned on a stove.
3. You learn a general rule that you can apply to other situations.

Bandura identified three kinds of models: live, verbal, and symbolic. A live model demonstrates a behaviour in person, as when Yao stood up on their surfboard so that Naomi could see how they did it. A verbal instructional model does not perform the behaviour, but instead explains or describes the behaviour, as when a soccer coach tells their young players to kick the ball with the side of the foot, not with the toe. A symbolic model can be fictional characters or real people who demonstrate behaviours in books, movies, television shows, video games, or Internet sources (Figure L.17).

(a)

(b)

Figure L.17 (a) Yoga students learn by observation as their yoga instructor demonstrates the correct stance and movement for her students (live model). (b) Models don't have to be present for learning to occur: through symbolic modelling, this child can learn a behaviour by watching someone demonstrate it on television. (credit a: modification of work by Tony Cecala; credit b: modification of work by Andrew Hyde)

Steps in the Modelling Process

Of course, we don't learn a behaviour simply by observing a model. Bandura described specific steps in the process of modelling that must be followed if learning is to be successful: attention, retention, reproduction, and motivation. First, you must be focused on what the model is doing—you have to pay attention. Next, you must be able to retain, or remember, what you observed; this is retention. Then, you must be able to perform the behaviour that you observed and committed to memory; this is reproduction. Finally, you must have

motivation. You need to want to copy the behaviour, and whether or not you are motivated depends on what happened to the model. If you saw that the model was reinforced for their behaviour, you will be more motivated to copy them. This is known as **vicarious reinforcement**. On the other hand, if you observed the model being punished, you would be less motivated to copy them. This is called **vicarious punishment**. For example, imagine that four-year-old Lake watched their older sibling Opal playing with their parent's makeup, and then saw Opal get a time out when their parent came in. After their parent left the room, Lake was tempted to play in the make-up, but did not want to get a time-out from their parent. What do you think Lake did? Once you actually demonstrate the new behaviour, the reinforcement you receive plays a part in whether or not you will repeat the behaviour.

Bandura researched modelling behaviour, particularly children's modelling of adults' aggressive and violent behaviours (Bandura, Ross, & Ross, 1961). He conducted an experiment with a five-foot inflatable doll that he called a Bobo doll. In the experiment, children's aggressive behaviour was influenced by whether the teacher was punished for their behaviour. In one scenario, a teacher acted aggressively with the doll, hitting, throwing, and even punching the doll, while a child watched. There were two types of responses by the children to the teacher's behaviour. When the teacher was punished for their bad behaviour, the children decreased their tendency to act as the teacher had. When the teacher was

praised or ignored (and not punished for her behaviour), the children imitated what the teacher did, and even what the teacher said. They punched, kicked, and yelled at the doll.

Link to Learning

Watch this clip about the famous Bobo doll experiment to see a portion of the experiment and an interview with Albert Bandura (more about this experiment can be found in the Psychological Research chapter).

What are the implications of this study? Bandura concluded that we watch and learn, and that this learning can have both prosocial and antisocial effects. Prosocial (positive) models can be used to encourage socially acceptable behaviour. Parents in particular should take note of this finding. If you want your children to read, then read to them. Let them see you reading. Keep books in your home. Talk about your favourite books. If you want your children to be healthy, then let them see you eat right and exercise, and spend time engaging in physical fitness activities together. The same holds

true for qualities like kindness, courtesy, and honesty. The main idea is that children observe and learn from their parents, even their parents' morals, so be consistent and toss out the old adage "Do as I say, not as I do," because children tend to copy what you do instead of what you say. Besides parents, many public figures, such as Martin Luther King, Jr. and Mahatma Gandhi, are viewed as prosocial models who are able to inspire global social change. Can you think of someone who has been a prosocial model in your life?

The antisocial effects of observational learning are also worth mentioning. Research suggests that this learning may help to explain why children who experienced abuse often grow up to abuse others (Murrell, Christoff, & Henning, 2007). Children who experience abuse, who grow up witnessing their parents deal with anger and frustration through violent and aggressive acts, often learn to behave in that manner themselves. Sadly, it's a vicious cycle that's difficult to break.

64.

KEY TERMS FOR LEARNING

acquisition
: period of initial learning in classical conditioning in which a human or an animal begins to connect a neutral stimulus and an unconditioned stimulus so that the neutral stimulus will begin to elicit the conditioned response

associative learning
: form of learning that involves connecting certain stimuli or events that occur together in the environment (classical and operant conditioning)

classical conditioning
: learning in which the stimulus or experience occurs before the behaviour and then gets paired or associated with the behaviour

cognitive map
: mental picture of the layout of the environment

conditioned response (CR)
: response caused by the conditioned stimulus

conditioned stimulus (CS)

stimulus that elicits a response due to its being paired with an unconditioned stimulus

continuous reinforcement

rewarding a behaviour every time it occurs

extinction

decrease in the conditioned response when the unconditioned stimulus is no longer paired with the conditioned stimulus

fear conditioning

a type of classical conditioning that elicits a fear response

fixed interval reinforcement schedule

behaviour is rewarded after a set amount of time

fixed ratio reinforcement schedule

set number of responses must occur before a behaviour is rewarded

higher-order conditioning

(also, second-order conditioning) using a conditioned stimulus to condition a neutral stimulus

insight

the sudden understanding of a solution to a problem

instinct

unlearned knowledge, involving complex patterns of behaviour; instincts are thought to be more prevalent in lower animals than in humans

latent learning

learning that occurs, but it may not be evident until

there is a reason to demonstrate it

law of effect

behaviour that is followed by consequences satisfying to the organism will be repeated and behaviours that are followed by unpleasant consequences will be discouraged

learning

change in behaviour or knowledge that is the result of experience

model

person who performs a behaviour that serves as an example (in observational learning)

negative punishment

taking away a pleasant stimulus to decrease or stop a behaviour

negative reinforcement

taking away an undesirable stimulus to increase a behaviour

neutral stimulus (NS)

stimulus that does not initially elicit a response

observational learning

type of learning that occurs by watching others

operant conditioning

form of learning in which the stimulus/experience happens after the behaviour is demonstrated

partial reinforcement

rewarding behaviour only some of the time

positive punishment

adding an undesirable stimulus to stop or decrease a behaviour

positive reinforcement

adding a desirable stimulus to increase a behaviour

primary reinforcer

has innate reinforcing qualities (e.g., food, water, shelter, sex)

punishment

implementation of a consequence in order to decrease a behaviour

radical behaviourism

staunch form of behaviourism developed by B. F. Skinner that suggested that even complex higher mental functions like human language are nothing more than stimulus-outcome associations

reflex

unlearned, automatic response by an organism to a stimulus in the environment

reinforcement

implementation of a consequence in order to increase a behaviour

secondary reinforcer

has no inherent value unto itself and only has reinforcing qualities when linked with something else (e.g., money, gold stars, poker chips)

shaping
rewarding successive approximations toward a target behaviour

spontaneous recovery
return of a previously extinguished conditioned response

stimulus discrimination
ability to respond differently to similar stimuli

stimulus generalization
demonstrating the conditioned response to stimuli that are similar to the conditioned stimulus

unconditioned response (UCR)
natural (unlearned) behaviour to a given stimulus

unconditioned stimulus (US)
stimulus that elicits a reflexive response

variable interval reinforcement schedule
behaviour is rewarded after unpredictable amounts of time have passed

variable ratio reinforcement schedule
number of responses differ before a behaviour is rewarded

vicarious punishment
process where the observer sees the model punished, making the observer less likely to imitate the model's behaviour

vicarious reinforcement
process where the observer sees the model rewarded, making the observer more likely to imitate the model's

behaviour

65.

SUMMARY OF LEARNING

L.1 What Is Learning?

Instincts and reflexes are innate behaviours—they occur naturally and do not involve learning. In contrast, learning is a change in behaviour or knowledge that results from experience. There are three main types of learning: classical conditioning, operant conditioning, and observational learning. Both classical and operant conditioning are forms of associative learning where associations are made between events that occur together. Observational learning is just as it sounds: learning by observing others.

L.2 Classical Conditioning

Pavlov's pioneering work with dogs contributed greatly to what we know about learning. His experiments explored the type of associative learning we now call classical conditioning. In classical conditioning, organisms learn to associate events that repeatedly happen together, and researchers study how a

reflexive response to a stimulus can be mapped to a different stimulus—by training an association between the two stimuli. Pavlov's experiments show how stimulus-response bonds are formed. Watson, the founder of behaviourism, was greatly influenced by Pavlov's work. He tested humans by conditioning fear in an infant known as Little Albert. His findings suggest that classical conditioning can explain how some fears develop.

L.3 Operant Conditioning

Operant conditioning is based on the work of B. F. Skinner. Operant conditioning is a form of learning in which the motivation for a behaviour happens *after* the behaviour is demonstrated. An animal or a human receives a consequence after performing a specific behaviour. The consequence is either a reinforcer or a punisher. All reinforcement (positive or negative) *increases* the likelihood of a behavioural response. All punishment (positive or negative) *decreases* the likelihood of a behavioural response. Several types of reinforcement schedules are used to reward behaviour depending on either a set or variable period of time.

L.4 Observational Learning (Modelling)

According to Bandura, learning can occur by watching others and then modelling what they do or say. This is known as

observational learning. There are specific steps in the process of modelling that must be followed if learning is to be successful. These steps include attention, retention, reproduction, and motivation. Through modelling, Bandura has shown that children learn many things both good and bad simply by watching their parents, siblings, and others.

66.

REVIEW QUESTIONS FOR LEARNING

Click here for the Answer Key

Multiple-Choice Questions

1. Which of the following is an example of a reflex that occurs at some point in the development of a human being?

a. child riding a bike
b. teen socializing
c. infant sucking on a nipple
d. toddler walking

2. Learning is best defined as a relatively permanent change in behaviour that _____.

a. is innate
b. occurs as a result of experience
c. is found only in humans
d. occurs by observing others

3. Two forms of associative learning are _____ and _____.

a. classical conditioning; operant conditioning
b. classical conditioning; Pavlovian conditioning
c. operant conditioning; observational learning
d. operant conditioning; learning conditioning

4. In _____ the stimulus or experience occurs before the behaviour and then gets paired with the behaviour.

a. associative learning
b. observational learning
c. operant conditioning
d. classical conditioning

5. A stimulus that does not initially elicit a response in an organism is a(n) _____.

a. unconditioned stimulus
b. neutral stimulus
c. conditioned stimulus
d. unconditioned response

6. In Watson and Rayner's experiments, Little Albert was conditioned to fear a white rat, and then he began to be afraid of other furry white objects. This demonstrates _____.

a. higher order conditioning
b. acquisition
c. stimulus discrimination
d. stimulus generalization

7. Extinction occurs when _____.

a. the conditioned stimulus is presented repeatedly without being paired with an unconditioned stimulus
b. the unconditioned stimulus is presented repeatedly without being paired with a conditioned stimulus
c. the neutral stimulus is presented repeatedly without being paired with an unconditioned stimulus
d. the neutral stimulus is presented repeatedly without being paired with a conditioned stimulus

8. In Pavlov's work with dogs, the psychic secretions were _____.

a. unconditioned responses
b. conditioned responses
c. unconditioned stimuli
d. conditioned stimuli

9. _____ is when you take away a pleasant stimulus to stop a behaviour.

a. positive reinforcement
b. negative reinforcement
c. positive punishment
d. negative punishment

10. Which of the following is *not* an example of a primary reinforcer?

a. food
b. money
c. water
d. sex

11. Rewarding successive approximations toward a target behaviour is _____.

a. shaping
b. extinction
c. positive reinforcement
d. negative reinforcement

12. Slot machines reward gamblers with money according to which reinforcement schedule?

a. fixed ratio
b. variable ratio
c. fixed interval

d. variable interval

13. The person who performs a behaviour that serves as an example is called a _____.

a. teacher
b. model
c. instructor
d. coach

14. In Bandura's Bobo doll study, when the children who watched the aggressive model were placed in a room with the doll and other toys, they _____.

a. ignored the doll
b. played nicely with the doll
c. played with tinker toys
d. kicked and threw the doll

15. Which is the correct order of steps in the modelling process?

a. attention, retention, reproduction, motivation
b. motivation, attention, reproduction, retention
c. attention, motivation, retention, reproduction
d. motivation, attention, retention, reproduction

16. Who proposed observational learning?

a. Ivan Pavlov
b. John Watson
c. Albert Bandura
d. B. F. Skinner

Critical Thinking Questions

17. Compare and contrast classical and operant conditioning. How are they alike? How do they differ?
18. What is the difference between a reflex and a learned behaviour?
19. If the sound of your toaster popping up toast causes your mouth to water, what are the US, CS, and CR?
20. Explain how the processes of stimulus generalization and stimulus discrimination are considered opposites.
21. How does a neutral stimulus become a conditioned stimulus?
22. What is a Skinner box and what is its purpose?
23. What is the difference between negative reinforcement and punishment?
24. What is shaping and how would you use shaping to teach a dog to roll over?
25. What is the effect of prosocial modelling and antisocial modelling?
26. Etienne is 17 years old. Both of Etienne's parents drink alcohol every night. They tell Etienne that drinking is bad and that Etienne shouldn't do it. Etienne goes to a party where beer is being served. What do you think Etienne will do?

Why?

Personal Application Questions

27. What is your personal definition of learning? How do your ideas about learning compare with the definition of learning presented in this text?
28. What kinds of things have you learned through the process of classical conditioning? Operant conditioning? Observational learning? How did you learn them?
29. Can you think of an example in your life of how classical conditioning has produced a positive emotional response, such as happiness or excitement? How about a negative emotional response, such as fear, anxiety, or anger?
30. Explain the difference between negative reinforcement and punishment, and provide several examples of each based on your own experiences.
31. Think of a behaviour that you have that you would like to change. How could you use behaviour modification, specifically positive reinforcement, to change your behaviour? What is your positive reinforcer?
32. What is something you have learned how to do after watching someone else?

67.

ACKNOWLEDGEMENTS & ATTRIBUTIONS

CHAPTER VIII
LANGUAGE & INTELLIGENCE

68.

INTRODUCTION TO LANGUAGE AND INTELLIGENCE

Chapter Outline

- What Is Cognition?
- Language
- Problem Solving
- What Are Intelligence and Creativity?
- Measures of Intelligence
- The Source of Intelligence

Figure LI.1 Thinking is an important part of our human experience, and one that has captivated people for centuries. Today, it is one area of psychological study. The 19th-century Girl with a Book by José Ferraz de Almeida Júnior, the 20th-century sculpture The Thinker by August Rodin, and Shi Ke's 10th-century painting Huike Thinking all reflect the fascination with the process of human thought. (credit "middle": modification of work by Jason Rogers; credit "right": modification of work by Tang Zu-Ming)

What is the best way to solve a problem? How does a person who has never seen or touched snow in real life develop an understanding of the concept of snow? How do young children acquire the ability to learn language with no formal instruction? Psychologists who study thinking explore questions like these and are called cognitive psychologists.

Cognitive psychologists also study intelligence. What is intelligence, and how does it vary from person to person? Are "street smarts" a kind of intelligence, and if so, how do they relate to other types of intelligence? What does an IQ test really measure? These questions and more will be explored in this chapter as you study thinking and intelligence.

In other chapters, we discussed the cognitive processes of perception, learning, and memory. In this chapter, we will

focus on high-level cognitive processes. As a part of this discussion, we will consider thinking and briefly explore the development and use of language. We will also discuss problem solving and creativity before ending with a discussion of how intelligence is measured and how our biology and environments interact to affect intelligence. After finishing this chapter, you will have a greater appreciation of the higher-level cognitive processes that contribute to our distinctiveness as a species.

69.

WHAT IS COGNITION?

Learning Objectives

By the end of this section, you will be able to:

- Describe cognition
- Distinguish concepts and prototypes
- Explain the difference between natural and artificial concepts
- Describe how schemata are organized and constructed

Imagine all of your thoughts as if they were physical entities, swirling rapidly inside your mind. How is it possible that the brain is able to move from one thought to the next in an organized, orderly fashion? The brain is endlessly perceiving,

processing, planning, organizing, and remembering—it is always active. Yet, you don't notice most of your brain's activity as you move throughout your daily routine. This is only one facet of the complex processes involved in cognition. Simply put, cognition is thinking, and it encompasses the processes associated with perception, knowledge, problem solving, judgment, language, and memory. Scientists who study cognition are searching for ways to understand how we integrate, organize, and utilize our conscious cognitive experiences without being aware of all of the unconscious work that our brains are doing (for example, Kahneman, 2011).

Cognition

Upon waking each morning, you begin thinking—contemplating the tasks that you must complete that day. In what order should you run your errands? Should you go to the bank, the cleaners, or the grocery store first? Can you get these things done before you head to class or will they need to wait until school is done? These thoughts are one example of cognition at work. Exceptionally complex, cognition is an essential feature of human consciousness, yet not all aspects of cognition are consciously experienced.

Cognitive psychology is the field of psychology dedicated to examining how people think. It attempts to explain how and why we think the way we do by studying the interactions

among human thinking, emotion, creativity, language, and problem solving, in addition to other cognitive processes. Cognitive psychologists strive to determine and measure different types of intelligence, why some people are better at problem solving than others, and how emotional intelligence affects success in the workplace, among countless other topics. They also sometimes focus on how we organize thoughts and information gathered from our environments into meaningful categories of thought, which will be discussed later.

Concepts and Prototypes

The human nervous system is capable of handling endless streams of information. The senses serve as the interface between the mind and the external environment, receiving stimuli and translating it into nervous impulses that are transmitted to the brain. The brain then processes this information and uses the relevant pieces to create thoughts, which can then be expressed through language or stored in memory for future use. To make this process more complex, the brain does not gather information from external environments only. When thoughts are formed, the mind synthesizes information from emotions and memories (Figure LI.2). Emotion and memory are powerful influences on both our thoughts and behaviours.

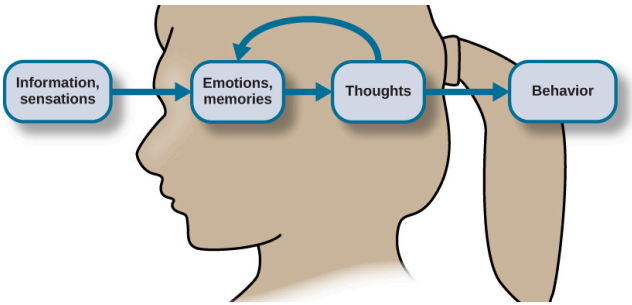

Figure LI.2 Sensations and information are received by our brains, filtered through emotions and memories, and processed to become thoughts.

In order to organize this staggering amount of information, the mind has developed a "file cabinet" of sorts in the mind. The different files stored in the file cabinet are called concepts. **Concepts** are categories or groupings of linguistic information, images, ideas, or memories, such as life experiences. Concepts are, in many ways, big ideas that are generated by observing details, and categorizing and combining these details into cognitive structures. You use concepts to see the relationships among the different elements of your experiences and to keep the information in your mind organized and accessible.

Concepts are informed by our semantic memory and are present in every aspect of our lives; however, one of the easiest places to notice concepts is inside a classroom, where they are discussed explicitly. When you study history, for example, you learn about more than just individual events that have

happened in the past. You absorb a large quantity of information by listening to and participating in discussions, examining maps, and reading first-hand accounts of people's lives. Your brain analyzes these details and develops an overall understanding of history. In the process, your brain gathers details that inform and refine your understanding of related concepts like democracy, power, and freedom.

Concepts can be complex and abstract, like justice, or more concrete, like types of birds. In psychology, for example, Piaget's stages of development are abstract concepts. Some concepts, like tolerance, are agreed upon by many people, because they have been used in various ways over many years. Other concepts, like the characteristics of your ideal friend or your family's birthday traditions, are personal and individualized. In this way, concepts touch every aspect of our lives, from our many daily routines to the guiding principles behind the way governments function.

Another technique used by your brain to organize information is the identification of prototypes for the concepts you have developed. A **prototype** is the best example or representation of a concept. For example, what comes to your mind when you think of a dog? Most likely your early experiences with dogs will shape what you imagine. If your first pet was a Golden Retriever, there is a good chance that this would be your prototype for the category of dogs.

Natural and Artificial Concepts

In psychology, concepts can be divided into two categories, natural and artificial. **Natural concepts** are created "naturally" through your experiences and can be developed from either direct or indirect experiences. For example, if you live in Northern Canada you have probably had a lot of direct experience with snow. You've watched it fall from the sky, you've seen lightly falling snow that barely covers the windshield of your car, and you've shovelled out 18 inches of fluffy white snow as you've thought, "This is perfect for skiing." You've thrown snowballs at your best friend and gone sledding down the steepest hill in town. In short, you know snow. You know what it looks like, smells like, tastes like, and feels like. If, however, you've lived your whole life on the island of Saint Vincent in the Caribbean, you may never have actually seen snow, much less tasted, smelled, or touched it. You know snow from the indirect experience of seeing pictures of falling snow—or from watching films that feature snow as part of the setting. Either way, snow is a natural concept because you can construct an understanding of it through direct observations, experiences with snow, or indirect knowledge (such as from films or books) (Figure LI.3).

(a) (b)

Figure LI.3 (a) Our concept of snow is an example of a natural concept—one that we understand through direct observation and experience. (b) In contrast, artificial concepts are ones that we know by a specific set of characteristics that they always exhibit, such as what defines different basic shapes. (credit a: modification of work by Maarten Takens; credit b: modification of work by "Shayan (USA)"/Flickr)

An **artificial concept**, on the other hand, is a concept that is defined by a specific set of characteristics. Various properties of geometric shapes, like squares and triangles, serve as useful examples of artificial concepts. A triangle always has three angles and three sides. A square always has four equal sides and four right angles. Mathematical formulas, like the equation for area (length × width) are artificial concepts defined by specific sets of characteristics that are always the same. Artificial concepts can enhance the understanding of a topic by building on one another. For example, before learning the concept of "area of a square" (and the formula to find it), you must understand what a square is. Once the concept of "area of a square" is understood, an understanding of area for other geometric shapes can be built upon the original understanding of area. The use of artificial concepts to define an idea is crucial

to communicating with others and engaging in complex thought. According to Goldstone and Kersten (2003), concepts act as building blocks and can be connected in countless combinations to create complex thoughts.

Schemata

A **schema** is a mental construct consisting of a cluster or collection of related concepts (Bartlett, 1932). There are many different types of schemata, and they all have one thing in common: schemata are a method of organizing information that allows the brain to work more efficiently. When a schema is activated, the brain makes immediate assumptions about the person or object being observed.

There are several types of schemata. A **role schema** makes assumptions about how individuals in certain roles will behave (Callero, 1994). For example, imagine you meet someone who introduces themselves as a firefighter. When this happens, your brain automatically activates the "firefighter schema" and begins making assumptions that this person is brave, selfless, and community-oriented. Despite not knowing this person, already you have unknowingly made judgments about them. Schemata also help you fill in gaps in the information you receive from the world around you. While schemata allow for more efficient information processing, there can be problems with schemata, regardless of whether they are accurate: Perhaps this particular firefighter is not brave, they just work

as a firefighter to pay the bills while studying to become a children's librarian.

An **event schema**, also known as a **cognitive script,** is a set of behaviours that can feel like a routine. Think about what you do when you walk into an elevator (Figure LI.4). First, the doors open and you wait to let exiting passengers leave the elevator car. Then, you step into the elevator and turn around to face the doors, looking for the correct button to push. You never face the back of the elevator, do you? And when you're riding in a crowded elevator and you can't face the front, it feels uncomfortable, doesn't it? Interestingly, event schemata can vary widely among different cultures and countries. For example, while it is quite common for people to greet one another with a handshake in Canada, in Tibet, you greet someone by sticking your tongue out at them, and in Belize, you bump fists (Cairns Regional Council, n.d.)

Figure LI.4 What event schema do you perform when riding in an elevator? (credit: "Gideon"/Flickr)

Because event schemata are automatic, they can be difficult to change. Imagine that you are driving home from work or school. This event schema involves getting in the car, shutting the door, and buckling your seatbelt before putting the key in the ignition. You might perform this script two or three times each day. As you drive home, you hear your phone's ring tone. Typically, the event schema that occurs when you hear your phone ringing involves locating the phone and answering it or responding to your latest text message. So without thinking, you reach for your phone, which could be in your pocket, in your bag, or on the passenger seat of the car. This powerful

event schema is informed by your pattern of behaviour and the pleasurable stimulation that a phone call or text message gives your brain. Because it is a schema, it is extremely challenging for us to stop reaching for the phone, even though we know that we endanger our own lives and the lives of others while we do it (Neyfakh, 2013) (Figure LI.5).

Figure LI.5 Texting while driving is dangerous, but it is a difficult event schema for some people to resist.

Remember the elevator? It feels almost impossible to walk in and *not* face the door. Our powerful event schema dictates our behaviour in the elevator, and it is no different with our phones. Current research suggests that it is the habit, or event schema, of checking our phones in many different situations that makes refraining from checking them while driving especially difficult (Bayer & Campbell, 2012). Because texting and driving has become a dangerous epidemic in recent years,

psychologists are looking at ways to help people interrupt the "phone schema" while driving. Event schemata like these are the reason why many habits are difficult to break once they have been acquired. As we continue to examine thinking, keep in mind how powerful the forces of concepts and schemata are to our understanding of the world.

70.

LANGUAGE

Learning Objectives

By the end of this section, you will be able to:

- Define language and demonstrate familiarity with the components of language
- Understand the development of language
- Explain the relationship between language and thinking

Language is a communication system that involves using words and systematic rules to organize those words to transmit information from one individual to another. While language is a form of communication, not all communication is language. Many species communicate with one another through their

postures, movements, odours, or vocalizations. This communication is crucial for species that need to interact and develop social relationships with their conspecifics. However, many people have asserted that it is language that makes humans unique among all of the animal species (Corballis & Suddendorf, 2007; Tomasello & Rakoczy, 2003). This section will focus on what distinguishes language as a special form of communication, how the use of language develops, and how language affects the way we think.

Components of Language

Language, be it spoken, signed, or written, has specific components: a lexicon and grammar. **Lexicon** refers to the words of a given language. Thus, lexicon is a language's vocabulary. **Grammar** refers to the set of rules that are used to convey meaning through the use of the lexicon (Fernández & Cairns, 2011). For instance, English grammar dictates that most verbs receive an "-ed" at the end to indicate past tense.

Words are formed by combining the various phonemes that make up the language. A **phoneme** (e.g., the sounds "ah" vs. "eh") is a basic sound unit of a given language, and different languages have different sets of phonemes. Phonemes are combined to form **morphemes**, which are the smallest units of language that convey some type of meaning (e.g., "I" is both a phoneme and a morpheme). We use semantics and syntax to construct language. Semantics and syntax are part

of a language's grammar. **Semantics** refers to the process by which we derive meaning from morphemes and words. **Syntax** refers to the way words are organized into sentences (Chomsky, 1965; Fernández & Cairns, 2011).

We apply the rules of grammar to organize the lexicon in novel and creative ways, which allow us to communicate information about both concrete and abstract concepts. We can talk about our immediate and observable surroundings as well as the surface of unseen planets. We can share our innermost thoughts, our plans for the future, and debate the value of a college education. We can provide detailed instructions for cooking a meal, fixing a car, or building a fire. Through our use of words and language, we are able to form, organize, and express ideas, schema, and artificial concepts.

TRICKY TOPIC: NATURE OF LANGUAGE

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For a full transcript of this video, click here

Theories of Language Acquisition

Psychological theories of language learning differ in terms of the importance they place on nature versus nurture. Yet it is clear that both matter. Children are not born knowing language; they learn to speak by hearing what happens around them. On the other hand, human brains, unlike those of any other animal, are prewired in a way that leads them, almost effortlessly, to learn language.Perhaps the most straightforward explanation of language development is that it occurs through principles of learning, including association, reinforcement, and the observation of others (Skinner, 1965). There must be at least some truth to the idea that language is learned, because children learn the language that they hear spoken around them rather than some other language. Also supporting this idea is the gradual improvement of language skills with time. It seems that children modify their language through imitation, reinforcement, and shaping, as would be predicted by learning theories.

But language cannot be entirely learned. For one, children learn words too fast for them to be learned through reinforcement. Between the ages of 18 months and five years, children learn up to 10 new words every day (Anglin,

1993). More importantly, language is more *generative* than it is imitative. **Generativity** refers to the fact that speakers of a language can compose sentences to represent new ideas that they have never before been exposed to. Language is not a predefined set of ideas and sentences that we choose when we need them, but rather a system of rules and procedures that allows us to create an infinite number of statements, thoughts, and ideas, including those that have never previously occurred. When a child says that they "swimmed" in the pool, for instance, the child is showing generativity. No adult speaker of English would ever say "swimmed," yet it is easily generated from the normal system of producing language.

Other evidence that refutes the idea that all language is learned through experience comes from the observation that children may learn languages better than they ever hear them. Deaf children whose parents do not speak ASL very well nevertheless are able to learn it perfectly on their own, and may even make up their own language if they need to (Goldin-Meadow & Mylander, 1998). A group of deaf children in a school in Nicaragua, whose teachers could not sign, invented a way to communicate through made-up signs (Senghas, Senghas, & Pyers, 2005). The development of this new Nicaraguan Sign Language has continued and changed as new generations of students have come to the school and started using the language. Although the original system was not a real language, it is becoming closer and closer every year, showing the development of a new language in modern times.

The linguist Noam Chomsky is a believer in the *nature approach to language*, arguing that human brains contain a language acquisition device that includes a universal grammar that underlies all human language (Chomsky, 1965, 1972). According to this approach, each of the many languages spoken around the world (there are between 6,000 and 8,000) is an individual example of the same underlying set of procedures that are hardwired into human brains. Chomsky's account proposes that children are born with a knowledge of general rules of syntax that determine how sentences are constructed.

Chomsky differentiates between the *deep structure of an idea* — how the idea is represented in the fundamental universal grammar that is common to all languages, and the *surface structure of the idea* — how it is expressed in any one language. Once we hear or express a thought in surface structure, we generally forget exactly how it happened. At the end of a lecture, you will remember a lot of the deep structure (i.e., the ideas expressed by the instructor), but you cannot reproduce the surface structure (the exact words that the instructor used to communicate the ideas).

Although there is general agreement among psychologists that babies are genetically programmed to learn language, there is still debate about Chomsky's idea that there is a universal grammar that can account for all language learning. Evans and Levinson (2009) surveyed the world's languages and found that none of the presumed underlying features of the

language acquisition device were entirely universal. In their search they found languages that did not have noun or verb phrases, that did not have tenses (e.g., past, present, future), and even some that did not have nouns or verbs at all, even though a basic assumption of a universal grammar is that all languages should share these features.

Language Development

Children begin to learn about language from a very early age (Table LI.1). In fact, it appears that this is occurring even before we are born. Newborns show preference for their mother's voice and appear to be able to discriminate between the language spoken by their mother and other languages. Babies are also attuned to the languages being used around them and show preferences for videos of faces that are moving in synchrony with the audio of spoken language versus videos that do not synchronize with the audio (Blossom & Morgan, 2006; Pickens, 1994; Spelke & Cortelyou, 1981).

Table LI.1 Stages of Language and Communication Development

Stage	Age	Developmental Language and Communication
1	From Birth	Crying
2	0-6 months	Cooing
3	5/6 months	Babbling
4	12–18 months	One word utterances
5	18–24 months	Two word utterances
6	2–3 years	Sentence Phase
7	3–5 years	Complex sentences; has conversations

You may recall that each language has its own set of phonemes that are used to generate morphemes, words, and so on. Babies can discriminate among the sounds that make up a language (for example, they can tell the difference between the "s" in vision and the "ss" in fission); early on, they can differentiate between the sounds of all human languages, even those that do not occur in the languages that are used in their environments. However, by the time that they are about 1 year old, they can only discriminate among those phonemes that are used in the language or languages in their environments (Jensen, 2011; Werker & Lalonde, 1988; Werker & Tees, 1984).

Link to Learning

Watch as Janet Weker explains how babies lose the ability to discriminate among all possible human phonemes as they age, to learn more.

From birth, babies enter the "cooing" stage of language where they produce vowel sounds. After the first few months of life, babies enter what is known as the babbling stage, during which time they tend to produce single syllables that are repeated over and over (with both consonant and vowel sounds). As time passes, more variations appear in the syllables that they produce. During this time, it is unlikely that the babies are trying to communicate; they are just as likely to babble when they are alone as when they are with their caregivers (Fernández & Cairns, 2011). Interestingly, babies who are raised in environments in which sign language is used will also begin to show babbling in the gestures of their hands during this stage (Petitto, Holowka, Sergio, Levy, & Ostry, 2004). Generally, a child's first word is uttered sometime between the ages of 1 year to 18 months, and for the next

few months, the child will remain in the "one word utterance" stage of language development. During this time, children know a number of words, but they only produce one-word utterances. The child's early vocabulary is limited to familiar objects or events, often nouns. Although children in this stage only make one-word utterances, these words often carry larger meaning (Fernández & Cairns, 2011). So, for example, a child saying "cookie" could be identifying a cookie or asking for a cookie.As a child's lexicon grows, they begin to utter simple sentences and to acquire new vocabulary at a very rapid pace. In addition, children begin to demonstrate a clear understanding of the specific rules that apply to their language(s). Even the mistakes that children sometimes make provide evidence of just how much they understand about those rules. This is sometimes seen in the form of **overgeneralization**. In this context, overgeneralization refers to an extension of a language rule to an exception to the rule. For example, in English, it is usually the case that an "s" is added to the end of a word to indicate plurality. For example, we speak of one dog versus two dogs. Young children will overgeneralize this rule to cases that are exceptions to the "add an s to the end of the word" rule and say things like "those two gooses" or "three mouses." Clearly, the rules of the language are understood, even if the exceptions to the rules are still being learned (Moskowitz, 1978).Moreover, it appears that there is a sensitive period for language acquisition, such that this proficiency at acquiring language is maximal early in

life; generally, as people age, the ease with which they acquire and master new languages diminishes (Johnson & Newport, 1989; Lenneberg, 1967; Singleton, 1995). Generally, the sensitive period for language development ends at about 12 years of age.

Dig Deeper

The Case of Genie

In the fall of 1970, a social worker in the Los Angeles area found a 13-year-old girl who was being raised in extremely neglectful and abusive conditions. The girl, who came to be known as Genie, had lived most of her life tied to a potty chair or confined to a crib in a small room that was kept closed with the curtains drawn. For a little over a decade, Genie had virtually no social interaction and no access to the outside world. As a result of these conditions, Genie was unable to stand up, chew solid food, or speak (Fromkin, Krashen, Curtiss, Rigler, & Rigler, 1974;

Rymer, 1993). The police took Genie into protective custody.

Genie's abilities improved dramatically following her removal from her abusive environment, and early on, it appeared she was acquiring language—much later than would be predicted by sensitive period hypotheses that had been posited at the time (Fromkin et al., 1974). Genie managed to amass an impressive vocabulary in a relatively short amount of time. However, she never developed a mastery of the grammatical aspects of language (Curtiss, 1981). Perhaps being deprived of the opportunity to learn language during a sensitive period impeded Genie's ability to fully acquire and use language.

Can Animals Learn Language?

Nonhuman animals have a wide variety of systems of communication. Some species communicate using scents; others use visual displays, such as baring the teeth, puffing up the fur, or flapping the wings; and still others use vocal sounds. Male songbirds, such as canaries and finches, sing songs to attract mates and to protect territory, and chimpanzees use a combination of facial expressions, sounds, and actions, such as slapping the ground, to convey aggression (de Waal,

1989). Honeybees use a waggle dance to direct other bees to the location of food sources (von Frisch, 1956). The language of vervet monkeys is relatively advanced in the sense that they use specific sounds to communicate specific meanings. Vervets make different calls to signify that they have seen either a leopard, a snake, or a hawk (Seyfarth & Cheney, 1997).Despite their wide abilities to communicate, efforts to teach animals to use language have had only limited success. One of the early efforts was made by Catherine and Keith Hayes, who raised a chimpanzee named Viki in their home along with their own children. But Viki learned little and could never speak (Hayes & Hayes, 1952). Researchers speculated that Viki's difficulties might have been in part because she could not create the words in her vocal cords, and so subsequent attempts were made to teach primates to speak using sign language or boards on which they can point to symbols.

Allen and Beatrix Gardner worked for many years to teach a chimpanzee named Washoe to sign using ASL. Washoe, who lived to be 42 years old, could label up to 250 different objects and make simple requests and comments, such as "please tickle" and "me sorry" (Fouts, 1997). Washoe's adopted daughter Loulis, who was never exposed to human signers, learned more than 70 signs simply by watching her mother sign.

The most proficient nonhuman language speaker is Kanzi, a bonobo who lives at the Language Learning Center at Georgia State University (Savage-Rumbaugh & Lewin, 1994). As you

can see in the video clip "Language Recognition in Bonobos," Kanzi has a propensity for language that is in many ways similar to humans. He learned faster when he was younger than when he got older, he learns by observation, and he can use symbols to comment on social interactions, rather than simply for food treats. Kanzi can also create elementary syntax and understand relatively complex commands. Kanzi can make tools and can even play the video game Pac-Man.

Link to Learning

Watch this video demonstrating Kanzi's (a bonobo) comprehension of language, to learn more.

And yet even Kanzi does not have a true language in the same way that humans do. Human babies learn words faster and faster as they get older, but Kanzi does not. Each new word he learns is almost as difficult as the one before. Kanzi usually requires many trials to learn a new sign, whereas human babies can speak words after only one exposure. Kanzi's language is focused primarily on food and pleasure and only rarely on social relationships. Although he can combine words, he

generates few new phrases and cannot master syntactic rules beyond the level of about a two-year-old human child (Greenfield & Savage-Rumbaugh, 1991). In sum, although many animals communicate, none of them has a true language. With some exceptions, the information that can be communicated in nonhuman species is limited primarily to displays of liking or disliking, and related to basic motivations of aggression and mating. Humans also use this more primitive type of communication, in the form of nonverbal behaviours such as eye contact, touch, hand signs, and interpersonal distance, to communicate their like or dislike for others, but they (unlike animals) also supplant this more primitive communication with language. Although other animal brains share similarities to ours, only the human brain is complex enough to create language. What is perhaps most remarkable is that although language never appears in nonhumans, language is universal in humans. All humans, unless they have a profound brain abnormality or are completely isolated from other humans, learn language.

Language and Thought

When we speak one language, we agree that words are representations of ideas, people, places, and events. The given language that children learn is connected to their culture and surroundings. But can words themselves shape the way we think about things? Psychologists have long investigated the

question of whether language shapes thoughts and actions, or whether our thoughts and beliefs shape our language. Two researchers, Edward Sapir and Benjamin Lee Whorf, began this investigation in the 1940s. They wanted to understand how the language habits of a community encourage members of that community to interpret language in a particular manner (Sapir, 1941/1964). Sapir and Whorf proposed that language determines thought. For example, in some languages there are many different words for love. However, in English we use the word love for all types of love. Does this affect how we think about love depending on the language that we speak (Whorf, 1956)? Researchers have since identified this view as too absolute, pointing out a lack of empiricism behind what Sapir and Whorf proposed (Abler, 2013; Boroditsky, 2011; van Troyer, 1994). Today, psychologists continue to study and debate the relationship between language and thought.

What do you think?

The Meaning of Language

Think about what you know of other languages;

perhaps you even speak multiple languages. Imagine for a moment that your closest friend fluently speaks more than one language. Do you think that friend thinks differently, depending on which language is being spoken? You may know a few words that are not translatable from their original language into English. For example, the Portuguese word *saudade* originated during the 15th century, when Portuguese sailors left home to explore the seas and travel to Africa or Asia. Those left behind described the emptiness and fondness they felt as *saudade* (Figure LI.6). The word came to express many meanings, including loss, nostalgia, yearning, warm memories, and hope. There is no single word in English that includes all of those emotions in a single description. Do words such as *saudade* indicate that different languages produce different patterns of thought in people? What do you think??

Figure LI.6 These two works of art depict saudade. (a) Saudade de Nápoles, which is translated into "missing Naples," was painted by Bertha Worms in 1895. (b) Almeida Júnior painted Saudade in 1899.

The idea that language and its structures influence and limit human thought is called *linguistic relativism*. The most frequently cited example of this possibility was proposed by Benjamin Whorf (1897-1941), a linguist who was particularly interested in Aboriginal languages. Whorf argued that the Inuit people of Canada had many words for snow, whereas English speakers have only one, and that this difference influenced how the different cultures perceived snow. Whorf argued that the Inuit perceived and categorized snow in finer

details than English speakers possibly could, because the English language constrained perception. He is one of the namesakes of the Sapir-Whorf Hypothesis (linguistic determinism), which hypothesizes that the language that people use determines their thoughts.

Although the idea of linguistic relativism seemed reasonable, research has suggested that language has less influence on thinking than might be expected. For one, in terms of perceptions of snow, although it is true that the Inuit do make more distinctions among types of snow than English speakers do, the latter also make some distinctions (think powder, slush, whiteout, and so forth). And it is also possible that thinking about snow may influence language, rather than the other way around.

In a more direct test of the possibility that language influences thinking, Eleanor Rosch (1973) compared people from the Dani culture of New Guinea, who have only two terms for colour (dark and bright), with English speakers who use many more terms. Rosch hypothesized that if language constrains perception and categorization, then the Dani should have a harder time distinguishing colours than English speakers would. But her research found that when the Dani were asked to categorize colours using new categories, they did so in almost the same way that English speakers did. Similar results were found by Frank, Everett, Fedorenko, and Gibson (2008), who showed that the Amazonian tribe known as the Pirahã, who have no linguistic method for expressing exact

quantities (not even the number one), were nevertheless able to perform matches with large numbers without problem.

Although these data led researchers to conclude that the language we use to describe colour and number does not influence our underlying understanding of the underlying sensation, another more recent study has questioned this assumption. Roberson, Davies, and Davidoff (2000) conducted another study with Dani participants and found that, at least for some colours, the names that they used to describe colours did influence their perceptions of the colours. Other researchers continue to test the possibility that our language influences our perceptions, and perhaps even our thoughts (Levinson, 1998), and yet the evidence for this possibility is, as of now, mixed.

71.

PROBLEM SOLVING

Learning Objectives

By the end of this section, you will be able to:

- Describe problem solving strategies
- Define algorithm and heuristic
- Explain some common roadblocks to effective problem solving and decision making

People face problems every day—usually, multiple problems throughout the day. Sometimes these problems are straightforward: To double a recipe for pizza dough, for example, all that is required is that each ingredient in the recipe be doubled. Sometimes, however, the problems we encounter are more complex. For example, say you have a work deadline,

and you must mail a printed copy of a report to your supervisor by the end of the business day. The report is time-sensitive and must be sent overnight. You finished the report last night, but your printer will not work today. What should you do? First, you need to identify the problem and then apply a strategy for solving the problem.

Problem-Solving Strategies

When you are presented with a problem—whether it is a complex mathematical problem or a broken printer, how do you solve it? Before finding a solution to the problem, the problem must first be clearly identified. After that, one of many problem solving strategies can be applied, hopefully resulting in a solution.

A **problem-solving strategy** is a plan of action used to find a solution. Different strategies have different action plans associated with them (Table LI.2). For example, a well-known strategy is **trial and error**. The old adage, "If at first you don't succeed, try, try again" describes trial and error. In terms of your broken printer, you could try checking the ink levels, and if that doesn't work, you could check to make sure the paper tray isn't jammed. Or maybe the printer isn't actually connected to your laptop. When using trial and error, you would continue to try different solutions until you solved your problem. Although trial and error is not typically one of the most time-efficient strategies, it is a commonly used one.

Table LI.2 Problem-Solving Strategies

Method	Description	Example
Trial and error	Continue trying different solutions until problem is solved	Restarting phone, turning off WiFi, turning off bluetooth in order to determine why your phone is malfunctioning
Algorithm	Step-by-step problem-solving formula	Instruction manual for installing new software on your computer
Heuristic	General problem-solving framework	Working backwards; breaking a task into steps

Another type of strategy is an algorithm. An **algorithm** is a problem-solving formula that provides you with step-by-step instructions used to achieve a desired outcome (Kahneman, 2011). You can think of an algorithm as a recipe with highly detailed instructions that produce the same result every time they are performed. Algorithms are used frequently in our everyday lives, especially in computer science. When you run a search on the Internet, search engines like Google use algorithms to decide which entries will appear first in your list

of results. Facebook also uses algorithms to decide which posts to display on your newsfeed. Can you identify other situations in which algorithms are used?

A **heuristic** is another type of problem solving strategy. While an algorithm must be followed exactly to produce a correct result, a heuristic is a general problem-solving framework (Tversky & Kahneman, 1974). You can think of these as mental shortcuts that are used to solve problems. A "rule of thumb" is an example of a heuristic. Such a rule saves the person time and energy when making a decision, but despite its time-saving characteristics, it is not always the best method for making a rational decision. Different types of heuristics are used in different types of situations, but the impulse to use a heuristic occurs when one of five conditions is met (Pratkanis, 1989):

- When one is faced with too much information
- When the time to make a decision is limited
- When the decision to be made is unimportant
- When there is access to very little information to use in making the decision
- When an appropriate heuristic happens to come to mind in the same moment

Working backwards is a useful heuristic in which you begin solving the problem by focusing on the end result. Consider this example: You live in Halifax, Nova Scotia, and have been

invited to a wedding at 4 PM on Saturday in Cape Breton. Knowing that the Canso Causeway can be backed up any day of the week, you need to plan your route and time your departure accordingly. If you want to be at the wedding service by 3:30 PM, and it takes 3 hours to get to Cape Breton without traffic, what time should you leave your house? You use the working backwards heuristic to plan the events of your day on a regular basis, probably without even thinking about it.

Another useful heuristic is the practice of accomplishing a large goal or task by breaking it into a series of smaller steps. Students often use this common method to complete a large research project or long essay for school. For example, students typically brainstorm, develop a thesis or main topic, research the chosen topic, organize their information into an outline, write a rough draft, revise and edit the rough draft, develop a final draft, organize the references list, and proofread their work before turning in the project. The large task becomes less overwhelming when it is broken down into a series of small steps.

TRICKY TOPIC: HEURISTICS

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For a full transcript of this video, click here

Everyday Connection

Solving Puzzles

Problem-solving abilities can improve with practice. Many people challenge themselves every day with puzzles and other mental exercises to sharpen their problem-solving skills. Sudoku puzzles appear daily in most newspapers. Typically, a sudoku puzzle is a 9×9 grid. The simple sudoku below (Figure LI.7) is a 4×4 grid. To solve the puzzle, fill in the empty boxes

with a single digit: 1, 2, 3, or 4. Here are the rules: The numbers must total 10 in each bolded box, each row, and each column; however, each digit can only appear once in a bolded box, row, and column. Time yourself as you solve this puzzle and compare your time with a classmate.

3			2
	4	1	
	3	2	
4			1

Figure LI.7 How long did it take you to solve this sudoku puzzle? (You can see the answer at the end of this section.)

Here is another popular type of puzzle (Figure LI.8)

that challenges your spatial reasoning skills. Connect all nine dots with four connecting straight lines without lifting your pencil from the paper:

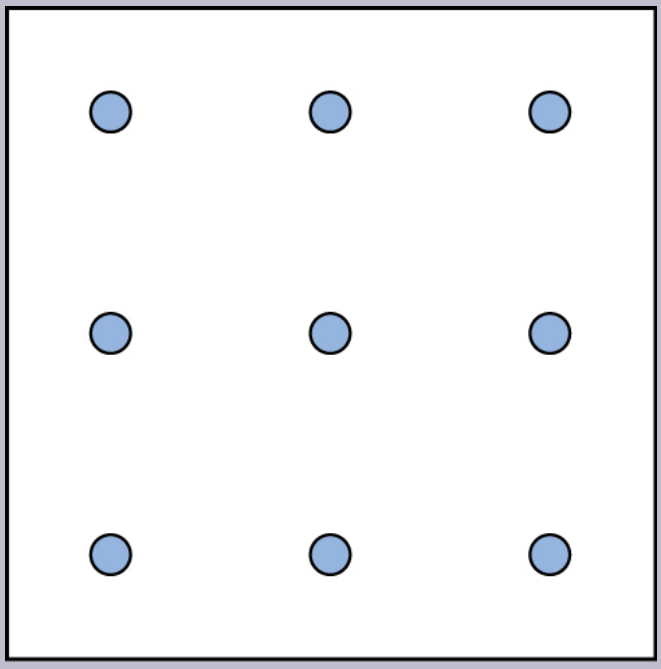

Figure LI.8 Did you figure it out? (The answer is at the end of this section.) Once you understand how to crack this puzzle, you won't forget.

Pitfalls to Problem Solving

Not all problems are successfully solved, however. What

challenges stop us from successfully solving a problem? Albert Einstein once said, "Insanity is doing the same thing over and over again and expecting a different result." Imagine a person in a room that has four doorways. One doorway that has always been open in the past is now locked. The person, accustomed to exiting the room by that particular doorway, keeps trying to get out through the same doorway even though the other three doorways are open. The person is stuck—but they just need to go to another doorway, instead of trying to get out through the locked doorway. A **mental set** is where you persist in approaching a problem in a way that has worked in the past but is clearly not working now.

Functional fixedness is a type of mental set where you cannot perceive an object being used for something other than what it was designed for. Duncker (1945) conducted foundational research on functional fixedness. He created an experiment in which participants were given a candle, a book of matches, and a box of thumbtacks. They were instructed to use those items to attach the candle to the wall so that it did not drip wax onto the table below. Participants had to use functional fixedness to solve the problem (Figure LI.9). During the *Apollo 13* mission to the moon, NASA engineers at Mission Control had to overcome functional fixedness to save the lives of the astronauts aboard the spacecraft. An explosion in a module of the spacecraft damaged multiple systems. The astronauts were in danger of being poisoned by rising levels of carbon dioxide because of problems with the carbon dioxide

filters. The engineers found a way for the astronauts to use spare plastic bags, tape, and air hoses to create a makeshift air filter, which saved the lives of the astronauts.

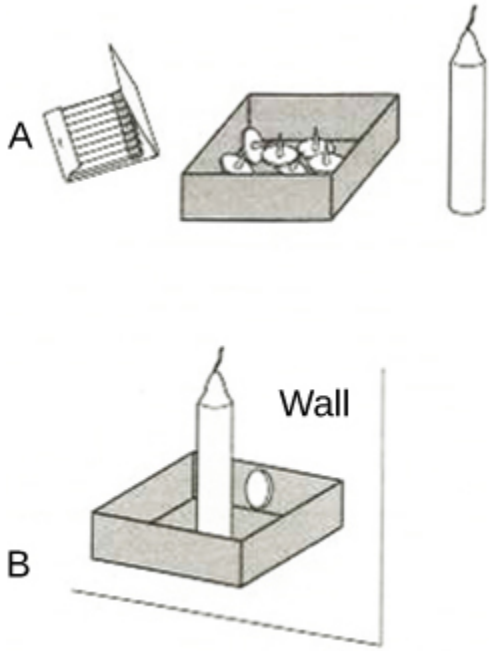

Figure LI.9 In Duncker's classic study, participants were provided the three objects in the top panel and asked to solve the problem. The solution is shown in the bottom portion.

Link to Learning

Check out this video showing how NASA (specifically Ed Smylie) overcame functional fixedness to save the crew of the Apollo 13 (using duct tape).

Researchers have investigated whether functional fixedness is affected by culture. In one experiment, individuals from the Shuar group in Ecuador were asked to use an object for a purpose other than that for which the object was originally intended. For example, the participants were told a story about a bear and a rabbit that were separated by a river and asked to select among various objects, including a spoon, a cup, erasers, and so on, to help the animals. The spoon was the only object long enough to span the imaginary river, but if the spoon was presented in a way that reflected its normal usage, it took participants longer to choose the spoon to solve the problem. (German & Barrett, 2005). The researchers wanted to know if exposure to highly specialized tools, as occurs with individuals in industrialized nations, affects their ability to transcend

functional fixedness. It was determined that functional fixedness is experienced in both industrialized and nonindustrialized cultures (German & Barrett, 2005).

In order to make good decisions, we use our knowledge and our reasoning. Often, this knowledge and reasoning is sound and solid. Sometimes, however, we are swayed by biases or by others manipulating a situation. For example, let's say you and three friends wanted to rent a house and had a combined target budget of $1,600. The realtor shows you only very run-down houses for $1,600 and then shows you a very nice house for $2,000. Might you ask each person to pay more in rent to get the $2,000 home? Why would the realtor show you the run-down houses and the nice house? The realtor may be challenging your anchoring bias. An **anchoring bias** occurs when you focus on one piece of information when making a decision or solving a problem. In this case, you're so focused on the amount of money you are willing to spend that you may not recognize what kinds of houses are available at that price point.

The **confirmation bias** is the tendency to focus on information that confirms your existing beliefs. For example, if you think that your professor is not very nice, you notice all of the instances of rude behaviour exhibited by the professor while ignoring the countless pleasant interactions they are involved in on a daily basis. **Hindsight bias** leads you to believe that the event you just experienced was predictable, even though it really wasn't. In other words, you knew all

along that things would turn out the way they did. **Representativeness heuristic** describes a faulty way of thinking, in which you unintentionally stereotype someone or something; for example, you may assume that your professors spend their free time reading books and engaging in intellectual conversation, because the idea of them spending their time playing volleyball or visiting an amusement park does not fit in with your stereotypes of professors.

Finally, the **availability heuristic** is a heuristic in which you make a decision based on an example, information, or recent experience that is that readily available to you, even though it may not be the best example to inform your decision. Biases tend to "preserve that which is already established—to maintain our preexisting knowledge, beliefs, attitudes, and hypotheses" (Aronson, 1995; Kahneman, 2011). These biases are summarized in Table LI.3.

LI.3 Summary of Decision Biases

Bias	Description
Anchoring	Tendency to focus on one particular piece of information when making decisions or problem-solving
Confirmation	Focuses on information that confirms existing beliefs
Hindsight	Belief that the event just experienced was predictable
Representative	Unintentional stereotyping of someone or something
Availability	Decision is based upon either an available precedent or an example that may be faulty

Link to Learning

Watch this catchy teacher-made music video about cognitive biases, to learn more (and maybe better remember the differences between these concepts!)

Inductive vs Deductive Reasoning

Scientific and everyday reasoning both employ **inductive reasoning**: drawing general conclusions from specific observations. For example, a person's opinion that cramming for a test increases performance may be based on her own memory of passing an exam after pulling an all-night study session. Similarly, a researcher's conclusion *against* cramming might be based on studies comparing the test performances of people who studied the material in different ways (e.g., cramming versus study sessions spaced out over time). In these scenarios, both scientific and everyday conclusions are drawn from a limited sample of potential observations.

Deductive reasoning starts with general principles that are applied to specific instances (the reverse of inductive reasoning). When the general principles, or *premises*, are true, and the structure of the argument is valid, the conclusion is, by definition, *proven;* it must be so. A deductive truth *must* apply in all relevant circumstances. For example, all living cells contain DNA. From this, you can reason—deductively—that any specific living cell (of an elephant, or a person, or a snake) will therefore contain DNA. Given the complexity of psychological phenomena, which involve many contributing factors, it is nearly impossible to make these types of broad statements with certainty.

Were you able to solve the problems in Figure LI.7 and Figure LI.8? Here are the answers (Figure LI.10).

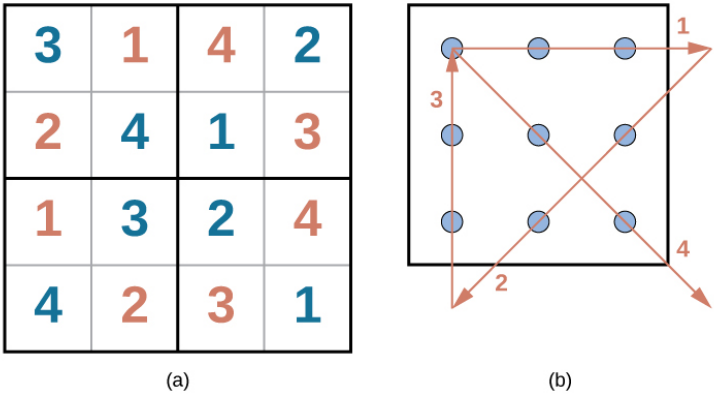

Figure LI.10 Solutions to previous examples.

72.

WHAT ARE INTELLIGENCE AND CREATIVITY?

Learning Objectives

By the end of this section, you will be able to:

- Define intelligence
- Explain the triarchic theory of intelligence
- Identify the difference between intelligence theories
- Explain emotional intelligence
- Define creativity

A four-and-a-half-year-old child sits at the kitchen table with their parent, who is reading a new story aloud to them. the parent turns the page to continue reading, but before they can begin, the child says, "Wait!" The child points to the words on the new page and reads aloud, "Go, Pig! Go!" The parent stops and looks at their child. "Can you read that?" the parent asks. "Yes, I can!" the child responds. The child then points to the words and reads again, "Go, Pig! Go!"

The parent was not actively teaching their child to read, even though the child constantly asked questions about letters, words, and symbols that they saw everywhere: in the car, in the store, on the television. The parent wondered about what else their child might understand and decided to try an experiment. Grabbing a sheet of blank paper, they wrote several simple words in a list: big, small, dog, bird, bed, truck, car, tree. The parent put the list down in front of the child and asked the child to read the words. "Big, small, dog, bird, bed, truck, car, tree," the child read, slowing down to carefully pronounce *bird* and *truck.* Then, "Did I do it?" "You sure did! That is very good." The parent gave their child a warm hug and continued reading the story about the pig, all the while wondering if their child's abilities were an indication of exceptional intelligence or simply a normal pattern of linguistic development. Like the parent in this example, psychologists have wondered what constitutes intelligence and how it can be measured.

Classifying Intelligence

What exactly is intelligence? The way that researchers have defined the concept of intelligence has been modified many times since the birth of psychology. British psychologist Charles Spearman believed intelligence consisted of one general factor, called *g*, which could be measured and compared among individuals. Spearman focused on the commonalities among various intellectual abilities and de-emphasized what made each unique. Long before modern psychology developed, however, ancient philosophers, such as Aristotle, held a similar view (Cianciolo & Sternberg, 2004).

Others psychologists believe that instead of a single factor, intelligence is a collection of distinct abilities. In the 1940s, Raymond Cattell proposed a theory of intelligence that divided general intelligence into two components: crystallized intelligence and fluid intelligence (Cattell, 1963). **Crystallized intelligence** is characterized as acquired knowledge and the ability to retrieve it. When you learn, remember, and recall information, you are using crystallized intelligence. You use crystallized intelligence all the time in your coursework by demonstrating that you have mastered the information covered in the course. **Fluid intelligence** encompasses the ability to see complex relationships and solve problems. Navigating your way home after being detoured onto an unfamiliar route because of road construction would draw upon your fluid intelligence. Fluid

intelligence helps you tackle complex, abstract challenges in your daily life, whereas crystallized intelligence helps you overcome concrete, straightforward problems (Cattell, 1963).

Other theorists and psychologists believe that intelligence should be defined in more practical terms. For example, what types of behaviours help you get ahead in life? Which skills promote success? Think about this for a moment. Being able to recite all 45 presidents of the United States in order is an excellent party trick, but will knowing this make you a better person?

Robert Sternberg developed another theory of intelligence, which he titled the **triarchic theory of intelligence** because it sees intelligence as comprised of three parts (Sternberg, 1988): practical, creative, and analytical intelligence (Figure LI.11).

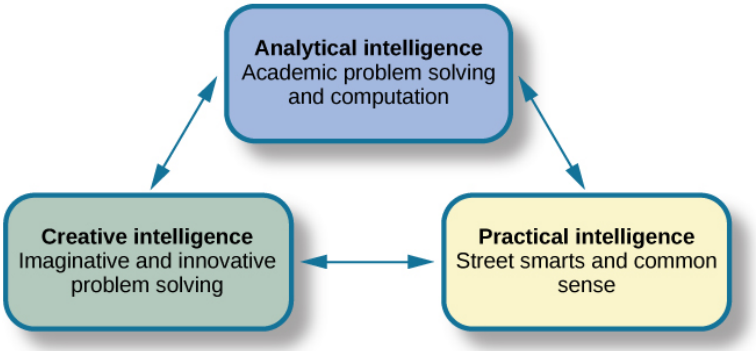

Figure LI.11 Sternberg's theory identifies three types of intelligence: practical, creative, and analytical.

Practical intelligence, as proposed by Sternberg, is

sometimes compared to "street smarts." Being practical means you find solutions that work in your everyday life by applying knowledge based on your experiences. This type of intelligence appears to be separate from traditional understanding of IQ; individuals who score high in practical intelligence may or may not have comparable scores in creative and analytical intelligence (Sternberg, 1988).

Analytical intelligence is closely aligned with academic problem solving and computations. Sternberg says that analytical intelligence is demonstrated by an ability to analyze, evaluate, judge, compare, and contrast. When reading a classic novel for literature class, for example, it is usually necessary to compare the motives of the main characters of the book or analyze the historical context of the story. In a science course such as anatomy, you must study the processes by which the body uses various minerals in different human systems. In developing an understanding of this topic, you are using analytical intelligence. When solving a challenging math problem, you would apply analytical intelligence to analyze different aspects of the problem and then solve it section by section.

Creative intelligence is marked by inventing or imagining a solution to a problem or situation. Creativity in this realm can include finding a novel solution to an unexpected problem or producing a beautiful work of art or a well-developed short story. Imagine for a moment that you are camping in the woods with some friends and realize that you've forgotten

your camp coffee pot. The person in your group who figures out a way to successfully brew coffee for everyone would be credited as having higher creative intelligence.

Multiple Intelligences Theory was developed by Howard Gardner, a Harvard psychologist and former student of Erik Erikson. Gardner's theory, which has been refined for more than 30 years, is a more recent development among theories of intelligence. In Gardner's theory, each person possesses at least eight intelligences. Among these eight intelligences, a person typically excels in some and falters in others (Gardner, 1983). Table LI.4 describes each type of intelligence.

Table LI.4 Multiple Intelligences

Intelligence Type	Characteristics	Representative Career
Linguistic intelligence	Perceives different functions of language, different sounds and meanings of words, may easily learn multiple languages	Journalist, novelist, poet, teacher
Logical-mathematical intelligence	Capable of seeing numerical patterns, strong ability to use reason and logic	Scientist, mathematician
Musical intelligence	Understands and appreciates rhythm, pitch, and tone; may play multiple instruments or perform as a vocalist	Composer, performer
Bodily kinesthetic intelligence	High ability to control the movements of the body and use the body to perform various physical tasks	Dancer, athlete, athletic coach, yoga instructor
Spatial intelligence	Ability to perceive the relationship between objects and how they move in space	Choreographer, sculptor, architect, aviator, sailor
Interpersonal intelligence	Ability to understand and be sensitive to the various emotional states of others	Counselor, social worker, salesperson

Table LI.4 Multiple Intelligences

Intelligence Type	Characteristics	Representative Career
Intrapersonal intelligence	Ability to access personal feelings and motivations, and use them to direct behavior and reach personal goals	Key component of personal success over time
Naturalist intelligence	High capacity to appreciate the natural world and interact with the species within it	Biologist, ecologist, environmentalist

Gardner's theory is relatively new and needs additional research to better establish empirical support. At the same time, his ideas challenge the traditional idea of intelligence to include a wider variety of abilities, although it has been suggested that Gardner simply relabeled what other theorists called "cognitive styles" as "intelligences" (Morgan, 1996). Furthermore, developing traditional measures of Gardner's intelligences is extremely difficult (Furnham, 2009; Gardner & Moran, 2006; Klein, 1997).

Gardner's inter- and intrapersonal intelligences are often combined into a single type: emotional intelligence. **Emotional intelligence** encompasses the ability to understand the emotions of yourself and others, show empathy, understand social relationships and cues, and

regulate your own emotions and respond in culturally appropriate ways (Parker, Saklofske, & Stough, 2009). People with high emotional intelligence typically have well-developed social skills. Some researchers, including Daniel Goleman, the author of *Emotional Intelligence: Why It Can Matter More than IQ*, argue that emotional intelligence is a better predictor of success than traditional intelligence (Goleman, 1995). However, emotional intelligence has been widely debated, with researchers pointing out inconsistencies in how it is defined and described, as well as questioning results of studies on a subject that is difficulty to measure and study empirically (Locke, 2005; Mayer, Salovey, & Caruso, 2004)

The most comprehensive theory of intelligence to date is the Cattell-Horn-Carroll (CHC) theory of cognitive abilities (Schneider & McGrew, 2018). In this theory, abilities are related and arranged in a hierarchy with general abilities at the top, broad abilities in the middle, and narrow (specific) abilities at the bottom. The narrow abilities are the only ones that can be directly measured; however, they are integrated within the other abilities. At the general level is general intelligence. Next, the broad level consists of general abilities such as fluid reasoning, short-term memory, and processing speed. Finally, as the hierarchy continues, the narrow level includes specific forms of cognitive abilities. For example, short-term memory would further break down into memory span and working memory capacity.

Intelligence can also have different meanings and values in

different cultures. If you live on a small island, where most people get their food by fishing from boats, it would be important to know how to fish and how to repair a boat. If you were an exceptional angler, your peers would probably consider you intelligent. If you were also skilled at repairing boats, your intelligence might be known across the whole island. Think about your own family's culture. What values are important for Latinx families? Italian families? In Irish families, hospitality and telling an entertaining story are marks of the culture. If you are a skilled storyteller, other members of Irish culture are likely to consider you intelligent.

Some cultures place a high value on working together as a collective. In these cultures, the importance of the group supersedes the importance of individual achievement. When you visit such a culture, how well you relate to the values of that culture exemplifies your **cultural intelligence**, sometimes referred to as cultural competence.

Link to Learning

Watch this video from Khan Academy, exploring the different theories of intelligence, to learn more.

Creativity

Creativity is the ability to generate, create, or discover new ideas, solutions, and possibilities. Very creative people often have intense knowledge about something, work on it for years, look at novel solutions, seek out the advice and help of other experts, and take risks. Although creativity is often associated with the arts, it is actually a vital form of intelligence that drives people in many disciplines to discover something new. Creativity can be found in every area of life, from the way you decorate your residence to a new way of understanding how a cell works.

Creativity is often assessed as a function of one's ability to engage in **divergent thinking**. Divergent thinking can be described as thinking "outside the box;" it allows an individual to arrive at unique, multiple solutions to a given problem.

In contrast, **convergent thinking** describes the ability to provide a correct or well-established answer or solution to a problem (Cropley, 2006; Guilford, 1967).

Everyday Connection

Creativity

Dr. Tom Steitz, former Sterling Professor of Biochemistry and Biophysics at Yale University, spent his career looking at the structure and specific aspects of RNA molecules and how their interactions could help produce antibiotics and ward off diseases. As a result of his lifetime of work, he won the Nobel Prize in Chemistry in 2009. He wrote, "Looking back over the development and progress of my career in science, I am reminded how vitally important good mentorship is in the early stages of one's career development and constant face-to-face conversations, debate and discussions with colleagues at all stages of research. Outstanding discoveries, insights and developments do not

happen in a vacuum" (Steitz, 2010, para. 39). Based on Steitz's comment, it becomes clear that someone's creativity, although an individual strength, benefits from interactions with others. Think of a time when your creativity was sparked by a conversation with a friend or classmate. How did that person influence you and what problem did you solve using creativity?

73.

MEASURES OF INTELLIGENCE

Learning Objectives

By the end of this section, you will be able to:

- Explain how intelligence tests are developed
- Describe the history of the use of IQ tests
- Describe the purposes and benefits of intelligence testing

While you're likely familiar with the term "IQ" and associate it with the idea of intelligence, what does IQ really mean? IQ stands for **intelligence quotient** and describes a score earned on a test designed to measure intelligence. You've already

learned that there are many ways psychologists describe intelligence (or more aptly, intelligences). Similarly, IQ tests—the tools designed to measure intelligence—have been the subject of debate throughout their development and use.

When might an IQ test be used? What do we learn from the results, and how might people use this information? While there are certainly many benefits to intelligence testing, it is important to also note the limitations and controversies surrounding these tests. For example, IQ tests have sometimes been used as arguments in support of insidious purposes, such as the eugenics movement (Severson, 2011). The infamous Supreme Court Case, *Buck v. Bell*, legalized the forced sterilization of some people deemed "feeble-minded" through this type of testing, resulting in about 65,000 sterilizations (*Buck v. Bell*, 274 U.S. 200; Ko, 2016). Today, only professionals trained in psychology can administer IQ tests, and the purchase of most tests requires an advanced degree in psychology. Other professionals in the field, such as social workers and psychiatrists, cannot administer IQ tests. In this section, we will explore what intelligence tests measure, how they are scored, and how they were developed.

Measuring Intelligence

It seems that the human understanding of intelligence is somewhat limited when we focus on traditional or academic-type intelligence. How then, can intelligence be measured?

And when we measure intelligence, how do we ensure that we capture what we're really trying to measure (in other words, that IQ tests function as valid measures of intelligence)? In the following paragraphs, we will explore the how intelligence tests were developed and the history of their use.

TRICKY TOPIC: MEASURING INTELLIGENCE

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For a full transcript of this video, click here

The IQ test has been synonymous with intelligence for over a century. In the late 1800s, Sir Francis Galton developed the first broad test of intelligence (Flanagan & Kaufman, 2004). Although he was not a psychologist, his contributions to the concepts of intelligence testing are still felt today (Gordon, 1995). Reliable intelligence testing (you may recall from earlier chapters that reliability refers to a test's ability to produce

consistent results) began in earnest during the early 1900s with a researcher named Alfred Binet (Figure LI.12). Binet was asked by the French government to develop an intelligence test to use on children to determine which ones might have difficulty in school; it included many verbally based tasks. American researchers soon realized the value of such testing. Louis Terman, a Stanford professor, modified Binet's work by standardizing the administration of the test and tested thousands of different-aged children to establish an average score for each age. As a result, the test was normed and standardized, which means that the test was administered consistently to a large enough representative sample of the population that the range of scores resulted in a bell curve (bell curves will be discussed later). **Standardization** means that the manner of administration, scoring, and interpretation of results is consistent. **Norming** involves giving a test to a large population so data can be collected comparing groups, such as age groups. The resulting data provide norms, or referential scores, by which to interpret future scores. Norms are not expectations of what a given group *should* know but a demonstration of what that group *does* know. Norming and standardizing the test ensures that new scores are reliable. This new version of the test was called the Stanford-Binet Intelligence Scale (Terman, 1916). Remarkably, an updated version of this test is still widely used today.

TRICKY TOPIC: VALIDITY AND

RELIABILITY

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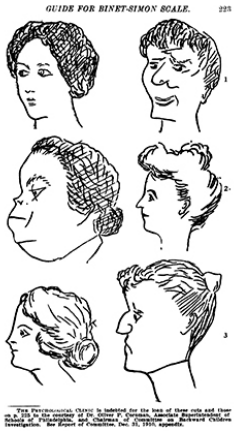

(b)

Figure LI.12 French psychologist Alfred Binet helped to develop intelligence testing. (b) This page is from a 1908 version of the Binet-Simon Intelligence Scale. Children being tested were asked which face, of each pair, was prettier.

In 1939, David Wechsler, a psychologist who spent part of his career working with World War I veterans, developed a new IQ test in the United States. Wechsler combined several subtests from other intelligence tests used between 1880 and World War I. These subtests tapped into a variety of verbal and nonverbal skills, because Wechsler believed that intelligence encompassed "the global capacity of a person to act purposefully, to think rationally, and to deal effectively with his environment" (Wechsler, 1958, p. 7). He named the test the Wechsler-Bellevue Intelligence Scale (Wechsler, 1981). This combination of subtests became one of the most extensively

used intelligence tests in the history of psychology. Although its name was later changed to the Wechsler Adult Intelligence Scale (WAIS) and has been revised several times, the aims of the test remain virtually unchanged since its inception (Boake, 2002). Today, there are three intelligence tests credited to Wechsler, the Wechsler Adult Intelligence Scale-fourth edition (WAIS-IV), the Wechsler Intelligence Scale for Children (WISC-V), and the Wechsler Preschool and Primary Scale of Intelligence—IV (WPPSI-IV) (Wechsler, 2012). These tests are used widely in schools and communities throughout the United States, and they are periodically normed and standardized as a means of recalibration. As a part of the recalibration process, the WISC-V was given to thousands of children across the country, and children taking the test today are compared with their same-age peers (Figure LI.12).

The WISC-V is composed of 14 subtests, which comprise five indices, which then render an IQ score. The five indices are Verbal Comprehension, Visual Spatial, Fluid Reasoning, Working Memory, and Processing Speed. When the test is complete, individuals receive a score for each of the five indices and a Full Scale IQ score. The method of scoring reflects the understanding that intelligence is comprised of multiple abilities in several cognitive realms and focuses on the mental processes that the child used to arrive at his or her answers to each test item.

Interestingly, the periodic recalibrations have led to an

interesting observation known as the **Flynn effect.** Named after James Flynn, who was among the first to describe this trend, the Flynn effect refers to the observation that each generation has a significantly higher IQ than the last. Flynn himself argues, however, that increased IQ scores do not necessarily mean that younger generations are more intelligent per se (Flynn, Shaughnessy, & Fulgham, 2012).

Ultimately, we are still left with the question of how valid intelligence tests are. Certainly, the most modern versions of these tests tap into more than verbal competencies, yet the specific skills that should be assessed in IQ testing, the degree to which any test can truly measure an individual's intelligence, and the use of the results of IQ tests are still issues of debate (Gresham & Witt, 1997; Flynn, Shaughnessy, & Fulgham, 2012; Richardson, 2002; Schlinger, 2003).

The Bell Curve

The results of intelligence tests follow the bell curve, a graph in the general shape of a bell. When the bell curve is used in psychological testing, the graph demonstrates a normal distribution of a trait, in this case, intelligence, in the human population. Many human traits naturally follow the bell curve. For example, if you lined up all your female schoolmates according to height, it is likely that a large cluster of them would be the average height for an American woman: 5'4"–5'6". This cluster would fall in the centre of the bell

curve, representing the average height for American women (Figure LI.13). There would be fewer women who stand closer to 4'11". The same would be true for women of above-average height: those who stand closer to 5'11". The trick to finding a bell curve in nature is to use a large sample size. Without a large sample size, it is less likely that the bell curve will represent the wider population. A **representative sample** is a subset of the population that accurately represents the general population. If, for example, you measured the height of the women in your classroom only, you might not actually have a representative sample. Perhaps the women's basketball team wanted to take this course together, and they are all in your class. Because basketball players tend to be taller than average, the women in your class may not be a good representative sample of the population of American women. But if your sample included all the women at your school, it is likely that their heights would form a natural bell curve.

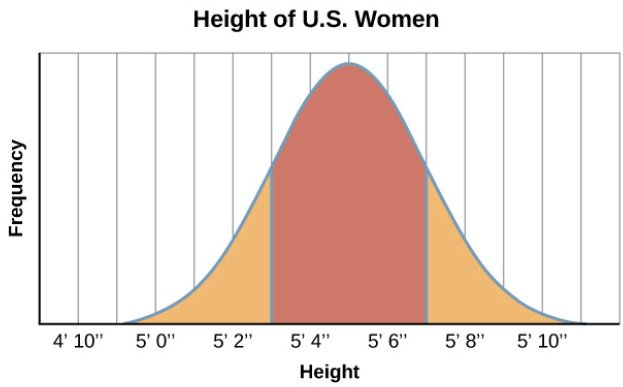

Figure LI.13 Are you of below-average, average, or above-average height?

The same principles apply to intelligence tests scores. Individuals earn a score called an intelligence quotient (IQ). Over the years, different types of IQ tests have evolved, but the way scores are interpreted remains the same. The average IQ score on an IQ test is 100. **Standard deviations** describe how data are dispersed in a population and give context to large data sets. The bell curve uses the standard deviation to show how all scores are dispersed from the average score (Figure LI.14). In modern IQ testing, one standard deviation is 15 points. So a score of 85 would be described as "one standard deviation below the mean." How would you describe a score of 115 and a score of 70? Any IQ score that falls within one standard deviation above and below the mean (between 85 and 115) is considered average, and 68% of the population has IQ scores in

this range. An IQ score of 130 or above is considered a superior level.

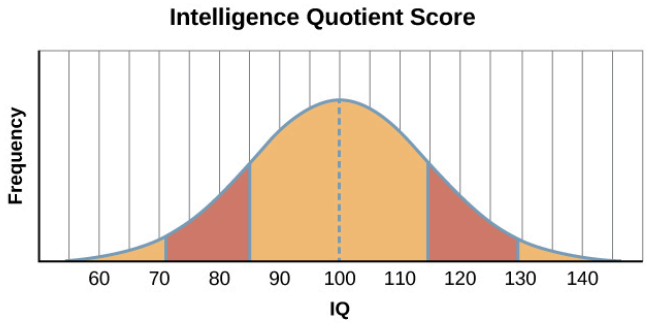

Figure LI.14 The majority of people have an IQ score between 85 and 115.

Only 2.2% of the population has an IQ score below 70 (American Psychological Association [APA], 2013). A score of 70 or below indicates significant cognitive delays. When these are combined with major deficits in adaptive functioning, a person is diagnosed with having an intellectual disability (American Association on Intellectual and Developmental Disabilities, 2013). Intellectual disability (formerly mental retardation) has four subtypes: mild, moderate, severe, and profound (Table LI.5). *The Diagnostic and Statistical Manual of Psychological Disorders* lists criteria for each subgroup (APA, 2013).

Table LI.5 Characteristics of Cognitive Disorders

Intellectual Disability Subtype	Percentage of Population with Intellectual Disabilities	Description
Mild	85%	3rd- to 6th-grade skill level in reading, writing, and math; may be employed and live independently
Moderate	10%	Basic reading and writing skills; functional self-care skills; requires some oversight
Severe	5%	Functional self-care skills; requires oversight of daily environment and activities
Profound	<1%	May be able to communicate verbally or nonverbally; requires intensive oversight

On the other end of the intelligence spectrum are those individuals whose IQs fall into the highest ranges. Consistent with the bell curve, about 2% of the population falls into this category. People are considered gifted if they have an IQ score of 130 or higher, or superior intelligence in a particular area. Long ago, popular belief suggested that people of high intelligence were maladjusted. This idea was disproven through a groundbreaking study of gifted children. In 1921, Lewis Terman began a longitudinal study of over 1500 children with IQs over 135 (Terman, 1925). His findings

showed that these children became well-educated, successful adults who were, in fact, well-adjusted (Terman & Oden, 1947). Additionally, Terman's study showed that the subjects were above average in physical build and attractiveness, dispelling an earlier popular notion that highly intelligent people were "weaklings." Some people with very high IQs elect to join Mensa, an organization dedicated to identifying, researching, and fostering intelligence. Members must have an IQ score in the top 2% of the population, and they may be required to pass other exams in their application to join the group.

Why Measure Intelligence?

The value of IQ testing is most evident in educational or clinical settings. Children who seem to be experiencing learning difficulties or severe behavioural problems can be tested to ascertain whether the child's difficulties can be partly attributed to an IQ score that is significantly different from the mean for their age group. Without IQ testing—or another measure of intelligence—children and adults needing extra support might not be identified effectively. In addition, IQ testing is used in courts to determine whether a defendant has special or extenuating circumstances that preclude them from participating in some way in a trial. People also use IQ testing results to seek disability benefits from the Social Assistance.

The following case study demonstrates the usefulness and

benefits of IQ testing. Candace, a 14-year-old girl experiencing problems at school in Connecticut, was referred for a court-ordered psychological evaluation. She was in regular education classes in ninth grade and was failing every subject. Candace had never been a stellar student but had always been passed to the next grade. When she arrived for the evaluation, Candace immediately said that she hated everything about school, including the teachers, the rest of the staff, the building, and the homework. When asked why she felt this way, Candace replied, "They only call on me when I don't know the answer. I don't want to say, 'I don't know' all of the time and look like an idiot in front of my friends. The teachers embarrass me." She was given a battery of tests, including an IQ test. Her score on the IQ test was 68. Given additional support, Candace's grades improved and her views toward school became more positive. What does Candace's score say about her ability to excel or even succeed in regular education classes without assistance? Why were her difficulties never noticed or addressed?

74.

THE SOURCE OF INTELLIGENCE

Learning Objectives

By the end of this section, you will be able to:

- Describe how genetics and environment affect intelligence
- Explain the relationship between IQ scores and socioeconomic status
- Describe how culture affects intelligence

A young girl, born of teenage parents, lives with her grandmother in rural Mississippi. They are poor—in serious poverty—but they do their best to get by with what they have.

She learns to read when she is just 3 years old. As she grows older, she longs to live with her mother, who now resides in Wisconsin. She moves there at the age of 6 years. Facing various tragedies in her youth, her life unravels. Her mother then sends her to Nashville to live with her father, who imposes strict behavioural expectations upon her, and over time, her wild life settles once again. She begins to experience success in school, and at 19 years old, becomes the youngest and first African-American female news anchor ("Dates and Events," n.d.). The woman—Oprah Winfrey—goes on to become a media giant known for both her intelligence and her empathy.

High Intelligence: Nature or Nurture?

Where does high intelligence come from? Some researchers believe that intelligence is a trait inherited from a person's parents. Scientists who research this topic typically use twin studies to determine the heritability of intelligence. The Minnesota Study of Twins Reared Apart is one of the most well-known twin studies. In this investigation, researchers found that identical twins raised together and identical twins raised apart exhibit a higher correlation between their IQ scores than siblings or fraternal twins raised together (Bouchard, Lykken, McGue, Segal, & Tellegen, 1990). The findings from this study reveal a genetic component to intelligence (Figure LI.15). At the same time, other psychologists believe that intelligence is shaped by a child's

developmental environment. If parents were to provide their children with intellectual stimuli from before they are born, it is likely that they would absorb the benefits of that stimulation, and it would be reflected in intelligence levels.

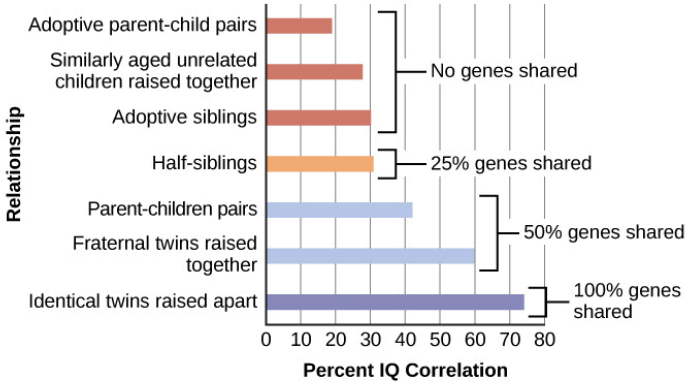

Figure LI.15 The correlations of IQs of unrelated versus related persons reared apart or together suggest a genetic component to intelligence.

The reality is that aspects of each idea are probably correct. In fact, one study suggests that although genetics seem to be in control of the level of intelligence, the environmental influences provide both stability and change to trigger manifestation of cognitive abilities (Bartels, Rietveld, Van Baal, & Boomsma, 2002). Certainly, there are behaviours that support the development of intelligence, but the genetic component of high intelligence should not be ignored. As with all heritable traits, however, it is not always possible to

isolate how and when high intelligence is passed on to the next generation.

Range of Reaction is the theory that each person responds to the environment in a unique way based on their genetic makeup. According to this idea, your genetic potential is a fixed quantity, but whether you reach your full intellectual potential is dependent upon the environmental stimulation you experience, especially in childhood. Think about this scenario: A couple adopts a child who has average genetic intellectual potential. They raise the child in an extremely stimulating environment. What will happen to the couple's new child? It is likely that the stimulating environment will improve their intellectual outcomes over the course of their life. But what happens if this experiment is reversed? If a child with an extremely strong genetic background is placed in an environment that does not stimulate them: What happens? Interestingly, according to a longitudinal study of highly gifted individuals, it was found that "the two extremes of optimal and pathological experience are both represented disproportionately in the backgrounds of creative individuals"; however, those who experienced supportive family environments were more likely to report being happy (Csikszentmihalyi & Csikszentmihalyi, 1993, p. 187).

Another challenge to determining origins of high intelligence is the confounding nature of our human social structures. It is troubling to note that some ethnic groups perform better

on IQ tests than others—and it is likely that the results do not have much to do with the quality of each ethnic group's intellect. The same is true for socioeconomic status. Children who live in poverty experience more pervasive, daily stress than children who do not worry about the basic needs of safety, shelter, and food. These worries can negatively affect how the brain functions and develops, causing a dip in IQ scores. Mark Kishiyama and his colleagues determined that children living in poverty demonstrated reduced prefrontal brain functioning comparable to children with damage to the lateral prefrontal cortex (Kishyama, Boyce, Jimenez, Perry, & Knight, 2009).

The debate around the foundations and influences on intelligence exploded in 1969, when an educational psychologist named Arthur Jensen published the article "How Much Can We Boost I.Q. and Achievement" in the *Harvard Educational Review*. Jensen had administered IQ tests to diverse groups of students, and his results led him to the conclusion that IQ is determined by genetics. He also posited that intelligence was made up of two types of abilities: Level I and Level II. In his theory, Level I is responsible for rote memorization, whereas Level II is responsible for conceptual and analytical abilities. According to his findings, Level I remained consistent among the human race. Level II, however, exhibited differences among ethnic groups (Modgil & Routledge, 1987). Jensen's most controversial conclusion was that Level II intelligence is prevalent among Asians, then Caucasians, then African Americans. Robert Williams was

among those who called out racial bias in Jensen's results (Williams, 1970).

Obviously, Jensen's interpretation of his own data caused an intense response in a nation that continued to grapple with the effects of racism (Fox, 2012). However, Jensen's ideas were not solitary or unique; rather, they represented one of many examples of psychologists asserting racial differences in IQ and cognitive ability. In fact, Rushton and Jensen (2005) reviewed three decades worth of research on the relationship between race and cognitive ability. Jensen's belief in the inherited nature of intelligence and the validity of the IQ test to be the truest measure of intelligence are at the core of his conclusions. If, however, you believe that intelligence is more than Levels I and II, or that IQ tests do not control for socioeconomic and cultural differences among people, then perhaps you can dismiss Jensen's conclusions as a single window that looks out on the complicated and varied landscape of human intelligence. Once again, the limitations of intelligence testing were revealed.

Racial Differences in Intelligence

Although their bell curves overlap considerably, there are also differences in which members of different racial and ethnic groups cluster along the IQ line. Lynn's 2006 work on racial differences in intelligence organizes the data by nine global regions, surveying 620 published studies from around the

world, with a total of 813,778 tested individuals. Lynn's meta-analysis lists the average IQ scores of East Asians (105), Europeans (99), Inuit (91), Southeast Asians and Amerindians each (87), Pacific Islanders (85), Middle Easterners (including South Asians and North Africans) (84), East and West Africans (67), Australian Aborigines (62), and Bushmen and Pygmies (54). Lynn and co-author Tatu Vanhanen (from the University of Helsinki) argue that differences in national income correlate with, and can be at least partially attributed to, differences in average national IQ (2002).The observed average differences in intelligence between groups has at times led to malicious and misguided attempts to try to correct for them through discriminatory treatment of people from different races, ethnicities, and nationalities (Lewontin, Rose, & Kamin, 1984). One of the most egregious was the spread of **eugenics**, the proposal that one could improve the human species by encouraging or permitting reproduction of only those people with genetic characteristics judged desirable.

Eugenics became popular in Canada and the United States in the early 20th century and was supported by many prominent psychologists, including Sir Francis Galton. Dozens of universities offered courses in eugenics, and the topic was presented in most high school and university biology texts (Selden, 1999). Belief in the policies of eugenics led the Canadian legislatures in Alberta and British Columbia as well as the U.S. Congress to pass laws designed to restrict immigration from other countries supposedly marked by low

intelligence, particularly those in eastern and southern Europe. Two of Canada's provinces and more than one-half of the U.S. states passed laws requiring the sterilization of low-IQ individuals. In Canada, approximately 5,000 were affected. Between 1928 and 1972, mostly Indigenous women and "mental defectives" underwent forced sterilizations. Although the practice of sterilization was generally considered to have been abandoned in Canada between the 1940s and the 1960s, among some contexts and populations (e.g., Indigenous women living in western-central Canada) there have been cases of forced sterilization documented as recently as the year 2017 (Boyer & Bartlett, 2017; Clarke, 2021; Leason, 2021).

One explanation for race differences in IQ is that intelligence tests are biased against some groups and in favour of others. By **bias**, what psychologists mean is that a test predicts outcomes — such as grades or occupational success — better for one group than it does for another. If IQ is a better predictor of school grade point average for Whites than it is for Asians, for instance, then the test would be biased against Asians, even though the average IQ scores for Asians might be higher. But IQ tests do not seem to be racially biased because the observed correlations between IQ tests and both academic and occupational achievement are about equal across races (Brody, 1992).

Another way that tests might be biased is if questions are framed such that they are easier for people from one culture to

understand than for people from other cultures. For example, even a very smart person will not do well on a test if they are not fluent in the language in which the test is administered, or does not understand the meaning of the questions being asked. But modern intelligence tests are designed to be culturally neutral, and group differences are found even on tests that only ask about spatial intelligence. Although some researchers still are concerned about the possibility that intelligence tests are culturally biased, it is probably not the case that the tests are creating all of the observed group differences (Suzuki & Valencia, 1997).

Dig Deeper

Stereotype Threat

Although intelligence tests may not be culturally biased, the situation in which one takes a test may be. One environmental factor that may affect how individuals perform and achieve is their expectations about their ability at a task. In some cases these

beliefs may be positive, and they have the effect of making us feel more confident and thus better able to perform tasks. For instance, research has found that because Asian students are aware of the cultural stereotype that "Asians are good at math," reminding them of this fact before they take a difficult math test can improve their performance on the test (Walton & Cohen, 2003).

On the other hand, sometimes these beliefs are negative, and they create negative self-fulfilling prophecies such that we perform more poorly just because of our knowledge about the stereotypes. In 1995 Claude Steele and Joshua Aronson tested the hypothesis that the differences in performance on IQ tests between Blacks and Whites might be due to the activation of negative stereotypes (Steele & Aronson, 1995). Because Black students are aware of the stereotype that Blacks are intellectually inferior to Whites, this stereotype might create a negative expectation, which might interfere with their performance on intellectual tests through fear of confirming that stereotype.

In support of this hypothesis, the experiments revealed that Black university students performed

worse (in comparison to their prior test scores) on standardized test questions when this task was described to them as being diagnostic of their verbal ability (and thus when the stereotype was relevant), but that their performance was not influenced when the same questions were described as an exercise in problem solving. And in another study, the researchers found that when Black students were asked to indicate their race before they took a math test (again activating the stereotype), they performed more poorly than they had on prior exams, whereas White students were not affected by first indicating their race.

Researchers concluded that thinking about negative stereotypes that are relevant to a task that one is performing creates **stereotype threat** — *performance decrements that are caused by the knowledge of cultural stereotypes*. That is, they argued that the negative impact of race on standardized tests may be caused, at least in part, by the performance situation itself.

Research has found that stereotype threat effects can help explain a wide variety of performance decrements among those who are targeted by negative stereotypes. When stereotypes are

activated, children with low socioeconomic status perform more poorly in math than do those with high socioeconomic status, and psychology students perform more poorly than do natural science students (Brown, Croizet, Bohner, Fournet, & Payne, 2003; Croizet & Claire, 1998). Even groups who typically enjoy advantaged social status can be made to experience stereotype threat. White men perform more poorly on a math test when they are told that their performance will be compared with that of Asian men (Aronson, Lustina, Good, Keough, & Steele, 1999), and White people perform more poorly than Black people on a sport-related task when it is described to them as measuring their natural athletic ability (Stone, 2002; Stone, Lynch, Sjomeling, & Darley, 1999).

Research has found that stereotype threat is caused by both cognitive and emotional factors (Schmader, Johns, & Forbes, 2008). On the cognitive side, individuals who are experiencing stereotype threat show an increased vigilance toward the environment as well as increased attempts to suppress stereotypic thoughts. Engaging in these behaviours takes cognitive capacity away from the task. On the affective side, stereotype threat occurs when there is a discrepancy between our positive

concept of our own skills and abilities and the negative stereotypes that suggest poor performance. These discrepancies create stress and anxiety, and these emotions make it harder to perform well on the task.

Stereotype threat is not, however, absolute; we can get past it if we try. What is important is to reduce the self doubts that are activated when we consider the negative stereotypes. Manipulations that affirm positive characteristics about the self or one's social group are successful at reducing stereotype threat (Marx & Roman, 2002; McIntyre, Paulson, & Lord, 2003). In fact, just knowing that stereotype threat exists and may influence our performance can help alleviate its negative impact (Johns, Schmader, & Martens, 2005).

75.

KEY TERMS FOR LANGUAGE & INTELLIGENCE

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algorithm
: problem-solving strategy characterized by a specific set of instructions

analytical intelligence
: aligned with academic problem solving and computations

anchoring bias
: faulty heuristic in which you fixate on a single aspect of a problem to find a solution

artificial concept
: concept that is defined by a very specific set of characteristics

availability heuristic
: faulty heuristic in which you make a decision based on information readily available to you

cognition
: thinking, including perception, learning, problem

solving, judgment, and memory

cognitive psychology

field of psychology dedicated to studying every aspect of how people think

cognitive script

set of behaviours that are performed the same way each time; also referred to as an event schema

concept

category or grouping of linguistic information, objects, ideas, or life experiences

confirmation bias

faulty heuristic in which you focus on information that confirms your beliefs

convergent thinking

providing correct or established answers to problems

creative intelligence

ability to produce new products, ideas, or inventing a new, novel solution to a problem

creativity

ability to generate, create, or discover new ideas, solutions, and possibilities

crystallized intelligence

characterized by acquired knowledge and the ability to retrieve it

cultural intelligence

ability with which people can understand and relate to those in another culture

deductive reasoning
: applying general rules to specific observations (the opposite of inductive reasoning)

divergent thinking
: ability to think "outside the box" to arrive at novel solutions to a problem

emotional intelligence
: ability to understand emotions and motivations in yourself and others

event schema
: set of behaviours that are performed the same way each time; also referred to as a cognitive script

fluid intelligence
: ability to see complex relationships and solve problems

Flynn effect
: observation that each generation has a significantly higher IQ than the previous generation

functional fixedness
: inability to see an object as useful for any other use other than the one for which it was intended

grammar
: set of rules that are used to convey meaning through the use of a lexicon

heuristic
: mental shortcut that saves time when solving a problem

hindsight bias
: belief that the event just experienced was predictable,

even though it really wasn't

inductive reasoning

drawing general conclusions from specific observations

intelligence quotient

(also, IQ) score on a test designed to measure intelligence

language

communication system that involves using words to transmit information from one individual to another

lexicon

the words of a given language

mental set

continually using an old solution to a problem without results

morpheme

smallest unit of language that conveys some type of meaning

Multiple Intelligences Theory

Gardner's theory that each person possesses at least eight types of intelligence

natural concept

mental groupings that are created "naturally" through your experiences

norming

administering a test to a large population so data can be collected to reference the normal scores for a population and its groups

overgeneralization

extension of a rule that exists in a given language to an exception to the rule

phoneme

basic sound unit of a given language

practical intelligence

aka "street smarts"

problem-solving strategy

method for solving problems

prototype

best representation of a concept

range of reaction

each person's response to the environment is unique based on his or her genetic make-up

representative bias

faulty heuristic in which you stereotype someone or something without a valid basis for your judgment

representative sample

subset of the population that accurately represents the general population

role schema

set of expectations that define the behaviours of a person occupying a particular role

schema

(plural = schemata) mental construct consisting of a cluster or collection of related concepts

semantics
process by which we derive meaning from morphemes and words

standard deviation
measure of variability that describes the difference between a set of scores and their mean

standardization
method of testing in which administration, scoring, and interpretation of results are consistent

stereotype threat
performance decrements that are caused by the knowledge of cultural stereotypes

syntax manner by which words are organized into sentences

trial and error
problem-solving strategy in which multiple solutions are attempted until the correct one is found

triarchic theory of intelligence
Sternberg's theory of intelligence; three facets of intelligence: practical, creative, and analytical

working backwards
heuristic in which you begin to solve a problem by focusing on the end result

76.

SUMMARY FOR LANGUAGE & INTELLIGENCE

LI.1 What Is Cognition?

In this section, you were introduced to cognitive psychology, which is the study of cognition, or the brain's ability to think, perceive, plan, analyze, and remember. Concepts and their corresponding prototypes help us quickly organize our thinking by creating categories into which we can sort new information. We also develop schemata, which are clusters of related concepts. Some schemata involve routines of thought and behaviour, and these help us function properly in various situations without having to "think twice" about them. Schemata show up in social situations and routines of daily behaviour.

LI.2 Language

Language is a communication system that has both a lexicon

and a system of grammar. Language acquisition occurs naturally and effortlessly during the early stages of life, and this acquisition occurs in a predictable sequence for individuals around the world. Language has a strong influence on thought, and the concept of how language may influence cognition remains an area of study and debate in psychology.

LI.3 Problem Solving

Many different strategies exist for solving problems. Typical strategies include trial and error, applying algorithms, and using heuristics. To solve a large, complicated problem, it often helps to break the problem into smaller steps that can be accomplished individually, leading to an overall solution. Roadblocks to problem solving include a mental set, functional fixedness, and various biases that can cloud decision making skills.

LI.4 What Are Intelligence and Creativity?

Intelligence is a complex characteristic of cognition. Many theories have been developed to explain what intelligence is and how it works. Sternberg generated his triarchic theory of intelligence, whereas Gardner posits that intelligence is comprised of many factors. Still others focus on the importance of emotional intelligence. Finally, creativity seems

to be a facet of intelligence, but it is extremely difficult to measure objectively.

LI.5 Measures of Intelligence

In this section, we learned about the history of intelligence testing and some of the challenges regarding intelligence testing. Intelligence tests began in earnest with Binet; Wechsler later developed intelligence tests that are still in use today: the WAIS-IV and WISC-V. The Bell curve shows the range of scores that encompass average intelligence as well as standard deviations.

LI.6 The Source of Intelligence

Genetics and environment affect intelligence and the challenges of certain learning disabilities. The intelligence levels of all individuals seem to benefit from rich stimulation in their early environments. Highly intelligent individuals, however, may have a built-in resiliency that allows them to overcome difficult obstacles in their upbringing.

77.

REVIEW QUESTIONS FOR LANGUAGE & INTELLIGENCE

Click here for Answer Key

Multiple Choice Questions

1. Cognitive psychology is the branch of psychology that focuses on the study of _____.

a. human development
b. human thinking
c. human behaviour
d. human society

2. Which of the following is an example of a prototype for the concept of leadership on an athletic team?

a. the equipment manager
b. the scorekeeper
c. the team captain
d. the quietest member of the team

3. Which of the following is an example of an artificial concept?

a. mammals
b. a triangle's area
c. gemstones
d. teachers

4. An event schema is also known as a cognitive _____.

a. stereotype
b. concept
c. script
d. prototype

5. _____ provides general principles for organizing words into meaningful sentences.

a. Linguistic determinism
b. Lexicon
c. Semantics
d. Syntax

6. _____ are the smallest unit of language that carry meaning.

a. Lexicon
b. Phonemes

c. Morphemes
d. Syntax

7. The meaning of words and phrases is determined by applying the rules of _____.

a. lexicon
b. phonemes
c. overgeneralization
d. semantics

8. _____ is (are) the basic sound units of a spoken language.

a. Syntax
b. Phonemes
c. Morphemes
d. Grammar

9. A specific formula for solving a problem is called _____.

a. an algorithm
b. a heuristic
c. a mental set
d. trial and error

10. A mental shortcut in the form of a general problem-solving framework is called _____.

a. an algorithm
b. a heuristic
c. a mental set
d. trial and error

11. Which type of bias involves becoming fixated on a single trait of a problem?

a. anchoring bias
b. confirmation bias
c. representative bias
d. availability bias

12. Which type of bias involves relying on a false stereotype to make a decision?

a. anchoring bias
b. confirmation bias
c. representative bias
d. availability bias

13. Fluid intelligence is characterized by _____.

a. being able to recall information
b. being able to create new products
c. being able to understand and communicate with different cultures

d. being able to see complex relationships and solve problems

14. Which of the following is not one of Gardner's Multiple Intelligences?

a. creative
b. spatial
c. linguistic
d. musical

15. Which theorist put forth the triarchic theory of intelligence?

a. Goleman
b. Gardner
c. Sternberg
d. Steitz

16. When you are examining data to look for trends, which type of intelligence are you using most?

a. practical
b. analytical
c. emotional
d. creative

17. In order for a test to be normed and standardized it must be tested on _____.

a. a group of same-age peers
b. a representative sample
c. children with mental disabilities
d. children of average intelligence

18. The mean score for a person with an average IQ is _____.

a. 70
b. 130
c. 85
d. 100

19. Who developed the IQ test most widely used today?

a. Sir Francis Galton
b. Alfred Binet
c. Louis Terman
d. David Wechsler

20. Where does high intelligence come from?

a. genetics
b. environment
c. both A and B

d. neither A nor B

21. Arthur Jensen believed that _____.

a. genetics was solely responsible for intelligence
b. environment was solely responsible for intelligence
c. intelligence level was determined by race
d. IQ tests do not take socioeconomic status into account

22. What is a learning disability?

a. a developmental disorder
b. a neurological disorder
c. an emotional disorder
d. an intellectual disorder

23. Which of the following statements is true?

a. Poverty always affects whether individuals are able to reach their full intellectual potential.
b. An individual's intelligence is determined solely by the intelligence levels of their siblings.
c. The environment in which an individual is raised is the strongest predictor of their future intelligence
d. There are many factors working together to influence an individual's intelligence level.

Critical Thinking Questions

24. Describe an event schema that you would notice at a sporting event.

25. Explain why event schemata have so much power over human behaviour.

26. How do words not only represent our thoughts but also represent our values?

27. How could grammatical errors actually be indicative of language acquisition in children?

28. What is functional fixedness and how can overcoming it help you solve problems?

29. How does an algorithm save you time and energy when solving a problem?

30. Describe a situation in which you would need to use practical intelligence.

31. Describe a situation in which cultural intelligence would help you communicate better.

32. Why do you think different theorists have defined intelligence in different ways?

33. Compare and contrast the benefits of the Stanford-Binet IQ test and Wechsler's IQ tests.

34. What evidence exists for a genetic component to an individual's IQ?

35. Describe the relationship between learning disabilities and intellectual disabilities to intelligence.

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ACKNOWLEDGEMENTS & ATTRIBUTIONS

The Source of Intelligence

Jocelyn Paul helped to rewrite a portion of the content in the 'Racial Differences in Intelligence' section, highlighting the impact and recency (as recently as 2017) of forced sterilization on Indigenous women.

CHAPTER IX
DEVELOPMENT

79.

INTRODUCTION TO DEVELOPMENT

Chapter Outline

- What Is Lifespan Development?
- Lifespan Theories
- Stages of Development

Figure LD.1 How have you changed since childhood? How are you the same? What will your life be like 25 years from now? Fifty years from now? Lifespan development studies how you change as well as how you remain the same over the course of your life. (credit: modification of work by Giles Cook)

Welcome to the story of your life. In this chapter we explore the fascinating tale of how you have grown and developed into the person you are today. We also look at some ideas about who you will grow into tomorrow. Yours is a story of lifespan development, from the start of life to the end.

The process of human growth and development is more obvious in infancy and childhood, yet your development is happening this moment and will continue, minute by minute, for the rest of your life. Who you are today and who you will be in the future depends on a blend of genetics, environment,

culture, relationships, and more, as you continue through each phase of life. You have experienced firsthand much of what is discussed in this chapter. Now consider what psychological science has to say about your physical, cognitive, and psychosocial development, from the womb to the tomb.

80.

WHAT IS LIFESPAN DEVELOPMENT?

Learning Objectives

By the end of this section, you will be able to:

- Define and distinguish physical, cognitive and psychosocial domains of development
- Discuss the normative approach to development
- Understand the three major issues in development: continuity and discontinuity, one common course of development or many unique courses of development, and nature versus nurture

Consider the following questions: To what extent is the adult you are today influenced by the child you once were? To what extent is a child fundamentally different from the adult they grow up to be?

These are the types of questions developmental psychologists try to answer, by studying how humans change and grow from conception through childhood, adolescence, adulthood, and death. They view development as a lifelong process that can be studied scientifically across three developmental domains—physical, cognitive, and psychosocial development. Physical development involves growth and changes in the body and brain, the senses, motor skills, and health and wellness. Cognitive development involves learning, attention, memory, language, thinking, reasoning, and creativity. Psychosocial development involves emotions, personality, and social relationships. We refer to these domains throughout the chapter.

Research Methods in Developmental Psychology

You've learned about a variety of research methods used by psychologists. Developmental psychologists use many of these approaches in order to better understand how individuals change mentally and physically over time. These methods

include naturalistic observations, case studies, surveys, and experiments, among others.

Naturalistic observations involve observing behaviour in its natural context. A developmental psychologist might observe how children behave on a playground, at a daycare centre, or in the child's own home. While this research approach provides a glimpse into how children behave in their natural settings, researchers have very little control over the types and/or frequencies of displayed behaviour.

In a case study, developmental psychologists collect a great deal of information from one individual in order to better understand physical and psychological changes over the lifespan. This particular approach is an excellent way to better understand individuals, who are exceptional in some way, but it is especially prone to researcher bias in interpretation, and it is difficult to generalize conclusions to the larger population.

The survey method asks individuals to self-report important information about their thoughts, experiences, and beliefs. This particular method can provide large amounts of information in relatively short amounts of time; however, validity of data collected in this way relies on honest self-reporting, and the data is relatively shallow when compared to the depth of information collected in a case study. An example of comprehensive survey was the research done by Ruth W. Howard. In 1947, she obtained her doctorate by surveying 229 sets of triplets, the most comprehensive research of triplets completed at the time. This pioneering woman was also the

first African-American woman to earn a PhD in psychology (American Psychological Association, 2019).

Experiments involve significant control over extraneous variables and manipulation of the independent variable. As such, experimental research allows developmental psychologists to make causal statements about certain variables that are important for the developmental process. Because experimental research must occur in a controlled environment, researchers must be cautious about whether behaviours observed in the laboratory translate to an individual's natural environment.

Later in this chapter, you will learn about several experiments in which toddlers and young children observe scenes or actions so that researchers can determine at what age specific cognitive abilities develop. For example, children may observe a quantity of liquid poured from a short, fat glass into a tall, skinny glass. As the experimenters question the children about what occurred, the subjects' answers help psychologists understand at what age a child begins to comprehend that the volume of liquid remained the same although the shapes of the containers differs.

Across these three domains—physical, cognitive, and psychosocial—the normative approach to development is also discussed. This approach asks, "What is normal development?" In the early decades of the 20th century, normative psychologists studied large numbers of children at

various ages to determine norms (i.e., average ages) of when most children reach specific developmental milestones in each of the three domains (Gesell, 1933, 1939, 1940; Gesell & Ilg, 1946; Hall, 1904). Although children develop at slightly different rates, we can use these age-related averages as general guidelines to compare children with same-age peers to determine the approximate ages they should reach specific normative events called developmental milestones (e.g., crawling, walking, writing, dressing, naming colours, speaking in sentences, and starting puberty).

Not all normative events are universal, meaning they are not experienced by all individuals across all cultures. Biological milestones, such as puberty, tend to be universal, but social milestones, such as the age when children begin formal schooling, are not necessarily universal; instead, they affect most individuals in a particular culture (Gesell & Ilg, 1946).

TRICKY TOPIC: DEVELOPMENTAL RESEARCH DESIGN

One or more interactive elements has been excluded from this version of the text. You can view them online here: https://caul-cbua.pressbooks.pub/intropsychneuro/?p=482#oembed-1

If the video above does not load, click here: https://youtu.be/q6h9e2J73xU
For a full transcript of this video, click here

Issues in Developmental Psychology

There are many different theoretical approaches regarding human development. As we evaluate them in this chapter, recall that developmental psychology focuses on how people change; all the approaches presented in this chapter address questions of change: Is the change smooth or uneven (continuous versus discontinuous)? Is this pattern of change the same for everyone, or are there many different patterns of change (one course of development versus many courses)? How do genetics and environment interact to influence development (nature versus nurture)?

Is Development Continuous or Discontinuous?

Continuous development views development as a cumulative process, gradually improving on existing skills (Figure LD.2). With this type of development, there is gradual change. Consider, for example, a child's physical growth: adding inches to height year by year. In contrast, theorists who view development as discontinuous believe that development takes place in unique stages: It occurs at specific times or ages. With this type of development, the change is more sudden, such as

an infant's ability to conceive **object permanence** (the idea that even if something is out of sight, it still exists).

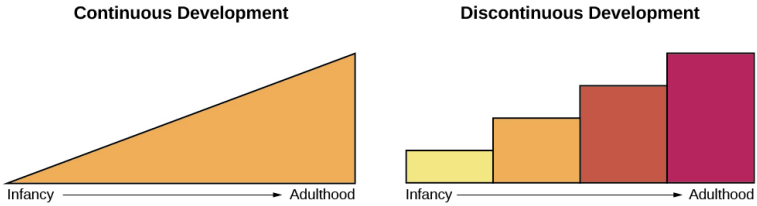


Figure LD.2 The concept of continuous development can be visualized as a smooth slope of progression, whereas discontinuous development sees growth in more discrete stages.

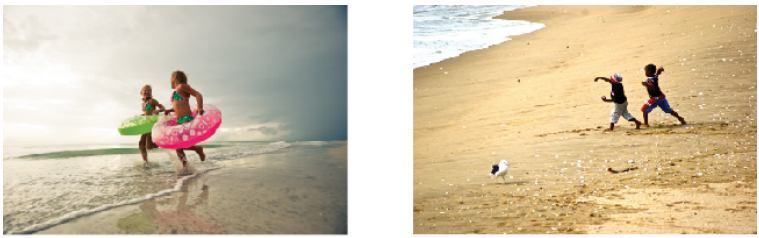
Is There One Course of Development or Many?

Is development essentially the same, or universal, for all children (i.e., there is one course of development) or does development follow a different course for each child, depending on the child's specific genetics and environment (i.e., there are many courses of development)? Do people across the world share more similarities or more differences in their development? How much do culture and genetics influence a child's behaviour?

Stage theories hold that the sequence of development is universal. For example, in cross-cultural studies of language development, children from around the world reach language milestones in a similar sequence (Gleitman & Newport, 1995). Infants in all cultures coo before they babble. They begin

babbling at about the same age and utter their first word around 12 months old. Yet we live in diverse contexts that have a unique effect on each of us. For example, researchers once believed that motor development follows one course for all children regardless of culture. However, child care practices vary by culture, and different practices have been found to alter the timing of developmental milestones such as sitting, crawling, and walking (Karasik, Adolph, Tamis-LeMonda, & Bornstein, 2010).

For instance, let's look at the Aché society in Paraguay. They spend a significant amount of time foraging in forests. While foraging, Aché mothers carry their young children, rarely putting them down in order to protect them from getting hurt in the forest. Consequently, their children walk much later: They walk around 23–25 months old, in comparison to infants in Western cultures who begin to walk around 12 months old. However, as Aché children become older, they are allowed more freedom to move about, and by about age 9, their motor skills surpass those of U.S. children of the same age: Aché children are able to climb trees up to 25 feet tall and use machetes to chop their way through the forest (Kaplan & Dove, 1987). So, development can be influenced by different contexts, but the functions themselves are present in all societies (Figure LD.3).



(a) (b)

Figure LD.3 All children across the world love to play. Whether in (a) Florida or (b) South Africa, children enjoy exploring sand, sunshine, and the sea. (credit a: modification of work by "Visit St. Pete/Clearwater"/Flickr; credit b: modification of work by "stringer_bel"/Flickr)

How Do Nature and Nurture Influence Development?

To what extent do nature (biology and genetics) and nurture (environment and culture) contribute to development? We are all born with specific genetic traits inherited from our parents, such as eye colour, height, and certain personality traits. There is also a deep interaction between our genes and our environment: Our unique experiences in our environment influence whether and how particular traits are expressed, and at the same time, our genes influence how we interact with our environment (Diamond, 2009; Lobo, 2008). This chapter will show that there is a reciprocal interaction between nature and nurture as they both shape who we become, but the debate continues as to the relative contributions of each.

81.

THEORIES OF DEVELOPMENT

Learning Objectives

By the end of this section, you will be able to:

- Discuss Freud's theory of psychosexual development
- Describe the major tasks of child and adult psychosocial development according to Erikson
- Discuss Piaget's view of cognitive development and apply the stages to understanding childhood cognition
- Describe Kohlberg's theory of moral

development
- Compare and contrast the strengths and weaknesses of major developmental theories

There are many theories regarding how babies and children grow and develop into happy, healthy adults. We explore several of these theories in this section.

Psychosexual Theory of Development

Sigmund Freud (1856–1939) believed that personality develops during early childhood. For Freud, childhood experiences shape our personalities and behaviour as adults. Freud viewed development as discontinuous; he believed that each of us must pass through a series of stages during childhood, and that if we lack proper nurturance and parenting during a stage, we may become stuck, or fixated, in that stage. Freud's stages are called the stages of psychosexual development. According to Freud, children's pleasure-seeking urges are focused on a different area of the body, called an erogenous zone, at each of the five stages of development: oral, anal, phallic, latency, and genital.

While most of Freud's ideas have not found support in modern research, we cannot discount the contributions that

Freud has made to the field of psychology. Psychologists today dispute Freud's psychosexual stages as a legitimate explanation for how one's personality develops, but what we can take away from Freud's theory is that personality is shaped, in some part, by experiences we have in childhood. These stages are discussed in detail in the chapter on personality.

Psychosocial Theory of Development

Erik Erikson (1902–1994) (Figure LD.4), another stage theorist, took Freud's theory and modified it as psychosocial theory. Erikson's psychosocial development theory emphasizes the social nature of our development rather than its sexual nature. While Freud believed that personality is shaped only in childhood, Erikson proposed that personality development takes place all through the lifespan. Erikson suggested that how we interact with others is what affects our sense of self, or what he called the ego identity.

Figure LD.4 Erik Erikson proposed the psychosocial theory of development. In each stage of Erikson's theory, there is a psychosocial task that we must master in order to feel a sense of competence.

Erikson proposed that we are motivated by a need to achieve competence in certain areas of our lives. According to psychosocial theory, we experience eight stages of development over our lifespan, from infancy through late adulthood. At each stage there is a conflict, or task, that we need to resolve. Successful completion of each developmental task results in a sense of competence and a healthy personality. Failure to master these tasks leads to feelings of inadequacy.

According to Erikson (1963), trust is the basis of our development during infancy (birth to 12 months). Therefore, the primary task of this stage is trust versus mistrust. Infants are dependent upon their caregivers, so caregivers who are responsive and sensitive to their infant's needs help their baby to develop a sense of trust; their baby will see the world as a safe, predictable place. Unresponsive caregivers who do not meet their baby's needs can engender feelings of anxiety, fear, and mistrust; their baby may see the world as unpredictable.

As toddlers (ages 1–3 years) begin to explore their world, they learn that they can control their actions and act on the environment to get results. They begin to show clear preferences for certain elements of the environment, such as food, toys, and clothing. A toddler's main task is to resolve the issue of autonomy versus shame and doubt, by working to establish independence. This is the "me do it" stage. For example, we might observe a budding sense of autonomy in a 2-year-old child who wants to choose their clothes and dress themselves. Although their outfits might not be appropriate for the situation, their input in such basic decisions has an effect on their sense of independence. If denied the opportunity to act on their environment, they may begin to doubt their abilities.

Once children reach the preschool stage (ages 3–6 years), they are capable of initiating activities and asserting control over their world through social interactions and play. According to Erikson, preschool children must resolve the task

of initiative versus guilt. By learning to plan and achieve goals while interacting with others, preschool children can master this task. Those who do will develop self-confidence and feel a sense of purpose.

During the elementary school stage (ages 7–11), children face the task of industry versus inferiority. Children begin to compare themselves to their peers to see how they measure up. They either develop a sense of pride and accomplishment in their schoolwork, sports, social activities, and family life, or they feel inferior and inadequate when they don't measure up.

In adolescence (ages 12–18), children face the task of identity versus role confusion. According to Erikson, an adolescent's main task is developing a sense of self. Adolescents struggle with questions such as "Who am I?" and "What do I want to do with my life?" Along the way, most adolescents try on many different selves to see which ones fit. Adolescents who are successful at this stage have a strong sense of identity and are able to remain true to their beliefs and values in the face of problems and other people's perspectives. Others might feel unsure of their identity and confused about the future.

People in early adulthood (i.e., 20s through early 40s) are concerned with intimacy versus isolation. After we have developed a sense of self in adolescence, we are ready to share our life with others. Erikson said that we must have a strong sense of self before developing intimate relationships with others.

When people reach their 40s, they enter the time known as

middle adulthood, which extends to the mid-60s. The social task of middle adulthood is generativity versus stagnation. Generativity involves finding your life's work and contributing to the development of others, through activities such as volunteering, mentoring, and raising children.

Erikson's final stage is from mid-60s to the end of life, which is concerned with integrity versus despair. He said that people in late adulthood reflect on their lives and feel either a sense of satisfaction or a sense of failure. People who feel proud of their accomplishments feel a sense of integrity, and they can look back on their lives with few regrets. However, people who are not successful at this stage may feel as if their life has been wasted. Table LD.1 summarizes the stages of Erikson's theory.

Table LD.1 Erikson's Psychosocial Stages of Development

Stage	Age (years)	Developmental Task	Description
1	0–1	Trust vs. mistrust	Trust (or mistrust) that basic needs, such as nourishment and affection, will be met
2	1–3	Autonomy vs. shame/doubt	Develop a sense of independence in many tasks
3	3–6	Initiative vs. guilt	Take initiative on some activities—may develop guilt when unsuccessful or boundaries overstepped
4	7–11	Industry vs. inferiority	Develop self-confidence in abilities when competent or sense of inferiority when not
5	12–18	Identity vs. confusion	Experiment with and develop identity and roles
6	19–29	Intimacy vs. isolation	Establish intimacy and relationships with others
7	30–64	Generativity vs. stagnation	Contribute to society and be part of a family
8	65–	Integrity vs. despair	Assess and make sense of life and meaning of contributions

Cognitive Theory of Development

Jean Piaget (1896–1980) is another stage theorist who studied childhood development (Figure LD.5). Instead of approaching development from a psychoanalytical or

psychosocial perspective, Piaget focused on children's cognitive growth. He believed that thinking is a central aspect of development and that children are naturally inquisitive. However, he said that children do not think and reason like adults (Piaget, 1930, 1932). His theory of cognitive development holds that our cognitive abilities develop through specific stages, which exemplifies the discontinuity approach to development. As we progress to a new stage, there is a distinct shift in how we think and reason.

Figure LD.5 Jean Piaget spent over 50 years studying children and how their minds develop.

Piaget said that children develop schemata to help them understand the world. Schemata are concepts (mental models) that are used to help us categorize and interpret information. By the time children have reached adulthood, they have created schemata for almost everything. When children learn new information, they adjust their schemata through two

processes: assimilation and accommodation. First, they assimilate new information or experiences in terms of their current schemata: *assimilation* is when they take in information that is comparable to what they already know. *Accommodation* describes when they change their schemata based on new information. This process continues as children interact with their environment.

For example, 2-year-old Majd learned the schema for dogs because his family has a Labrador retriever. When Majd sees other dogs in his picture books, he says to his parents, "Dog!" So Majd has assimilated them into his schema for dogs. One day, Majd sees a sheep for the first time and says to his parent, "Dog!" Having a basic schema that a dog is an animal with four legs and fur, Majd thinks all furry, four-legged creatures are dogs. When Majd's parent tells him that the animal he sees is a sheep, not a dog, Majd must accommodate his schema for dogs to include more information based on his new experiences. Majd's schema for dog was too broad, since not all furry, four-legged creatures are dogs. He now modifies his schema for dogs and forms a new one for sheep.

Like Freud and Erikson, Piaget thought development unfolds in a series of stages approximately associated with age ranges. He proposed a theory of cognitive development that unfolds in four stages: sensorimotor, preoperational, concrete operational, and formal operational (Table LD.2).

Table LD.2 Piaget's Stages of Cognitive Development

Age (years)	Stage	Description	Developmental issues
0–2	Sensorimotor	World experienced through senses and actions	Object permanence Stranger anxiety
2–6	Preoperational	Use words and images to represent things, but lack logical reasoning	Pretend play Egocentrism Language development
7–11	Concrete operational	Understand concrete events and analogies logically; perform arithmetical operations	Conservation Mathematical transformations
12–	Formal operational	Formal operations Utilize abstract reasoning	Abstract logic Moral reasoning

The first stage is the *sensorimotor stage,* which lasts from birth to about 2 years old. During this stage, children learn about the world through their senses and motor behaviour. Young children put objects in their mouths to see if the items are edible, and once they can grasp objects, they may shake or bang them to see if they make sounds. Between 5 and 8 months old, the child develops object permanence, which is the understanding that even if something is out of sight, it still exists (Bogartz, Shinskey, & Schilling, 2000). According to Piaget, young infants do not remember an object after it has been removed from sight. Piaget studied infants' reactions

when a toy was first shown to an infant and then hidden under a blanket. Infants who had already developed object permanence would reach for the hidden toy, indicating that they knew it still existed, whereas infants who had not developed object permanence would appear confused.

Link to Learning

Watch this brief video demonstrating different children's abilities to understand object permanence to learn more.

In Piaget's view, around the same time children develop object permanence, they also begin to exhibit stranger anxiety, which is a fear of unfamiliar people. Babies may demonstrate this by crying and turning away from a stranger, by clinging to a caregiver, or by attempting to reach their arms toward familiar faces such as parents. Stranger anxiety results when a child is unable to assimilate the stranger into an existing schema; therefore, the child can't predict what their experience with that stranger will be like, which results in a fear response.

Piaget's second stage is the *preoperational stage*, which is

from approximately 2 to 7 years old. In this stage, children can use symbols to represent words, images, and ideas, which is why children in this stage engage in pretend play. A child's arms might become airplane wings as they zoom around the room, or a child with a stick might become a brave knight with a sword. Children also begin to use language in the preoperational stage, but they cannot understand adult logic or mentally manipulate information (the term *operational* refers to logical manipulation of information, so children at this stage are considered to be *pre*-operational). Children's logic is based on their own personal knowledge of the world so far, rather than on conventional knowledge. For example, a parent gave a slice of pizza to 10-year-old Hatsu and another slice to their 3-year-old sibling, Rei. Rei's pizza slice was cut into five pieces, so Rei told their sibling that they got more pizza than Hatsu did. Children in this stage cannot perform mental operations because they have not developed an understanding of conservation, which is the idea that even if you change the appearance of something, it is still equal in size as long as nothing has been removed or added.

Link to Learning

Watch this video of a boy in the pre-operational stage, responding to Piaget's conservation tasks, to learn more.

During this stage, we also expect children to display egocentrism, which means that the child is not able to take the perspective of others. A child at this stage thinks that everyone sees, thinks, and feels just as they do. Let's look at Rei and Hatsu again. Hatsu's birthday is coming up, so their parents take Rei to the toy store to choose a present for their sibling. They select an Iron Man action figure for Hatsu, thinking that if they like the toy, their sibling will too. An egocentric child is not able to infer the perspective of other people and instead attributes their own perspective.

Link to Learning

Watch this short video, from the University of Minnesota, of the three-mountain task in action. Piaget developed the Three-Mountain Task to determine the level of egocentrism displayed by children. Children view a 3-dimensional mountain scene from one viewpoint, and are asked what another person at a different viewpoint would see in the same scene.

Piaget's third stage is the *concrete operational stage*, which occurs from about 7 to 11 years old. In this stage, children can think logically about real (concrete) events; they have a firm grasp on the use of numbers and start to employ memory strategies. They can perform mathematical operations and understand transformations, such as addition is the opposite of subtraction, and multiplication is the opposite of division. In this stage, children also master the concept of conservation: Even if something changes shape, its mass, volume, and number stay the same. For example, if you pour water from

a tall, thin glass to a short, fat glass, you still have the same amount of water. Remember Hatsu and Rei and the pizza? How did Hatsu know that Rei was wrong when Rei said that they had more pizza?

Children in the concrete operational stage also understand the principle of reversibility, which means that objects can be changed and then returned back to their original form or condition. Take, for example, water that you poured into the short, fat glass: You can pour water from the fat glass back to the thin glass and still have the same amount (minus a couple of drops).

The fourth, and last, stage in Piaget's theory is the *formal operational stage*, which is from about age 11 to adulthood. Whereas children in the concrete operational stage are able to think logically only about concrete events, children in the formal operational stage can also deal with abstract ideas and hypothetical situations. This is because they tend to think more flexibly and creatively. Children in this stage can use abstract thinking to problem solve, look at alternative solutions, and test these solutions.

Beyond Formal Operational Thought

As with other major contributors of theories of development, several of Piaget's ideas have come under criticism, several contemporary studies support a model of development that is more continuous than Piaget's discrete stages (Courage &

Howe, 2002; Siegler, 2005, 2006). Many others suggest that children reach cognitive milestones earlier than Piaget describes (Baillargeon, 2004; de Hevia & Spelke, 2010).

According to Piaget, the highest level of cognitive development is formal operational thought, which develops between 11 and 20 years old. However, many developmental psychologists disagree with Piaget, suggesting a fifth stage of cognitive development, known as the postformal stage (Basseches, 1984; Commons & Bresette, 2006; Sinnott, 1998). In postformal thinking, decisions are made based on situations and circumstances, and logic is integrated with emotion as adults develop principles that depend on contexts. One way that we can see the difference between an adult in postformal thought and an adolescent in formal operations is in terms of how they handle emotionally charged issues.

In adulthood problem-solving abilities typically change, we tend to think more deeply about many areas of our lives, such as relationships, work, and politics (Labouvie-Vief & Diehl, 1999). Because of this, postformal thinkers are able to draw on past experiences to help them solve new problems. Problem-solving strategies using postformal thought vary, depending on the situation. What does this mean? Adults can recognize, for example, that what seems to be an ideal solution to a problem at work involving a disagreement with a colleague may not be the best solution to a disagreement with a significant other.

TRICKY TOPIC: PIAGET AND HIS STAGES

One or more interactive elements has been excluded from this version of the text. You can view them online here: https://caul-cbua.pressbooks.pub/intropsychneuro/?p=483#oembed-1

If the video above does not load, click here: https://youtu.be/kyp0kg5i_g8
For a full transcript of this video, click here

Everyday Connection

Neuroconstructivism

The genetic environmental correlation you've learned about concerning the bidirectional influence

of genes and the environment has been explored in more recent theories (Newcombe, 2011). One such theory, neuroconstructivism, suggests that neural brain development influences cognitive development. Experiences that a child encounters can impact or change the way that neural pathways develop in response to the environment. An individual's behaviour is based on how one understands the world. There is interaction between neural and cognitive networks at and between each level, consisting of these:

- genes
- neurons
- brain
- body
- social environment

These interactions shape mental representations in the brain and are dependent on context that individuals actively explore throughout their lifetimes (Westermann, Mareschal, Johnson, Sirois, Spratling, & Thomas, 2007).

An example of this would be a child who may be genetically predisposed to a difficult temperament. They may have parents who provide a social

environment in which they are encouraged to express themselves in an optimal manner. The child's brain would form neural connections enhanced by that environment, thus influencing the brain. The brain gives information to the body about how it will experience the environment. Thus, neural and cognitive networks work together to influence genes (e.g., attenuating temperament), body (e.g., may be less prone to high blood pressure), and social environment (e.g., may seek people who are similar to them).

Sociocultural Theory of Development

Lev Vygotsky was a Russian psychologist who proposed a sociocultural theory of development. He suggested that human development is rooted in one's culture. A child's social world, for example, forms the basis for the formation of language and thought. The language one speaks and the ways a person thinks about things is dependent on one's cultural background. Vygotsky also considered historical influences as key to one's development. He was interested in the process of development and the individual's interactions with their environment (John-Steiner & Mahn, 1996)

Moral Theory Of Development

A major task beginning in childhood and continuing into adolescence is distinguishing right from wrong. Lawrence Kohlberg (1927–1987) attempted to extend Piaget's ideas about stages of cognitive development to moral development, suggesting that morality too was developed over a series of stages throughout life. To develop this theory, Kohlberg posed moral dilemmas to people of all ages and placed them in particular stages based upon analysis of their answers. Using this framework, Kohlberg claimed that more males than females reach higher stages and that females seem to be deficient in their moral reasoning abilities (1969). Carol Gilligan, who worked with Kohlberg, challenged his framework interpretations in her book *In a Different Voice: Psychological Theory and Women's Development* (1982). Kohlberg studied predominantly upper-middle class, white, male-identified people and Gilligan pointed out the obvious bias inherent in basing a theory on such a narrowly defined group of people. Using female-identified participants, she redefined Kohlberg's stages to allow moral problems to be considered from different perspectives.

Although an improvement over Kohlberg's theories, the dilemma-based tasks used by Gilligan assessed moral *reasoning*, which is different from moral *behaviour*. Sometimes what we say we'd do in a situation is not what we actually do. We might "talk the talk," but not "walk the walk." So, how exactly does

one define moral behaviour? The definition of what makes a "good person" has long been the subject of philosophical debate and is unlikely to reach consensus anytime soon. As a tool for measuring moral development, neither Kohlberg's nor Gilligan's dilemmas are feasible in young children, who do not have the language comprehension required for these tests. In fact, Kohlberg lumped all children under the age of 10 in the same level of moral development.

An alternative approach is to measure specific components of morality which are easier to define, like prosocial behaviour, defined as any behaviour done with the intention of benefiting someone else. This includes acts such as helping, consoling, and sharing, and can be assessed using simple behavioural tests. For example, participants can be asked to allocate resources to themselves and others under different conditions. Research using these simpler tasks has revealed that helping behaviour and sharing are evident in children as young as 2 years old, and that the nature of these prosocial behaviours changes over the course of development (Warneken & Tomasello, 2006; Williams *et al.,* 2014).

One 2019 study compared rates at which infants demonstrated prosocial behaviours across three different age ranges; 16-, 19-, and 24-months-old. To do this, infants were placed in a situation where a researcher, using verbal communication and body language, indicated they needed help with a basic task, such as finding a hidden toy. They then recorded infants' prosocial behaviour according to three

different categories; instrumental helping (such as offering the researcher a different object), comforting (such as hugging the upset researcher), and indirect helping (such as asking another adult in the room for help). The study found that 24-month old children were significantly more likely to demonstrate prosocial behaviours than the 16- and 19-month olds, particularly when it came to comforting. This suggests that the second year of life is an extremely important period in the development of this important component of morality (Walle et al., 2019).

This approach remedies some of the problems with Kohlberg's studies in that he didn't specifically define specific "good" or "bad" behaviours. Rather he assumed his own ideas about good versus bad behaviour were true and incorporated these assumptions into the design of his studies. Therefore, the outcomes of Kohlberg's studies were strongly influenced by his culturally informed ideas about morality. By instead focusing on one aspect of morality, like prosocial behaviour described above, it allows researchers to assess developmental changes without judging this aspect as morally good or bad. This approach also ensures that judgements about what constitutes "good" behaviour doesn't colour the scientific data being collected or the design of the studies being done.

82.

STAGES OF DEVELOPMENT

Learning Objectives

By the end of this section, you will be able to:

- Describe the stages of prenatal development
- Identify factors that influence prenatal development
- Explain theories of cognitive and psychosocial development
- Describe the major changes that occur in adolescence

Development from conception into a fully grown human

involves major alterations to anatomy, physiology, cognition, and behaviour, and many of these changes follow a predictable, age-based progression. This section will discuss prenatal, infant, child, adolescent, and adult development across three domains: physical, cognitive, and psychosocial.

Prenatal Development

How did you come to be who you are? From beginning as a one-cell structure to your birth, your prenatal development occurred in an orderly and delicate sequence. There are three main stages of prenatal development: germinal, embryonic, and fetal. Let's explore what happens to the developing baby in each of these stages.

Germinal Stage (Conception–Week 2)

Each biological parent contributes DNA at the moment of conception, when sperm and egg unite to form a single-celled zygote (Figure LD.6). Growth and development of the zygote are guided by these inherited genetic instructions, coded in DNA within 46 chromosomes, 23 from each parent. In mammals, sex is determined by contribution of specific chromosomes, females are typically XX and males are typically XY, so it's the male parent's contribution that determines genetic sex, a female parent only has Xs to contribute.

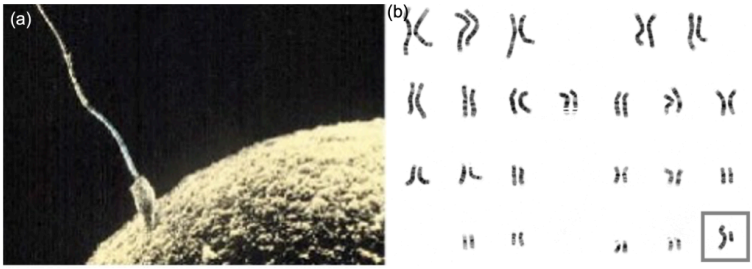


Figure LD.6 (a) Sperm and ovum fuse at the point of conception. (b) 23 pairs of human chromosomes inherited from each parent, box displays the sex chromosomes; one large X and a smaller Y in this individual.

During the first week after conception, the zygote divides and multiplies, going from a one-cell structure to two cells, then four cells, then eight cells, and so on. This process of cell division is called mitosis. Mitosis is a fragile process, and fewer than one-half of all zygotes survive beyond the first two weeks (Hall, 2004). After 5 days of mitosis there are 100 cells, and after 9 months there are billions of cells. As the cells divide, they become more specialized, forming different organs and body parts. In the germinal stage, the mass of cells has yet to attach itself to the lining of the uterus. Once it does, the next stage begins.

Embryonic Stage (Weeks 2–8)

After the zygote divides for about 7–10 days and has 150 cells, it travels down the fallopian tubes and implants itself in the

lining of the uterus. Upon implantation, this multi-cellular organism is called an embryo. Blood vessels grow, forming the placenta, a structure connected to the uterus that provides nourishment and oxygen to the developing embryo via the umbilical cord. Basic structures of the embryo start to develop into areas that will become the head, chest, and abdomen. During the embryonic stage, organs form and begin to function, at this stage there is a detectable heart-beat. The neural tube forms along the back of the embryo, developing into the spinal cord and brain.

Fetal Stage (Week 8-9 – Onward)

At about nine weeks, the embryo becomes a fetus. At this stage, the fetus is about the size of a kidney bean and begins to take on the recognizable form of a human being. It's during the fetal stage that the sex organs begin to differentiate. At about 16 weeks, the fetus is approximately 4.5 inches long. Fingers and toes are fully developed, and fingerprints are visible. By the time the fetus reaches the sixth month of development (24 weeks), it weighs up to 1.4 pounds. Hearing has developed, so the fetus can respond to sounds. The internal organs, such as the lungs, heart, stomach, and intestines, have formed enough that a fetus born prematurely at this point has a chance to survive outside of the womb. Throughout the fetal stage the brain continues to grow and develop, nearly doubling in size from weeks 16 to 28. Around 36 weeks, the fetus is almost ready for birth. It weighs about 6 pounds and is about 18.5

inches long, and by week 37 all of the fetus's organ systems are developed enough that it could survive outside the uterus without many of the risks associated with premature birth. The fetus continues to gain weight and grow in length until approximately 40 weeks. By then, the fetus has very little room to move around and birth becomes imminent. The progression through the stages is shown in Figure LD.7.

Figure LD.7 During the fetal stage, the baby's brain develops and the body adds size and weight, until the fetus reaches full-term development.

Reproductive Development and Sex Assignment

The first step in differentiation of the reproductive organs happens with a sexless collection of cells at an area called the germinal ridge. In mammals, the main determinant of the pathway the germinal ridge follows is the SRY gene on the Y chromosome. This gene leads to the growth and specialization of cells in the inner portion of the germinal ridge, which eventually become the testes. In the absence of this gene, as in XX individuals, the outer part of the germinal ridge develops into ovaries. Both the testes and ovaries are **gonads**, reproductive organs that contain reproductive hormones and gametes (sperm or eggs). In most XY individuals, high levels of fetal androgens, like testosterone, released from the testes promote development of the external **genitals** into a penis. In the absence of testosterone, as in most XX individuals, this same tissue becomes a vagina. The practice of sexing newborn infants in this way has historically led misclassification of intersex people. Therefore, the terms *assigned female at birth* (**AFAB)** and *assigned male at birth* (**AMAB**) describe biological sex more accurately than female and male, since it includes intersex individuals. This terminology is preferred by many members of transgender, intersex and non-binary communities since it acknowledges an individual's medical history and allows a distinction between biological sex and gender identity.

Dig Deeper

Understanding Gender

Gender refers to the way in which one perceives themselves in the historical context of sex and/or gender categories. Gender is largely socially constructed, however, it the form it takes is shaped and influenced by biological sex (American Psychological Association, 2015). So, what does it mean to be a boy or a man? What does it mean to be a girl or a woman?

First let's start with the basics. "Boy/man", and "girl/woman" are indeed gender categories that most people identify with. Historically, the categories have been tied to the perceived biological sex of the individual, with "boy/man" correlating to biological males and
"girl/woman" correlating to biological females. A person is "cisgender" when their gender identity matches their assigned sex (i.e., identifies as a woman and was assigned female at birth). A person

is "transgender" when their gender identity does not match their assigned sex. (American Psychological Association, 2015). A person is "non-binary" when they don't identify as either a "boy/man" or "girl/woman". Non-binary people may or may not also identify as transgender, this will vary from person to person.

In many cultures, gender categories are constructed with the presumption people's gender identity maps easily onto their (assumed) biological sex. However, there is a lot more to being a man or woman then whether a person has a penis or a vagina and breasts. For instance, masculinity and femininity play a huge role in many people's conception of their own gender. For most of history, society has been organized by a binary system, male or female, starting with birth certificates. At the moment of birth, every infant is labelled either male or female by a medical authority, and this is usually registered with the government (Preves, 2002). From here, parents and other adults begin to place expectations on who the infant will be as they grow, for instance, what kind of toys they will like or their favorite colour. Because adults start treating the child as a person with gender based on the biological sex before the child has developed their own sense of

gender identity, the infant's own sense of gender reacts and responds to these expectations. Masculinity and femininity is the expression of these reactions and responses. The decision to shave facial hair or not could be considered an expression of masculinity. The decision to wear make-up or not could be considered an expression of femininity. It is not that choosing to wear make-up, or grow out one's beard makes one more masculine or feminine, so much as the choice is an expression of how one relates to these categories on their own terms. Many women wear make-up, many choose not to. Many men can't help but grow out long beards, many simply can't grow one at all (Schippers, 2007).

It would be wrong to suggest that biological sex doesn't have any influence over gender. Our minds, thoughts, feelings and identities are ultimately generated by the brain and body. For instance, testosterone is a hormone responsible for behaviors and traits associated with social domination and certain types of aggression, such as risk-assessment, initiative and task performance (Goudriaan et al., 2010; Platje et al., 2015; Welling et al., 2016). For many species, biological males experience an increase in testosterone production during puberty, often leading to an increase in muscle mass and

body hair and reduction in body fat. Despite popular conception however, this doesn't make testosterone the "boy/male" hormone since *both* males and females have measurable levels of testosterone. While it is true that males produce more testosterone, it's inaccurate to say that testosterone plays no role in female physiology, meaning that testosterone is part of what shapes girls too. Secondly, it's entirely possible that a cisgender boy may go through puberty and not display any increase in the behaviors associated with testosterone at any point in his life. This doesn't mean this boy has any less testosterone in his system than his peers (Booth et al., 2006). And even if that were the case, that wouldn't somehow invalidate the boy's identity as a "boy" experiencing a "boy's puberty.

Intersex Conditions

Chromosomal, gonadal, and genital sex most commonly follow either a route to a male reproductive system which donates X and Y gametes via sperm or an XX female system that provides an environment for conception and growth of a fertilized egg. However genetic sex and gonadal sex do not

always follow this typical pattern, for example there are XY individuals with vaginas. The external genitals derive from the same tissue so they commonly develop along a continuum with male-typical at one end and female-typical at the other, though some individuals are born with genitals that fall somewhere in the middle of this range. The term **intersex** refers to individuals who have characteristics that do not fit typical male and female categories. Intersex is an umbrella term to describe many variations, which are sometimes referred to as disorders of sexual development. Since intersex conditions are not harmful to health and usually only affect reproduction, the term disorder to describe these individuals is not accurate.

Chromosomes and gonads are not easy to see, so often the appearance of the external genitals is used to determine sex at birth. However, as mentioned above, this practice has historically led to the misclassification of intersex people. In fact, this can have a number of consequences for the person in question, including a misunderstanding of their own bodies health, and difficulties navigating the medical system. Rates of intersexuality within the human population are difficult to ascertain, especially considering the history of unethical medical intervention on intersex infants. There have been unfortunately many cases of doctors performing unnecessary corrective surgery in order to make the genitals of an intersex infant more "normal". Occasionally, the parents of the infant may not have been informed of the condition or procedure,

nor given their consent. While this is justified as being done to provide the infant with a more normal life, most intersex advocacy groups are strongly opposed to this practice. Often a person has no reason to suspect they are intersex until they reach puberty and, in some cases, it's only discovered after the death of the individual.

Link to Learning

For more information on intersex conditions, check out the FAQ for interACT, an advocacy group for intersex youth, to learn more.

Prenatal Influences

The placenta is a structure that develops during pregnancy and provides nourishment and oxygen to the fetus. Almost everything the pregnant parent ingests, including food and medication, travels through the placenta to the fetus, hence the phrase "eating for two." In fact, the parental environment can have long-term effects on the

developing fetus. A teratogen is any environmental agent—biological, chemical, or physical—that causes damage to the developing embryo or fetus. Most teratogens have their greatest impact during early pregnancy. Take for example, lead, which can cause lead poisoning if the pregnant parent becomes exposed from sources like paint or soil. Since the ban on leaded gasoline in the early 90's, levels in children has declined dramatically, yet childhood lead poisoning remains a global health concern. Research shows that even extremely low levels of lead exposure can still have negative effects, including cognitive impairments (Koller et al., 2004). In the United States alone, deaths related to lead poising are comparable to those caused by smoking tobacco, around 412,000 a year (O'Connor et al., 2020).

Many recreational drugs, like alcohol and tobacco are considered teratogens because they can cross the placenta and negatively affect the fetus. Other teratogens include exposure to radiation and viruses such as HIV, herpes, and rubella (German measles). Additionally, people who experience high stress during pregnancy are more likely to have children with enhanced responses to stress (Leung et al., 2010).

TRICKY TOPIC: PRENATAL DEVELOPMENT

One or more interactive elements has been excluded from this version of the text. You can view them online here: https://caul-cbua.pressbooks.pub/intropsychneuro/?p=485#oembed-1

If the video above does not load, click here: https://youtu.be/vN2NRvyQ6Dc
For a full transcript of this video, click here

Infancy Through Childhood

The average newborn weighs approximately 7.5 pounds. Although small, a newborn is not completely helpless because their reflexes and sensory capacities help them interact with the environment from the moment of birth. All healthy babies are born with newborn reflexes: inborn automatic responses to specific forms of stimulation. Reflexes help the newborn survive until they're capable of more complex behaviours—these reflexes are crucial to survival. They are present in babies whose brains are developing

normally and usually disappear around 4–5 months old. Let's take a look at some of these newborn reflexes.

The rooting reflex is the newborn's response to anything that touches their cheek: When you stroke a baby's cheek, they naturally turn their head in that direction and begin to suck. The sucking reflex is the automatic, unlearned, sucking motions that infants do with their mouths. You can observe the grasping reflex if you put your finger into a newborn's hand, they automatically grasp anything that touches their palms. The Moro reflex is the newborn's response when a baby feels like they are falling. The baby spreads their arms, pulls them back in, and then (usually) cries. How do you think these reflexes promote survival in the first months of life?

Link to Learning

Watch this video, created by the Inter-Tribal Council of Michigan, describing and showing newborn reflexes, to learn more.

What can young infants see, hear, and smell? Newborn infants' sensory abilities are significant, but their senses are not

yet fully developed. Many of a newborn's innate preferences facilitate interaction with caregivers and other humans. Although vision is their least developed sense, newborns already show a preference for faces. Babies who are just a few days old also prefer human voices, they will listen to voices longer than sounds that do not involve speech (Vouloumanos & Werker, 2004), and they seem to prefer the voice of the parent who was pregnant over a stranger's voice (Mills & Melhuish, 1974). In an interesting experiment, 3-week-old babies were given pacifiers that played a recording of the pregnant parent's voice and of a stranger's voice. When the infants heard their parent's voice, they sucked more strongly at the pacifier (Mills & Melhuish, 1974). Newborns also have a strong sense of smell. For instance, newborn babies can distinguish the smell of the parent who was pregnant from that of others. In a study by MacFarlane (1978), 1-week-old babies who were being breastfed were placed between two gauze pads. One gauze pad was from the bra of a nursing parent who was a stranger, and the other gauze pad was from the bra of the infant's own nursing parent. More than two-thirds of the week-old babies turned toward the gauze pad with their own nursing parent's scent.

Physical Development

During infancy, toddlerhood, and early childhood, the body's physical development is rapid. On average, newborns weigh between 5 and 10 pounds. By 2 years old, this weight will have

quadrupled, with most 2 year olds weighing between 20 and 40 pounds (WHO Multicentre Growth Reference Study Group, 2006). Growth slows between 4 and 6 years old. During this time children gain 5–7 pounds and grow about 2–3 inches per year.

There are two important patterns of development: **cephalocaudal** and **proximodistal**. Cephalocaudal development refers to the pattern of growth from the head down, also referred to as development from head to toe. Proximodistal development is the tendency for growth to start in the centre of the body and move outwards to the extremities. This is reflected in the development of more general motor skills of the limbs close to the torso before development of fine motor skills in the fingers and toes.

Figure LD.8 Children experience rapid physical changes through infancy and early childhood. (credit "left": modification of work by Kerry Ceszyk; credit "middle-left": modification of work by Kristi Fausel; credit "middle-right": modification of work by "devinf"/Flickr; credit "right": modification of work by Rose Spielman)

The nervous system continues to grow and develop after birth; each neural pathway forms thousands of

new connections during infancy and toddlerhood. This period of rapid neural growth is called blooming. The blooming period of neural growth is then followed by a period of pruning, where neural connections are reduced. It is thought that pruning allows the brain to function more efficiently, allowing for mastery of more complex skills (Hutchinson, 2011). Blooming occurs during the first few years of life, and pruning continues through childhood and into adolescence in various areas of the brain.

The size of our brains increases rapidly. For example, the brain of a 2-year-old is 55% of its adult size, and by 6 years old the brain is about 90% of its adult size (Tanner, 1978). During early childhood (ages 3–6), the frontal lobes grow rapidly. The frontal lobes are associated with planning, reasoning, memory, and impulse control. Therefore, by the time children reach school age, they are developmentally capable of controlling their attention and behaviour. Through the elementary school years, the frontal, temporal, occipital, and parietal lobes all grow in size. The brain growth spurts experienced in childhood tend to follow Piaget's sequence of cognitive development, so that significant changes in neural functioning are associated with cognitive advances (Kolb & Whishaw, 2009; Overman, Bachevalier, Turner, & Peuster, 1992).

Motor development occurs in an orderly sequence as infants move from reflexive reactions (e.g., sucking and rooting) to more advanced motor functioning. Motor skills refer to our ability to move our bodies and manipulate objects. Fine motor

skills focus on the muscles in our fingers, toes, and eyes, and enable coordination of small actions (e.g., grasping a toy, writing with a pencil, and using a spoon). Gross motor skills focus on large muscle groups that control our arms and legs and involve larger movements (e.g., balancing, running, and jumping).

As motor skills develop, there are certain developmental milestones that young children typically achieve at certain age ranges (Table LD.4) An example of a developmental milestone is sitting. On average, most babies sit alone at 7 months old. Sitting involves both coordination and muscle strength, and 90% of babies achieve this milestone between 5 and 9 months old. In another example, babies on average are able to hold up their head at 6 weeks old, and 90% of babies achieve this between 3 weeks and 4 months old. If a child is displaying delays on several milestones, that could be reason for concern since some developmental delays can be identified and addressed through early intervention.

Table LD.4 Developmental Milestones, Ages 2–5 Years

Age (years)	Physical	Personal/ Social	Language	Cognitive
2	Kicks a ball; walks up and down stairs	Plays alongside other children; copies adults	Points to objects when named; puts 2–4 words together in a sentence	Sorts shapes and colours; follows 2-step instructions
3	Climbs and runs; pedals tricycle	Takes turns; expresses many emotions; dresses self	Names familiar things; uses pronouns	Plays make believe; works toys with parts (levers, handles)
4	Catches balls; uses scissors	Prefers social play to solo play; knows likes and interests	Knows songs and rhymes by memory	Names colours and numbers; begins writing letters
5	Hops and swings; uses fork and spoon	Distinguishes real from pretend; likes to please friends	Speaks clearly; uses full sentences	Counts to 10 or higher; prints some letters and copies basic shapes

Cognitive Development

In addition to rapid physical growth, young children also exhibit significant development of their cognitive abilities. Piaget thought that children's ability to understand

objects—such as learning that a rattle makes a noise when shaken—was a cognitive skill that develops slowly as a child matures and interacts with the environment. Today, developmental psychologists think Piaget was incorrect. Researchers have found that even very young children understand physical properties of objects long before they have direct experience with those objects (Baillargeon, 1987; Baillargeon, Li, Gertner, & Wu, 2011). For example, children as young as 3 months old demonstrated knowledge of the properties of objects that they had only viewed and did not have prior experience with them. In one study, 3-month-old infants were shown a truck rolling down a track and behind a screen. The box, which appeared solid but was actually hollow, was placed next to the track. The truck rolled past the box as would be expected. Then the box was placed on the track to block the path of the truck. When the truck was rolled down the track this time, it continued unimpeded. The infants spent significantly more time looking at this impossible event (Figure LD.9). Baillargeon (1987) concluded that they knew solid objects cannot pass through each other. Baillargeon's findings suggest that very young children have an understanding of objects and how they work, which Piaget (1954) would have said is beyond their cognitive abilities due to their limited experiences in the world.

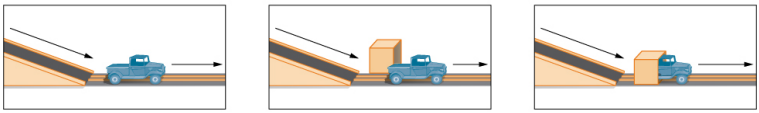


Figure LD.9 In Baillargeon's study, infants observed a truck (a) roll down an unobstructed track, (b) roll down an unobstructed track with an obstruction (box) beside it, and (c) roll down and pass through what appeared to be an obstruction.

Like physical milestones, there are also cognitive milestones children typically reach at certain ages. For example, infants shake their head "no" around 6–9 months, and they respond to verbal requests to do things like "wave bye-bye" or "blow a kiss" around 9–12 months. Remember Piaget's ideas about object permanence? We can expect children to grasp the concept that objects continue to exist even when they are not in sight by around 8 months old. Because toddlers (i.e., 12–24 months old) have mastered object permanence, they enjoy games like hide and seek, and they realize that when someone leaves the room they will come back (Loop, 2013). Toddlers also point to pictures in books and look in appropriate places when you ask them to find objects.

Preschool-age children (i.e., 3–5 years old) also make steady progress in cognitive development. Not only can they count, name colours, and tell you their name and age, but they can also make some decisions on their own, such as choosing an outfit to wear. Preschool-age children understand basic time

concepts and sequencing (e.g., before and after), and they can predict what will happen next in a story. They also begin to enjoy the use of humour in stories. Because they can think symbolically, they enjoy pretend play and inventing elaborate characters and scenarios. One of the most common examples of their cognitive growth is their blossoming curiosity. Preschool-age children love to ask "Why?"

An important cognitive change occurs in children this age. Recall that Piaget described 2–3 year olds as egocentric, meaning that they do not have an awareness of others' points of view. Between 3 and 5 years old, children come to understand that people have thoughts, feelings, and beliefs that are different from their own. This is known as theory-of-mind (TOM). Children can use this skill to tease others, persuade their parents to purchase a candy bar, or understand why a sibling might be angry. When children develop TOM, they can recognize that others have false beliefs (Dennett, 1987; Callaghan et al., 2005).

Link to Learning

Watch this video outlining the basics of Theory of Mind and showing young children engaging in a classic 'false belief' or ToM activity – the 'Sally-Anne' test.

Cognitive skills continue to expand in middle and late childhood (6–11 years old). Thought processes become more logical and organized when dealing with concrete information (Figure LD.10). Children at this age understand concepts such as the past, present, and future, giving them the ability to plan and work toward goals. Additionally, they can process complex ideas such as addition and subtraction and cause-and-effect relationships.

Figure LD.10 Because they understand luck and fairness, children in middle and late childhood (6–11 years old) are able to follow rules for games. (credit: Edwin Martinez)

One well-researched aspect of cognitive development is language acquisition. The order in which children learn language structures is consistent across children and cultures (Hatch, 1983). Starting before birth, babies begin to develop language and communication skills. At birth, babies apparently recognize the voice of their birth parent, and can discriminate between the language(s) spoken by their birth parent and foreign languages, and they show preferences for faces that are moving in synchrony with audible language (Blossom & Morgan, 2006; Pickens, 1994; Spelke & Cortelyou, 1981).

Children communicate information through gesturing long before they speak, and there is some evidence that gesture

usage predicts subsequent language development (Iverson & Goldin-Meadow, 2005). In terms of producing spoken language, babies begin to coo almost immediately. Cooing is a one-syllable combination of a consonant and a vowel sound (e.g., coo or ba). Interestingly, babies replicate sounds from their own languages. A baby whose parents speak French will coo in a different tone than a baby whose parents speak Spanish or Urdu. After cooing, the baby starts to babble. Babbling begins with repeating a syllable, such as ma-ma, da-da, or ba-ba. When a baby is about 12 months old, we expect them to say their first word for meaning, and to start combining words for meaning at about 18 months.

At about 2 years old, a toddler uses between 50 and 200 words; by 3 years old they have a vocabulary of up to 1,000 words and can speak in sentences. During the early childhood years, children's vocabulary increases at a rapid pace. This is sometimes referred to as the "vocabulary spurt" and has been claimed to involve an expansion in vocabulary at a rate of 10–20 new words per week. Recent research may indicate that while some children experience these spurts, it is far from universal (as discussed in Ganger & Brent, 2004). It has been estimated that, 5 year olds understand about 6,000 words, speak 2,000 words, and can define words and question their meanings. They can rhyme and name the days of the week. Seven year olds speak fluently and use slang and clichés (Stork & Widdowson, 1974).

What accounts for such dramatic language learning by

children? Behaviorist B. F. Skinner thought that we learn language in response to reinforcement or feedback, such as through parental approval or simply by being understood. For example, when a two-year-old child asks for juice, they might say, "me juice," to which their parent might respond by giving them a cup of apple juice. Noam Chomsky (1957) criticized Skinner's theory and proposed that we are all born with an innate capacity to learn language. Chomsky called this mechanism a language acquisition device (LAD). Researchers now believe that language acquisition is partially inborn and partially learned through our interactions with our linguistic environment (Gleitman & Newport, 1995; Stork & Widdowson, 1974).

Attachment

Psychosocial development occurs as children form relationships, interact with others, and understand and manage their feelings. In social and emotional development, forming healthy attachments is very important and is the major social milestone of infancy. Attachment is a long-standing connection or bond with others and is often used to describe the emotional bond between child and caregiver. Attachment is more easily established during the early years of a child's life and is therefore thought to be reflective of a sensitive period. Developmental psychologists are interested in how infants reach this milestone. They ask such questions as: How do parent and infant attachment bonds form? How

does neglect affect these bonds? What accounts for children's attachment differences?

Researchers Harry Harlow, John Bowlby, and Mary Ainsworth conducted studies designed to answer these questions. In the 1950s, Harlow conducted a series of experiments on monkeys. He separated newborn monkeys from their mothers. Each monkey was presented with two surrogate mothers. One surrogate monkey was made out of wire mesh, and dispensed milk. The other monkey was softer and made from cloth: This monkey did not dispense milk. Research shows that the monkeys preferred the soft, cuddly cloth monkey, even though it did not provide any nourishment. The baby monkeys spent their time clinging to the cloth monkey and only went to the wire monkey when they needed to be fed. Prior to this study, the medical and scientific communities generally thought that babies become attached to the people who provide their nourishment. However, Harlow (1958) concluded that there was more to the birth parent-child bond than nourishment. Feelings of comfort and security are the critical components to parental-infant bonding, which leads to healthy psychosocial development.

Link to Learning

Harlow's studies of attachment in monkeys was foundational to our understanding of attachment, bonding, and comfort. However, these studies were performed before modern ethics guidelines were in place, and today his experiments are widely considered unethical. You can watch this video of actual footage of Harlow's monkey studies, to learn more.

Building on the work of Harlow and others, John Bowlby developed the concept of attachment theory. He defined attachment as the affectional bond that an infant forms with the parent who birthed them (Bowlby, 1969). An infant must form this bond with a primary caregiver in order to have normal social and emotional development. In addition, Bowlby proposed that this attachment bond is very powerful and continues throughout life. He used the concept of secure base to define a healthy attachment between parent and child (1988). A secure base is a parental presence that gives the child

a sense of safety as he explores his surroundings. Bowlby said that two things are needed for a healthy attachment: The caregiver must be responsive to the child's physical, social, and emotional needs; and the caregiver and child must engage in mutually enjoyable interactions (Bowlby, 1969) (Figure LD.11).

Figure LD.11 Mutually enjoyable interactions promote the parent-infant bond. (credit: "balouriarajesh_Pixabay"/Pixabay)

While Bowlby thought attachment was an all-or-nothing process, Mary Ainsworth's (1970) research showed otherwise. Ainsworth wanted to know if children differ in the ways they bond, and if so, why. To find the answers, she used the Strange Situation procedure to study attachment between parents and their infants (1970). In the Strange Situation, the primary

caregiver and child (age 12-18 months) are placed in a room together. There are toys in the room, and the caregiver and child spend some time alone in the room. After the child has had time to explore their surroundings, a stranger enters the room. The caregiver then leaves the baby with the stranger. After a few minutes, the caregiver returns to comfort their child.

Based on how the infants/toddlers responded to the separation and reunion, Ainsworth identified three types of parent-child attachments: secure, avoidant, and resistant (Ainsworth & Bell, 1970). A fourth style, known as disorganized attachment, was later described (Main & Solomon, 1990). The most common type of attachment is called secure attachment (Figure LD.12). In this type of attachment, the toddler prefers their parent over a stranger. The attachment figure is used as a secure base to explore the environment and is sought out in times of stress. Securely attached children were distressed when their caregivers left the room in the Strange Situation experiment, but when their caregivers returned, the securely attached children were happy to see them. Securely attached children have caregivers who are sensitive and responsive to their needs.

Figure LD.12 In secure attachment, the parent provides a secure base for the toddler, allowing them to securely explore his environment. (credit: Kerry Ceszyk)

With avoidant attachment, the child is unresponsive to the parent, does not use the parent as a secure base, and does not appear to care if the parent leaves. The toddler reacts to the parent the same way they react to a stranger. When the parent does return, the child is slow to show a positive reaction. Ainsworth theorized that these children were most likely to have a caregiver who was inattentive to their needs (Ainsworth, Blehar, Waters, & Wall, 1978).

In cases of resistant attachment, children tend to show clingy behaviour, but then they reject the attachment figure's

attempts to interact with them (Ainsworth & Bell, 1970). These children do not explore the toys in the room, as they are too fearful. During separation in the Strange Situation, they became extremely disturbed and angry with the parent. When the parent returns, the children are difficult to comfort. Resistant attachment is the result of the caregivers' inconsistent level of response to their child.

Finally, children with disorganized attachment behaved oddly in the Strange Situation. They freeze, run around the room in an erratic manner, or try to run away when the caregiver returns (Main & Solomon, 1990). This type of attachment is seen most often in kids who have been abused. Research has shown that abuse disrupts a child's ability to regulate their emotions.

While Ainsworth's research has found support in subsequent studies, it has also met criticism. Some researchers have pointed out that a child's temperament may have a strong influence on attachment (Gervai, 2009; Harris, 2009), and others have noted that attachment varies from culture to culture, a factor not accounted for in Ainsworth's research (Rothbaum, Weisz, Pott, Miyake, & Morelli, 2000; van Ijzendoorn & Sagi-Schwartz, 2008).

Link to Learning

Watch this video that explains and shows the process involved with the strange situation test, originally developed by Ainsworth.

Self-Concept

Just as attachment is the main psychosocial milestone of infancy, the primary psychosocial milestone of childhood is the development of a positive sense of self. How does self-awareness develop? If you place a baby in front of a mirror, they will reach out to touch their image, thinking it is another baby. However, by about 18 months a toddler will recognize that the person in the mirror is them. How do we know this? In a well-known experiment, a researcher placed a red dot of paint on children's noses before putting them in front of a mirror (Amsterdam, 1972). Commonly known as the mirror test, this behaviour is demonstrated by humans and a few other species and is considered evidence of self-recognition (Archer, 1992). At 18 months old they would touch their own noses

when they saw the paint, surprised to see a spot on their faces. By 24–36 months old children can name and/or point to themselves in pictures, clearly indicating self-recognition.

Children from 2–4 years old display a great increase in social behaviour once they have established a self-concept. They enjoy playing with other children, but they have difficulty sharing their possessions. Also, through play children explore and come to explore gender roles (Chick, Heilman-Houser, & Hunter, 2002). By 4 years old, children can cooperate with other children, share when asked, and separate from parents with little anxiety. Children at this age also exhibit autonomy, initiate tasks, and carry out plans. Success in these areas contributes to a positive sense of self. Once children reach 6 years old, they can identify themselves in terms of group memberships: "I'm a first grader!" School-age children compare themselves to their peers and discover that they are competent in some areas and less so in others (recall Erikson's task of industry versus inferiority). At this age, children recognize their own personality traits as well as some other traits they would like to have. For example, 10-year-old Alix says, "I'm kind of shy. I wish I could be more talkative like my friend Ro."

Development of a positive self-concept is important to healthy development. Children with a positive self-concept tend to be more confident, do better in school, act more independently, and are more willing to try new activities (Maccoby, 1980; Ferrer & Fugate, 2003). Formation of a

positive self-concept begins in Erikson's toddlerhood stage, when children establish autonomy and become confident in their abilities. Development of self-concept continues in elementary school, when children compare themselves to others. When the comparison is favourable, children feel a sense of competence and are motivated to work harder and accomplish more. Self-concept is re-evaluated in Erikson's adolescence stage, as teens form an identity. They internalize the messages they have received regarding their strengths and weaknesses, keeping some messages and rejecting others. Adolescents who have achieved identity formation are capable of contributing positively to society (Erikson, 1968).

One behavioural aspect that contributes to children's developing sense of self-identity is play. Children spend a significant portion of their day playing, pre-schoolers often spending most of the day engaged in some sort of play activity (Malloy, 2020). Play is an important aspect of social and cognitive development as it makes social learning something children desire to engage in. Play also provides the space for children to begin practicing social skills such as humour, which has been found to have influence on peer acceptance and perceived social competence. It has even been argued that play is an essential element in the acquisition of language and concept meaning. Given this, it seems reasonable to assume that the interest children take in play and developmental concepts like self-concept, motivation, learning and security in relationships (Lillemyr et al., 2010).

Children develop a personal sense of play style at as young as the second year to life. It's at this stage we see children start to make choices of individuation, such as toy preference. Toy preference is one of the earliest places we begin to see children develop a sense of gender identity, one study showed gender-based toy preferences at as young as 12-months old (Servin, Bohlin, and Berlin, 1999). One might expect that children would show a preferential bias towards toys assigned to the same sex-category as the biological sex of the child, with AFAB children showing a higher preference for "girls' toys" and AMAB children showing a higher preference for "boys' toys". However, the full story is more complex. Parents and authority figures begin instilling children with gender norms based on their own cultural expectations of gender from the moment the child is born. (van de Beek et al., 2006). Because of this, it is possible that children's expressions of self may be influenced by the expectation that there is a correct way for them to perform self-hood. It also worth keeping in mind that many studies looking at expressions of gender mistakenly use a circular definition in the construction of their categories. A circular definition is a definition that uses one or more of the terms being defined as part of its definition. For instance, it would be circular to claim that violent video game cause teenagers to be violent because violent teenagers play violent video games.

Take for instance a study which attempted to measure the rate at which infants preferred toys assigned to the same gender

category assigned to the infant (Alexander et al, 2009). To do this, they tracked rates at which infants visually fixated on one of two toys; a doll (the "girls' toy") or a truck (the "boys' toy") and compared the amount of time AFAB and AMAB children spent fixated on each toy. The published study claims to have found notable discrepancies in gender-based toy preference. However, there are two major issues. First, the study uses a circular definition in constructing its toy categories. The researchers designated the doll a "girls' toy" as it was the toy preferred by girls based on the presumption that girls prefer them. The second problem with this study is that their results do not support their claim. Based on average visual fixating on each object, AFAB infants preferred the doll to the truck. AFAB infants spent approximately the same amount of time fixated on the truck as AMAB infants, and AMAB infants actually spent slightly longer looking at the doll than the truck (though this difference was quite small). This underscores the importance of critically evaluating published scientific studies to so as to not mistakenly believe false or misinterpreted conclusions.

So, what can we conclude about children's early toy preferences and play style? Generally, there are two perspectives on childhood development, one based in the social environment of the child, and one based more in biology. The social environment perspective posits that children's preferences are influenced by parents and authority figures (such as teachers) who can reinforce or discourage a

child's preferences. The biological perspective claims that children's preferences are influenced by gonadal hormones, like testosterone (Servin, Bohlin, and Berlin, 1999), which is associated with preference for stereotypically masculine toys and physically active "rough and tumble" play (van de Beek et al., 2006). Both the social environment and the presence of hormones are associated with children's toy preferences, play-style, and self-concept (Servin, Bohlin, and Berlin, 1999; Chick et al, 2002).

What do you think?

The Importance of Play and Recess

According to the American Academy of Pediatrics (2007), unstructured play is an integral part of a child's development. It builds creativity, problem solving skills, and social relationships. Play also allows children to develop a theory-of-mind as they imaginatively take on the perspective of others.

Outdoor play allows children the opportunity to directly experience and sense the world around

them. While doing so, they may collect objects that they come across and develop lifelong interests and hobbies. They also benefit from increased exercise and engaging in outdoor play can actually increase how much they enjoy physical activity. This helps support the development of a healthy heart and brain. Research suggests that today's children are engaging in less and less outdoor play (Clements, 2004). While it is true that easier access to calorie-dense food has led to an increase in levels of childhood obesity, this alone does not explain the decrease in physical activity. There are actually a number of factors that may contribute to this decrease in physical activity. Easier access to calorie-dense foods have contributed to increased levels of childhood obesity. It has also become more difficult for children to both access the space required for physical activity and feel safe doing so. Due to parental concerns about things like road safety and stranger danger, children these days have low levels of independent mobility (ie. freedom to travel outdoors without adult supervision). This means that children frequently lack the opportunity to play outdoors. Additionally, factors such as playground overcrowding and the presence of teenagers/older children has been shown to

decrease physical activity in children. Play spaces designed to encourage structured activities like team sports may not appeal to all children, many of whom are shown to be more physically active when engaged in activities like creating things or using their imaginations. It has also been shown that children who cross perceived gender norms are likely to be the targets of bullying and/or disapproval from their peers and elders. Due to the gender stereotypes associated with different forms of physical activity, it seems likely that some children may choose to not engage in a physical activity to avoid harassment (inversely, some may choose to participate in an activity solely to avoid the same harassment) (Reimers et al., 2018).

Despite the adverse consequences associated with reduced play, some children are over scheduled and have little free time to engage in unstructured play. In addition, some schools have taken away recess time for children in a push for students to do better on standardized tests, and many schools commonly use loss of recess as a form of punishment. Do you agree with these practices? Why or why not?

Adolescence

Adolescence is a socially constructed concept. In pre-industrial society, children were considered adults when they reached physical maturity, but today we have an extended time between childhood and adulthood called adolescence. Adolescence is the period of development that begins at puberty and ends at emerging adulthood, which is discussed later. In the United States, adolescence is seen as a time to develop independence from parents while remaining connected to them (Figure LD.13). The typical age range of adolescence is from 12 to 18 years, and this stage of development also has some predictable physical, cognitive, and psychosocial milestones.

Figure LD.13 Peers are a primary influence on our development in adolescence. (credit: "manseok_Pixabay"/ Pixabay)

Physical Development

As noted above, adolescence begins with puberty. While the sequence of physical changes in puberty is predictable, the onset and pace of puberty vary widely. Several physical changes occur during puberty, such as adrenarche and gonadarche, the maturing of the adrenal glands and sex glands, respectively. Also during this time, primary and secondary sexual characteristics develop and mature. Primary sexual characteristics are organs specifically needed for reproduction, like the uterus, ovaries, and testes. Secondary sexual characteristics are physical signs of sexual maturation that do not directly involve sex organs, such as development of breasts and hips, development of facial hair and a deepened voice. Around half of children will experience menarche, the beginning of menstrual periods,

usually around 12–13 years old. The other half will experience spermarche, the first ejaculation, around 13–14 years old. Sexual development is triggered by an increase in secretion of hormones either from the ovaries or the testes. During puberty, most people experience a rapid increase in height (i.e., growth spurt). For those going through an estrogen-dominated puberty, this begins between 8 and 13 years old, with adult height reached between 10 and 16 years old. Those going through a testosterone-dominated puberty begin their growth spurt slightly later, usually between 10 and 16 years old, and reach their adult height between 13 and 17 years old. Both nature (i.e., genes) and nurture (e.g., nutrition, medications, and medical conditions) can influence height.

Because rates of physical development vary so widely among teenagers, puberty can be a source of pride or embarrassment. Early maturing males tend to be stronger, taller, and more athletic than their later maturing peers. They are usually more popular, confident, and independent, but they are also at a greater risk for substance abuse and early sexual activity (Flannery, Rowe, & Gulley, 1993; Kaltiala-Heino, Rimpela, Rissanen, & Rantanen, 2001). Early maturing females may be teased or overtly admired, which can cause them to feel self-conscious about their developing bodies. These females are at a higher risk for depression, substance abuse, and eating disorders (Ge, Conger, & Elder, 2001; Graber, Lewinsohn,

Seeley, & Brooks-Gunn, 1997; Striegel-Moore & Cachelin, 1999). Late blooming males and females (i.e., they develop more slowly than their peers) may feel self-conscious about their lack of physical development. Negative feelings are particularly a problem for late maturing males, who are at a higher risk for depression and conflict with parents (Graber et al., 1997) and more likely to be bullied (Pollack & Shuster, 2000).

The adolescent brain also remains under development. Up until puberty, brain cells continue to bloom in the frontal region. Adolescents engage in increased risk-taking behaviours and emotional outbursts possibly because the frontal lobes of their brains are still developing (Figure LD.14). Recall that this area is responsible for judgment, impulse control, and planning, and it is still maturing into early adulthood (Casey, Tottenham, Liston, & Durston, 2005).

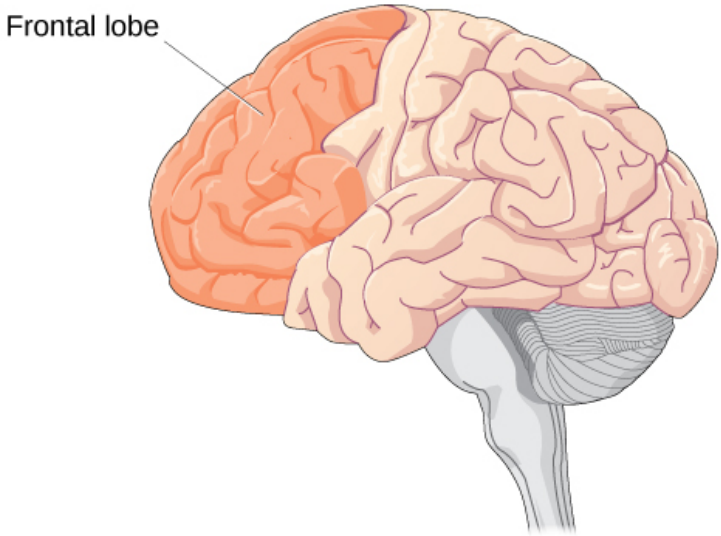


Figure LD.14 Brain growth continues into the early 20s. The development of the frontal lobe, in particular, is important during this stage.

TRICKY TOPIC: MYELINATION OF THE PREFRONTAL CORTEX

One or more interactive elements has been excluded from this version of the text. You can view them online here: https://caul-

cbua.pressbooks.pub/intropsychneuro/?p=485#oembed-2

If the video above does not load, click here: https://youtu.be/DHljv1t2_uk
For a full transcript of this video, click here

Cognitive Development

More complex thinking abilities emerge during adolescence. Some researchers suggest this is due to increases in processing speed and efficiency rather than as the result of an increase in mental capacity—in other words, due to improvements in existing skills rather than development of new ones (Bjorkland, 1987; Case, 1985). During adolescence, teenagers move beyond concrete thinking and become capable of abstract thought. Recall that Piaget refers to this stage as formal operational thought. Teen thinking is also characterized by the ability to consider multiple points of view, imagine hypothetical situations, debate ideas and opinions (e.g., politics, religion, and justice), and form new ideas (Figure LD.15). In addition, it's not uncommon for adolescents to question authority or challenge established societal norms.

Cognitive empathy, also known as theory-of-mind (which we discussed earlier with regard to egocentrism), relates to the

ability to take the perspective of others and feel concern for others (Shamay-Tsoory, Tomer, & Aharon-Peretz, 2005). Cognitive empathy begins to increase in adolescence and is an important component of social problem solving and conflict avoidance.

Figure LD.15 Teenage thinking is characterized by the ability to reason logically and solve hypothetical problems such as how to design, plan, and build a structure. (credit: U.S. Army RDECOM)

Psychosocial Development

Adolescents continue to refine their sense of self as they relate to others. Erikson referred to the task of the adolescent as one of identity versus role confusion. Thus, in Erikson's view, an adolescent's main questions are "Who am I?" and "Who do I want to be?" Some adolescents adopt the values and roles that their parents expect for them. Other teens develop identities

that are in opposition to their parents but align with a peer group. This is common as peer relationships become a central focus in adolescents' lives.As adolescents work to form their identities, they pull away from their parents, and the peer group becomes very important (Shanahan, McHale, Osgood, & Crouter, 2007). Despite spending less time with their parents, most teens report positive feelings toward them (Moore, Guzman, Hair, Lippman, & Garrett, 2004). Warm and healthy parent-child relationships have been associated with positive child outcomes, such as better grades and fewer school behaviour problems, in the United States as well as in other countries (Hair et al., 2005).It appears that most teens don't experience adolescent storm and stress to the degree once famously suggested by G. Stanley Hall, a pioneer in the study of adolescent development. Only small numbers of teens have major conflicts with their parents (Steinberg & Morris, 2001), and most disagreements are minor. For example, in a study of over 1,800 parents of adolescents from various cultural and ethnic groups, Barber (1994) found that conflicts occurred over day-to-day issues such as homework, money, curfews, clothing, chores, and friends. These types of arguments tend to decrease as teens develop (Galambos & Almeida, 1992). There is emerging research on the adolescent brain. Galvan, Hare, Voss, Glover and Casey (2007) examined its role in risk-taking behaviour. They used fMRI to assess the readings' relationship to risk-taking, risk perception, and impulsivity. The researchers found that there was no

correlation between brain activity in the neural reward centre and impulsivity and risk perception. However, activity in that part of the brain was correlated to risk taking. In other words, risk-taking adolescents experienced brain activity in the reward centre. The idea that adolescents, however, are but more impulsive than other demographics was challenged in their research, which included children and adults.

Dig Deeper

Developmental Trajectories: The Impact of the Indian Residential School System

Childhood and adolescence are life stages pivotal to someone's developmental maturation (Cabral & Patel, 2020; Cassidy & Shaver, 2018; White et al., 2017). Experiences such as adversity, loss, trauma, and/or maltreatment have been linked to feelings of anxiety and depression (Hovens et al., 2015; Jurena et al., 2020) as well as issues with attachment in older adult relationships (Cohen et al., 2012; Lo et al.,

2017), issues in development (Sege et al., 2017), and other health problems (Asselmann et al., 2018; Nelson et al., 2020; Rojo-Wissar et al., 2021).

Since confederation (1867), the Canadian federal government has continued to forcefully attempt total assimilation of Indigenous peoples into "Euro-Canadian culture and society" (Truth and Reconciliation Commission [TRC], 2015). One of the ways in which the government has attempted to do this was through the Indian Residential School (IRS) system (TRC, 2015). The IRS system in Canada has often been referred to as a series of concentration camps (TRC, 2015) or "boarding schools"used to house Indigenous children. Unlawful and immoral acts perpetuated in the IRSs have been termed "cultural genocide" at the international level (TRC, 2015; United Nations Declaration on the Rights of Indigenous Peoples [UNDRIP], 2007).

Impact on Attachment

From 1876 until the last school closed in 1996, the Canadian federal government physically forced hundreds of thousands of Indigenous children (as young as 4-years-old from their homes and communities, into IRSs (TRC, 2015). Indigenous

parents, caregivers and/or family members who showed verbal or physical restraint relative to the police-enforced taking of Indigenous children to IRSs, were often jailed or shot and killed (Bombay et al., 2014ab; Facing History and Ourselves, 2021; TRC, 2015). Once Indigenous children arrived at the schools, many children were stripped, shaved, and had their skin dyed lighter by IRS staff (Smith, n.d.; TRC, 2015). Students were then assigned numbers (used by staff in place of birth names), were separated from their siblings, and told that if they spoke their Indigenous language (the only language most children knew), there would be severe consequences (TRC, 2015). While it is expected that temporary separations from loved ones (e.g., parents) under tense conditions increased the risk of health issues later in life (Räikkönen et al., 2011), extended separations under tense conditions are expected to have increased Survivor risk of depressive symptoms and/or disorders (Bohman et al., 2017; Coffino, 2009) and anxiety symptoms and/or disorders (Bryant et al., 2017; Lähdepuro et al., 2019).

Intergenerational Impacts

Federal, institutional and academic inquiries into the IRS system continue to highlight various atrocities experienced by many IRS Survivors such as spiritual, verbal, emotional, physical and sexual assault, abuse and violence (TRC, 2015). Trauma of this magnitude continues to impact not only the Survivors, but their children, grandchildren, and other relatives (Bombay et al., 2014ab). This phenomenon, known as **intergenerational trauma**, has direct and indirect impacts on various generations of Indigenous populations (Bombay et al., 2014ab; Lehrner & Yehuda, 2018). For example, Indigenous children of IRS Survivors are more likely to have poor psychological health because of the IRS impacts on their parents' psychosocial functioning and health (Bombay et al., 2011; 2014ab; 2018; Elias et al., 2012; Kaspar, 2014).

Biopsychosocial Framework

In general, a Biopsychosocial Framework has been characterised by the ways biological, psychological, and social factors can affect an individual and helps health practitioners conceptualize manifestation of

particular physical or mental health issues (Karunamuni et al., 2020). With this framework, it is not hard to understand that while many IRSs delivered/had poor curriculum, instruction, staffing, and high levels of racism (Barnes & Josefowitz, 2019; TRC, 2015), many Survivors were academically ill-equipped (e.g., lacked adequate language proficiency; Barnes et al., 2006) and oftentimes extremely poorly prepared for adult employment (Miller, 1996; TRC, 2015). It is expected that the cumulative trauma experienced at the IRSs lead to many Survivors struggling with psychosocial well-being/regulation, connection with other Indigenous socio cultural customs, practices and peoples, and physical and mental health difficulties (Barnes et al., 2019; Ogle et al., 2013; Miller, 1996; TRC, 2015; Vachon et al., 2015).

Cumulative Risk

Cumulative risk can be understood as the number and severity of adversities (e.g., low SES, addict parent or caregiver) experienced in childhood, wherein a greater number and severity of adversities often “adds” to a greater risk of an individual to experience later physical and mental

health issues (Boles, 2021; Kwong & Hayes, 2017; Felitti & Anda, 2009; Felitti et al., 1998). Putting this research into context, IRS Survivors who underwent separation from parents, and experienced abuse, racism, and forced immersion in a hostile non-Indigenous culture, were all factors that had a cumulative impact and amplified adverse effects of their adverse experiences at IRS (McQuaid et al., 2017; Richmond et al., 2009). As many Indigenous peoples were directly or indirectly affected by IRSs and colonization, in combination with deficient health resources/geographical isolation, and other ongoing inequities, it is not surprising that many health inequities faced by Indigenous peoples documented 20 years ago, are still faced today (Gracey & King, 2009; RCAP, 1996; TRC, 2015).

Cultural Resilience

While Indigenous peoples in Canada continue to face premeditated colonial assimilation tactics, such as the child welfare crisis or "modern day IRS system" (Ma et al., 2019; McMillan, 2021; Mitchell, 2019), resilience among Indigenous populations in Canada continues to be researched (Bombay et al., 2010; 2011; Paul et al., 2022). To date, various facets of

cultural identity among Indigenous populations in Canada have shown to be protective of the negative effects of colonization, such as cultural community belonging (Bombay et al., 2014ab; First Nations Health Authority, 2019; Paul et al., 2022). While Indigenous culture has been suggested to be protective and stabilize and/or heighten various aspects of health and wellbeing (e.g., Paul et al., 2022), continued research is needed to better understand how these cultural facets can be implemented in culturally-appropriate care models for Indigenous populations.

Link to Learning

Watch as Chief Robert Joseph recalls his experience at an Indian Residential School and learn about the importance of Truth and Reconciliation.

83.

KEY TERMS FOR LIFESPAN DEVELOPMENT

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accommodation

adjustment of a schema by changing a scheme to accommodate new information different from what was already known

adolescence

period of development that begins at puberty and ends at early adulthood

adrenarche

maturing of the adrenal glands

advance directive

a written legal document that details specific interventions a person wants (see living will)

assimilation

adjustment of a schema by adding information similar to what is already known

attachment

long-standing connection or bond with others

authoritarian parenting style

parents place a high value on conformity and obedience, are often rigid, and express little warmth to the child

authoritative parenting style

parents give children reasonable demands and consistent limits, express warmth and affection, and listen to the child's point of view

avoidant attachment

characterized by child's unresponsiveness to parent, does not use the parent as a secure base, and does not care if parent leaves

cephalocaudal development

pattern of growth from the head down; also referred to as development from head to toe

cognitive development

domain of lifespan development that examines learning, attention, memory, language, thinking, reasoning, and creativity

cognitive empathy

ability to take the perspective of others and to feel concern for others

conception

when a sperm fertilizes an egg and forms a zygote

concrete operational stage

third stage in Piaget's theory of cognitive development; from about 7 to 11 years old, children can think logically

about real (concrete) events

conservation

idea that even if you change the appearance of something, it is still equal in size, volume, or number as long as nothing is added or removed

continuous development

view that development is a cumulative process: gradually improving on existing skills

critical (sensitive) period

time during fetal growth when specific parts or organs develop

developmental milestone

approximate ages at which children reach specific normative events

discontinuous development

view that development takes place in unique stages, which happen at specific times or ages

disorganized attachment

characterized by the child's odd behaviour when faced with the parent; type of attachment seen most often with kids that are abused

do not resuscitate (DNR)

a legal document stating that if a person stops breathing their heart stops, medical personnel such as doctors and nurses are not to take steps to revive or resuscitate the patient

egocentrism

preoperational child's difficulty in taking the perspective of others

embryo

multi-cellular organism in its early stages of development

emerging adulthood

newly defined period of lifespan development from 18 years old to the mid-20s; young people are taking longer to complete college, get a job, get married, and start a family

fine motor skills

use of muscles in fingers, toes, and eyes to coordinate small actions

formal operational stage

final stage in Piaget's theory of cognitive development; from age 11 and up, children are able to deal with abstract ideas and hypothetical situations

gonadarche

maturing of the sex glands

gross motor skills

use of large muscle groups to control arms and legs for large body movements

health care proxy

a legal document that appoints a specific person to make medical decisions for a patient if they are unable to speak for themselves

hospice

service that provides a death with dignity; pain management in a humane and comfortable environment; usually outside of a hospital setting

intergenerational trauma

trauma that is so significant, it impacts not only the Survivors, but subsequent generations (e.g., children and grandchildren)

living will

a written legal document that details specific interventions a person wants; may include health care proxy

menarche

beginning of menstrual period; around 12–13 years old

mitosis

process of cell division

motor skills

ability to move our body and manipulate objects

nature

genes and biology

newborn reflexes

inborn automatic response to a particular form of stimulation that all healthy babies are born with

normative approach

study of development using norms, or average ages, when most children reach specific developmental milestones

nurture

environment and culture

object permanence

idea that even if something is out of sight, it still exists

permissive parenting style

parents make few demands and rarely use punishment

physical development

domain of lifespan development that examines growth and changes in the body and brain, the senses, motor skills, and health and wellness

placenta

structure connected to the uterus that provides nourishment and oxygen to the developing baby

prenatal care

medical care during pregnancy that monitors the health of both the mother and the fetus

preoperational stage

second stage in Piaget's theory of cognitive development; from ages 2 to 7, children learn to use symbols and language but do not understand mental operations and often think illogically

primary sexual characteristics

organs specifically needed for reproduction

proximodistal development

tendency for growth to start in the centre of the body and move outwards to the extremities

psychosexual development

process proposed by Freud in which pleasure-seeking urges focus on different erogenous zones of the body as humans move through five stages of life

psychosocial development

domain of lifespan development that examines emotions, personality, and social relationships

psychosocial development

process proposed by Erikson in which social tasks are mastered as humans move through eight stages of life from infancy to adulthood

resistant attachment

characterized by the child's tendency to show clingy behaviour and rejection of the parent when the parent attempts to interact with the child

reversibility

principle that objects can be changed, but then returned back to their original form or condition

schema

(plural = schemata) concept (mental model) that is used to help us categorize and interpret information

secondary sexual characteristics

physical signs of sexual maturation that do not directly involve sex organs

secure attachment

characterized by the child using the parent as a secure base from which to explore

secure base

parental presence that gives the infant/toddler a sense of safety as they explores their surroundings

sensorimotor stage

first stage in Piaget's theory of cognitive development; from birth through age 2, a child learns about the world through senses and motor behaviour

socioemotional selectivity theory

social support/friendships dwindle in number, but remain as close, if not more close than in earlier years

spermarche

first penile ejaculation

stage of moral reasoning

process proposed by Kohlberg; humans move through three stages of moral development

temperament

innate traits that influence how one thinks, behaves, and reacts with the environment

teratogen

biological, chemical, or physical environmental agent that causes damage to the developing embryo or fetus

uninvolved parenting style

parents are indifferent, uninvolved, and sometimes referred to as neglectful; they don't respond to the child's needs and make relatively few demands

zygote

structure created when a sperm and egg merge at

conception; begins as a single cell and rapidly divides to form the embryo and placenta

84.

SUMMARY OF LIFESPAN DEVELOPMENT

LD.1 What Is Lifespan Development?

Lifespan development explores how we change and grow from conception to death. This field of psychology is studied by developmental psychologists. They view development as a lifelong process that can be studied scientifically across three developmental domains: physical, cognitive development, and psychosocial. There are several theories of development that focus on the following issues: whether development is continuous or discontinuous, whether development follows one course or many, and the relative influence of nature versus nurture on development.

LD.2 Lifespan Theories

There are many theories regarding how babies and children grow and develop into happy, healthy adults. Sigmund Freud suggested that we pass through a series of psychosexual stages in which our energy is focused on certain erogenous zones on

the body. Eric Erikson modified Freud's ideas and suggested a theory of psychosocial development. Erikson said that our social interactions and successful completion of social tasks shape our sense of self. Jean Piaget proposed a theory of cognitive development that explains how children think and reason as they move through various stages. Finally, Lawrence Kohlberg turned his attention to moral development. He said that we pass through three levels of moral thinking that build on our cognitive development.

LD.3 Stages of Development

At conception the egg and sperm cell are united to form a zygote, which will begin to divide rapidly. This marks the beginning of the first stage of prenatal development (germinal stage), which lasts about two weeks. Then the zygote implants itself into the lining of the woman's uterus, marking the beginning of the second stage of prenatal development (embryonic stage), which lasts about six weeks. The embryo begins to develop body and organ structures, and the neural tube forms, which will later become the brain and spinal cord. The third phase of prenatal development (fetal stage) begins at 9 weeks and lasts until birth. The body, brain, and organs grow rapidly during this stage. During all stages of pregnancy it is important that the mother receive prenatal care to reduce health risks to herself and to her developing baby.

Newborn infants weigh about 7.5 pounds. Doctors assess

a newborn's reflexes, such as the sucking, rooting, and Moro reflexes. Our physical, cognitive, and psychosocial skills grow and change as we move through developmental stages from infancy through late adulthood. Attachment in infancy is a critical component of healthy development. Parenting styles have been found to have an effect on childhood outcomes of well-being. The transition from adolescence to adulthood can be challenging due to the timing of puberty, and due to the extended amount of time spent in emerging adulthood. Although physical decline begins in middle adulthood, cognitive decline does not begin until later. Activities that keep the body and mind active can help maintain good physical and cognitive health as we age. Social supports through family and friends remain important as we age.

85.

REVIEW QUESTIONS FOR LIFESPAN DEVELOPMENT

Click here for Answer Key

Multiple Choice Questions

1. The view that development is a cumulative process, gradually adding to the same type of skills is known as _____.

a. nature
b. nurture
c. continuous development
d. discontinuous development

2. Developmental psychologists study human growth and development across three domains. Which of the following is *not* one of these domains?

a. cognitive
b. psychological

c. physical
d. psychosocial

3. How is lifespan development defined?

a. The study of how we grow and change from conception to death.
b. The study of how we grow and change in infancy and childhood.
c. The study of physical, cognitive, and psychosocial growth in children.
d. The study of emotions, personality, and social relationships.

4. The idea that even if something is out of sight, it still exists is called _____.

a. egocentrism
b. object permanence
c. conservation
d. reversibility

5. Which theorist proposed that moral thinking proceeds through a series of stages?

a. Sigmund Freud
b. Erik Erikson

c. John Watson
d. Lawrence Kohlberg

6. According to Erikson's theory of psychosocial development, what is the main task of the adolescent?

a. developing autonomy
b. feeling competent
c. forming an identity
d. forming intimate relationships

7. Which of the following is the correct order of prenatal development?

a. zygote, fetus, embryo
b. fetus, embryo zygote
c. fetus, zygote, embryo
d. zygote, embryo, fetus

8. The time during fetal growth when specific parts or organs develop is known as _____.

a. critical period
b. mitosis
c. conception
d. pregnancy

9. What begins as a single-cell structure that is created when a sperm and egg merge at conception?

a. embryo
b. fetus
c. zygote
d. infant

10. Using scissors to cut out paper shapes is an example of _____.

a. gross motor skills
b. fine motor skills
c. large motor skills
d. small motor skills

11. The child uses the parent as a base from which to explore their world in which attachment style?

a. secure
b. insecure avoidant
c. insecure ambivalent-resistant
d. disorganized

12. The frontal lobes become fully developed _____.

a. at birth
b. at the beginning of adolescence

c. at the end of adolescence
d. by 25 years old

13. Who created the very first modern hospice?

a. Elizabeth Kübler-Ross
b. Cicely Saunders
c. Florence Wald
d. Florence Nightingale

14. Which of the following is the order of stages in Kübler-Ross's five-stage model of grief?

a. denial, bargaining, anger, depression, acceptance
b. anger, depression, bargaining, acceptance, denial
c. denial, anger, bargaining, depression, acceptance
d. anger, acceptance, denial, depression, bargaining

Critical Thinking Questions

15. Describe the nature versus nurture controversy, and give an example of a trait and how it might be influenced by each?

16. Compare and contrast continuous and discontinuous development.

17. Why should developmental milestones only be used as a general guideline for normal child development?

18. What is the difference between assimilation and accommodation? Provide examples of each.

19. Why was Carol Gilligan critical of Kohlberg's theory of moral development?

20. What is egocentrism? Provide an original example.

21. What are some known teratogens, and what kind of damage can they do to the developing fetus?

22. What is prenatal care and why is it important?

23. Describe what happens in the embryonic stage of development. Describe what happens in the fetal stage of development.

24. What makes a personal quality part of someone's personality?

25. Describe some of the newborn reflexes. How might they promote survival?

26. Compare and contrast the four parenting styles and describe the kinds of childhood outcomes we can expect with each.

27. What is emerging adulthood and what are some factors that have contributed to this new stage of development?

28. Describe the five stages of grief and provide examples of how a person might react in each stage.

29. What is the purpose of hospice care?

Personal Application Questions

30. How are you different today from the person you were at 6 years old? What about at 16 years old? How are you the same as the person you were at those ages?

31. Your 3-year-old child is not yet potty trained. Based on what you know about the normative approach, should you be concerned? Why or why not?

32. Explain how you would use your understanding of one of the major developmental theories to deal with each of the difficulties listed below:

A. Your infant puts everything in their mouth, including the dog's food.
B. Your eight-year-old child is failing math; all they care about is baseball.
C. Your two-year-old child refuses to wear the clothes you pick for them every morning, which makes getting dressed a twenty-minute battle.
D. Your sixty-eight-year-old neighbour is chronically depressed and feels they have wasted their life.
E. Your 18-year-old child has decided not to go to college.

Instead they're moving to Colorado to become a ski instructor.

F. Your 11-year-old child is the class bully.

33. Which parenting style describes how you were raised? Provide an example or two to support your answer.

34. Would you describe your experience of puberty as one of pride or embarrassment? Why?

35. Your best friend is a smoker who just found out they are pregnant. What would you tell them about smoking and pregnancy?

36. Imagine you are a nurse working at a clinic that provides prenatal care for expecting parents. Your patient has heard that it's a good idea to play music for their unborn baby, and they wants to know when their baby's hearing will develop. What will you tell them?

37. Have you ever had to cope with the loss of a loved one? If so, what concepts described in this section provide context that may help you understand your experience and process of grieving?

38. If you were diagnosed with a terminal illness would you choose hospice care or a traditional death in a hospital? Why?

86.

ACKNOWLEDGEMENTS & ATTRIBUTIONS

Lifespan Theories

Jack Williams helped to re-write this section, updating the content on Moral Theories of Development; de-emphasizing Kohler's work and adding new content on measuring moral behaviour.

Stages of Development

Jack Williams wrote, and **Max Dysart** helped to edit, a new section on reproductive development and sex assignment, intersex conditions, prenatal influences, and research on play in AMAB and AFAB children. Jack also wrote a new Dig Deeper on Understanding Gender.

Jocelyn Paul wrote (Max Dysart edit) a new Dig Deeper, entitled 'Developmental Trajectories: The Impact of the Indian Residential School System' explaining the impacts of residential schools on attachment, biopsychosocial

development, and culture and the concept of intergenerational trauma.

In May 2022, Drs **Erin Mazerolle**, **Erin Austen**, and **Jesse Husk** (StFX University; with funding from Atlantic OER) organized an 'OER Sprint Hackathon' event in which students from across the Atlantic provinces reviewed portions of this textbook with Equity, Diversity, Inclusivity, and Accessibility in mind. Students provided comments, suggestions, concerns, and recommendations about ways to improve content. We'd like to specifically acknowledge the following students who contributed feedback for the Stages of Development section:

- Brooke Tracy
- Jack Weatherbey
- Sarah MacIsaac
- Sophie Landry
- Tessa Cosman

CHAPTER X
EMOTION & MOTIVATION

87.

INTRODUCTION TO MOTIVATION & EMOTION

Chapter Outline

- Motivation
- Hunger and Eating
- Sexual Behaviour
- Emotion

Figure EM.1 A mother and child enjoy a meal together. (credit: Flikr user Yousuf Tushar)

What makes us behave as we do? What drives us to eat? What drives us toward sex? Is there a biological basis to explain the feelings we experience? How universal are emotions?

In this chapter, we will explore issues relating to both motivation and emotion. We will begin with a discussion of several theories that have been proposed to explain motivation and why we engage in a given behaviour. You will learn about the physiological needs that drive some human behaviours, as well as the importance of our social experiences in influencing our actions.

Next, we will consider both eating and having sex as examples of motivated behaviours. What are the physiological mechanisms of hunger and satiety? What understanding do

scientists have of why obesity occurs, and what treatments exist for obesity and eating disorders? How has research into human sex and sexuality evolved over the past century? How do psychologists understand and study the human experience of sexual orientation and gender identity? These questions—and more—will be explored.

This chapter will close with a discussion of emotion. You will learn about several theories that have been proposed to explain how emotion occurs, the biological underpinnings of emotion, and the universality of emotions.

88.

MOTIVATION

Learning Objectives

By the end of this section, you will be able to:

- Define intrinsic and extrinsic motivation
- Understand that instincts, drive reduction, self-efficacy, and social motives have all been proposed as theories of motivation
- Explain the basic concepts associated with models of needs

Why do we do the things we do? What motivations underlie our behaviours? **Motivation** describes the wants or needs that direct behaviour toward a goal. In addition to biological motives, motivations can be **intrinsic** (arising from internal

factors) or **extrinsic** (arising from external factors) (Figure EM.2). Intrinsically motivated behaviours are performed because of the sense of personal satisfaction that they bring, while extrinsically motivated behaviours are performed in order to receive something from others.

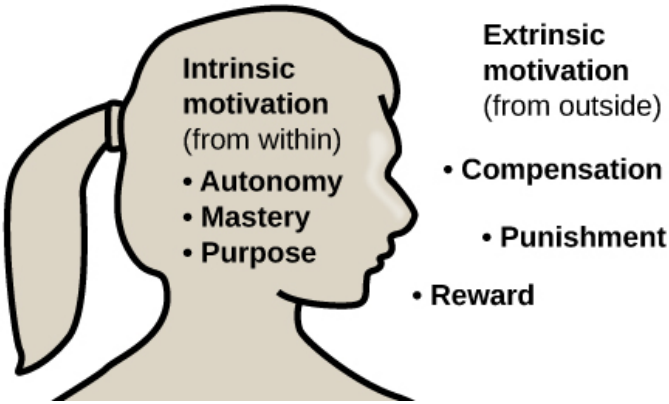


Figure EM.2 Intrinsic motivation comes from within the individual, while extrinsic motivation comes from outside the individual.

Think about why you are currently in college. Are you here because you enjoy learning and want to pursue an education to make yourself a more well-rounded individual? If so, then you are intrinsically motivated. However, if you are here because you want to get a college degree to make yourself more marketable for a high-paying career or to satisfy the demands of your parents, then your motivation is more extrinsic in nature.

In reality, our motivations are often a mix of both intrinsic

and extrinsic factors, but the nature of the mix of these factors might change over time (often in ways that seem counter-intuitive). There is an old adage: "Choose a job that you love, and you will never have to work a day in your life," meaning that if you enjoy your occupation, work doesn't seem like . . . well, work. Some research suggests that this isn't necessarily the case (Daniel & Esser, 1980; Deci, 1972; Deci, Koestner, & Ryan, 1999). According to this research, receiving some sort of extrinsic reinforcement (i.e., getting paid) for engaging in behaviours that we enjoy leads to those behaviours being thought of as work no longer providing that same enjoyment. As a result, we might spend less time engaging in these reclassified behaviours in the absence of any extrinsic reinforcement. For example, Odessa loves baking, so in their free time, they bake for fun. Oftentimes, after stocking shelves at their grocery store job, they often whips up pastries in the evenings because they enjoy baking. When a coworker in the store's bakery department leaves their job, Odessa applies for the position and gets transferred to the bakery department. Although Odessa enjoys what they do at her new job, after a few months, they no longer have much desire to concoct tasty treats in their free time. Baking has become work in a way that changes Odessa's motivation to do it (Figure EM.3). What Odessa has experienced is called the overjustification effect—intrinsic motivation is diminished when extrinsic motivation is given. This can lead to extinguishing the intrinsic

motivation and creating a dependence on extrinsic rewards for continued performance (Deci et al., 1999).

Figure EM.3 Research suggests that when something we love to do, like icing cakes, becomes our job, our intrinsic and extrinsic motivations to do it may change. (credit: Agustín Ruiz)

Other studies suggest that intrinsic motivation may not be so vulnerable to the effects of extrinsic reinforcements, and in fact, reinforcements such as verbal praise might actually increase intrinsic motivation (Arnold, 1976; Cameron & Pierce, 1994). In that case, Odessa's motivation to bake in their free time might remain high if, for example, customers regularly compliment their baking or cake decorating skills.

These apparent discrepancies in the researchers' findings may be understood by considering several factors. For one, physical reinforcement (such as money) and verbal reinforcement (such as praise) may affect an individual in very

different ways. In fact, tangible rewards (i.e., money) tend to have more negative effects on intrinsic motivation than do intangible rewards (i.e., praise). Furthermore, the expectation of the extrinsic motivator by an individual is crucial: If the person expects to receive an extrinsic reward, then intrinsic motivation for the task tends to be reduced. If, however, there is no such expectation, and the extrinsic motivation is presented as a surprise, then intrinsic motivation for the task tends to persist (Deci et al., 1999).

In addition, culture may influence motivation. For example, in collectivistic cultures, it is common to do things for your family members because the emphasis is on the group and what is best for the entire group, rather than what is best for any one individual (Nisbett, Peng, Choi, & Norenzayan, 2001). This focus on others provides a broader perspective that takes into account both situational and cultural influences on behaviour; thus, a more nuanced explanation of the causes of others' behaviour becomes more likely. (You will learn more about collectivistic and individualistic cultures when you learn about social psychology.)

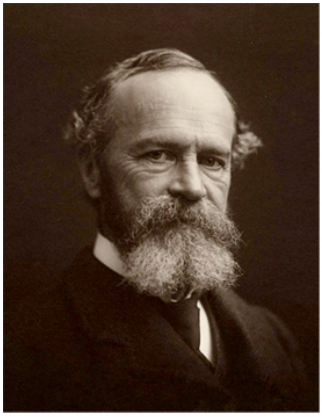
In educational settings, students are more likely to experience intrinsic motivation to learn when they feel a sense of belonging and respect in the classroom. This internalization can be enhanced if the evaluative aspects of the classroom are de-emphasized and if students feel that they exercise some control over the learning environment. Furthermore, providing students with activities that are challenging, yet

doable, along with a rationale for engaging in various learning activities can enhance intrinsic motivation for those tasks (Niemiec & Ryan, 2009). Consider Kausar, a first-year law student with two courses this semester: Family Law and Criminal Law. The Family Law professor has a rather intimidating classroom: This professor likes to put students on the spot with tough questions, which often leaves students feeling belittled or embarrassed. Grades are based exclusively on quizzes and exams, and the instructor posts results of each test on the classroom door. In contrast, the Criminal Law professor facilitates classroom discussions and respectful debates in small groups. The majority of the course grade is not exam-based, but centres on a student-designed research project on a crime issue of the student's choice. Research suggests that Kausar will be less intrinsically motivated in their Family Law course, where students are intimidated in the classroom setting, and there is an emphasis on teacher-driven evaluations. Kausar is likely to experience a higher level of intrinsic motivation in their Criminal Law course, where the class setting encourages inclusive collaboration and a respect for ideas, and where students have more influence over their learning activities.

Theories About Motivation

William James (1842–1910) was an important contributor to early research into motivation, and he is often referred to as

the father of psychology in the United States. James theorized that behaviour was driven by a number of instincts, which aid survival (Figure EM.4). From a biological perspective, an **instinct** is a species-specific pattern of behaviour that is not learned. There was, however, considerable controversy among James and his contemporaries over the exact definition of instinct. James proposed several dozen special human instincts, but many of his contemporaries had their own lists that differed. A parent's protection of their baby, the urge to lick sugar, and hunting prey were among the human behaviours proposed as true instincts during James's era. This view—that human behaviour is driven by instincts—received a fair amount of criticism because of the undeniable role of learning in shaping all sorts of human behaviour. In fact, as early as the 1900s, some instinctive behaviours were experimentally demonstrated to result from associative learning (recall when you learned about Watson's conditioning of fear response in "Little Albert") (Faris, 1921).



(a)

(b)

Figure EM.4(a) William James proposed the instinct theory of motivation, asserting that behaviour is driven by instincts. (b) In humans, instincts may include behaviours such as an infant's rooting for a nipple and sucking. (credit b: modification of work by "Mothering Touch"/Flickr)

Drive Reduction Theory

Another early theory of motivation proposed that the maintenance of homeostasis is particularly important in directing behaviour. You may recall from your earlier reading that homeostasis is the tendency to maintain a balance, or optimal level, within a biological system. In a body system, a control centre (which is often part of the brain) receives input from receptors (which are often complexes of neurons). The control centre directs effectors (which may be other neurons) to correct any imbalance detected by the control centre.

According to the **drive reduction theory** of motivation,

deviations from homeostasis create physiological needs. These needs result in psychological drive states that direct behaviour to meet the need and, ultimately, bring the system back to homeostasis. For example, if it's been a while since you ate, your blood sugar levels will drop below normal. This low blood sugar will induce a physiological need and a corresponding drive state (i.e., hunger) that will direct you to seek out and consume food (Figure EM.5). Eating will eliminate the hunger, and, ultimately, your blood sugar levels will return to normal. Interestingly, drive theory also emphasizes the role that habits play in the type of behavioural response in which we engage. A habit is a pattern of behaviour in which we regularly engage. Once we have engaged in a behaviour that successfully reduces a drive, we are more likely to engage in that behaviour whenever faced with that drive in the future (Graham & Weiner, 1996).

Figure EM.5 Hunger and subsequent eating are the result of complex physiological processes that maintain homeostasis. (credit "left": modification of work by "Gracie and Viv"/Flickr; credit "center": modification of work by Steven Depolo; credit "right": modification of work by Monica Renata)

The Optimal Arousal Model

Extensions of drive theory take into account levels of arousal as potential motivators. As you recall from your study of learning, these theories assert that there is an optimal level of arousal that we all try to maintain (Figure EM.6). If we are underaroused, we become bored and will seek out some sort of stimulation. On the other hand, if we are overaroused, we will engage in behaviours to reduce our arousal (Berlyne, 1960). Most students have experienced this need to maintain optimal levels of arousal over the course of their academic career. Think about how much stress students experience toward the end of spring semester. They feel overwhelmed with seemingly endless exams, papers, and major assignments that must be completed on time. They probably yearn for the rest and relaxation that awaits them over the extended summer break. However, once they finish the semester, it doesn't take too

long before they begin to feel bored. Generally, by the time the next semester is beginning in the fall, many students are quite happy to return to school. This is an example of how arousal theory works.

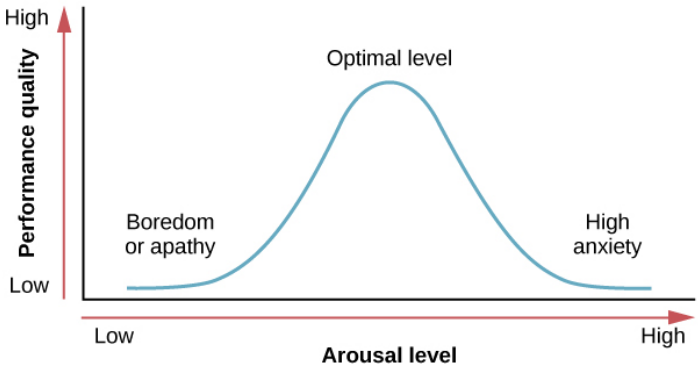


Figure EM.6 The concept of optimal arousal in relation to performance on a task is depicted here. Performance is maximized at the optimal level of arousal, and it tapers off during under- and over-arousal.

So what is the optimal level of arousal? What level leads to the best performance? Research shows that moderate arousal is generally best; when arousal is very high or very low, performance tends to suffer (Yerkes & Dodson, 1908). Think of your arousal level regarding taking an exam for this class. If your level is very low, such as boredom and apathy, your performance will likely suffer. Similarly, a very high level, such as extreme anxiety, can be paralyzing and hinder performance. Consider the example of a softball team facing a tournament. They are favoured to win their first game by a large margin, so

they go into the game with a lower level of arousal and get beat by a less skilled team.

But optimal arousal level is more complex than a simple answer that the middle level is always best. Researchers Robert Yerkes (pronounced "Yerk-EES") and John Dodson discovered that the optimal arousal level depends on the complexity and difficulty of the task to be performed (Figure EM.7). This relationship is known as **Yerkes-Dodson law**, which holds that a simple task is performed best when arousal levels are relatively high and complex tasks are best performed when arousal levels are lower.

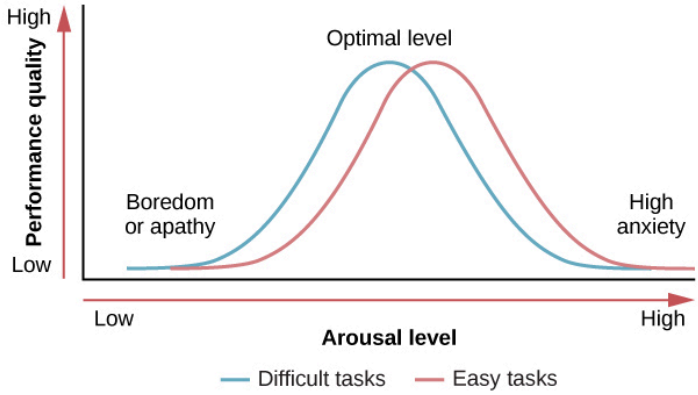


Figure EM.7 Task performance is best when arousal levels are in a middle range, with difficult tasks best performed under lower levels of arousal and simple tasks best performed under higher levels of arousal.

Self-efficacy and Social Motives

Self-efficacy is an individual's belief in their own capability

to complete a task, which may include a previous successful completion of the exact task or a similar task. Albert Bandura (1994) theorized that an individual's sense of self-efficacy plays a pivotal role in motivating behaviour. Bandura argues that motivation derives from expectations that we have about the consequences of our behaviours, and ultimately, it is the appreciation of our capacity to engage in a given behaviour that will determine what we do and the future goals that we set for ourselves. For example, if you have a sincere belief in your ability to achieve at the highest level, you are more likely to take on challenging tasks and to not let setbacks dissuade you from seeing the task through to the end.

A number of theorists have focused their research on understanding social motives (McAdams & Constantian, 1983; McClelland & Liberman, 1949; Murray et al., 1938). Among the motives they describe are needs for achievement, affiliation, and intimacy. It is the need for achievement that drives accomplishment and performance. The need for affiliation encourages positive interactions with others, and the need for intimacy causes us to seek deep, meaningful relationships. Henry Murray et al. (1938) categorized these needs into domains. For example, the need for achievement and recognition falls under the domain of ambition. Dominance and aggression were recognized as needs under the domain of human power, and play was a recognized need in the domain of interpersonal affection.

Models of Needs

Western Perspectives

While the theories of motivation described earlier relate to basic biological drives, individual characteristics, or social contexts, Abraham Maslow (1943) proposed a **hierarchy of needs** that spans the spectrum of motives ranging from the biological to the individual to the social. This theory demonstrates that we can have drives that are not rooted in a biological need. These needs are often depicted as a pyramid (Figure EM.8).

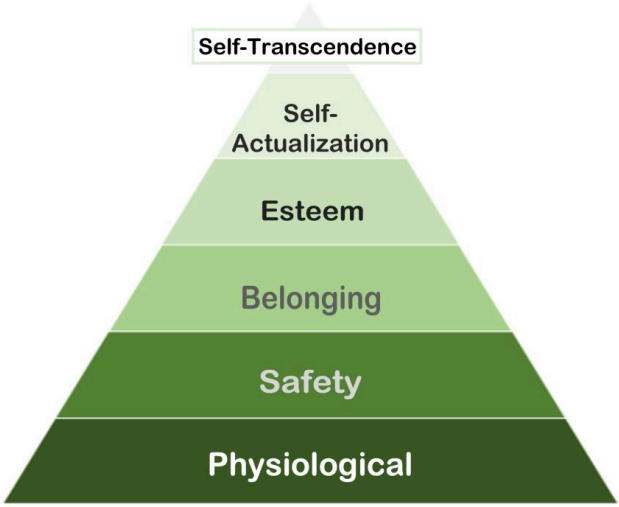


Figure EM.8. Maslow's hierarchy of needs is illustrated here. In some versions of Maslow's model, cognitive and aesthetic needs are also included between esteem and self-actualization.

At the base of the pyramid are all of the physiological needs that are necessary for survival. These are followed by basic needs for security and safety, the need to be loved and to have a sense of belonging, and the need to have self-worth and confidence. The top tier of the pyramid is self-actualization, which is a need that essentially equates to achieving one's full potential, and it can only be realized when needs lower on the pyramid have been met. To Maslow and humanistic theorists, self-actualization reflects the humanistic emphasis on positive aspects of human nature. Maslow suggested that this is an

ongoing, life-long process and that only a small percentage of people actually achieve a self-actualized state (Francis & Kritsonis, 2006; Maslow, 1943).

According to Maslow (1943), one must satisfy lower-level needs before addressing those needs that occur higher in the pyramid. So, for example, if someone is struggling to find enough food to meet his nutritional requirements, it is quite unlikely that they would spend an inordinate amount of time thinking about whether others viewed them as a good person or not. Instead, all of their energies would be geared toward finding something to eat. However, it should be pointed out that Maslow's theory has been criticized for its subjective nature and its inability to account for phenomena that occur in the real world (Leonard, 1982). Other research has more recently addressed that late in life, Maslow proposed a self-transcendence level above self-actualization—to represent striving for meaning and purpose beyond the concerns of oneself (Koltko-Rivera, 2006). For example, people sometimes make self-sacrifices in order to make a political statement or in an attempt to improve the conditions of others. In the early 1900s, many suffragettes and women's rights activists went on hunger strikes when they were arrested while protesting for women's right to vote. In instances like this, people may starve themselves or otherwise put themselves in danger in service of higher-level motives beyond their own needs.

Maslow's model has been influential in Psychology, but has not gone without criticism due to the narrow focus on

individualistic values, such as those of the United States, Canada, New Zealand, and Germany. In other words, this model has little applicability to **collectivistic** cultures, which include Indigenous populations living in colonized countries like Canada and the United States, as well as peoples who live and/or associate with traditional values in countries like China, Korea, Japan, Costa Rica, and Indonesia. Despite Maslow's model's long-standing interdisciplinary use in various contexts, less emphasis on the model should be placed regarding it as a cross-cultural or universal model of motivation.

First Nations (Indigenous) Foundations

Figure EM.9 Abraham Maslow sitting next to traditional housing on-reserve (Blackfoot) in the late 1930's. (Credit: Glenbow Archives)

Over past decades, evidence emerged that Maslow's model was likely based in part on his observations of **Blackfoot** (First Nations) cultural understandings of need, meaning and life purpose in the 1930's-40's. Traditional methods of oral communication were used to share knowledge of Blackfoot understandings of need, meaning and life purpose. That said, the Blackfoot were not acknowledged for their contribution of knowledge and translation. In fact, it was not until less than a dozen years ago that Behavioural Health Director at Navajo Regional Behavioural Health Center, Dr. Sidney Brown, received permission from Maslow's daughter to excavate his archival work from the Smithsonian archives. From this, Dr. Brown gained insight into the extent to which Maslow's work

was reproduced based on Blackfoot knowledge. From this, Dr. Brown wrote a transformative novel: "Native Self-Actualization: Transformation Beyond Greed" (Brown, 2014).

Link to Learning

If you want to read more about the process of rediscovering Blackfoot science and their influence on Maslow, read this article published by the Government of Canada's Social Sciences and Humanities Research Council (SSHRC).

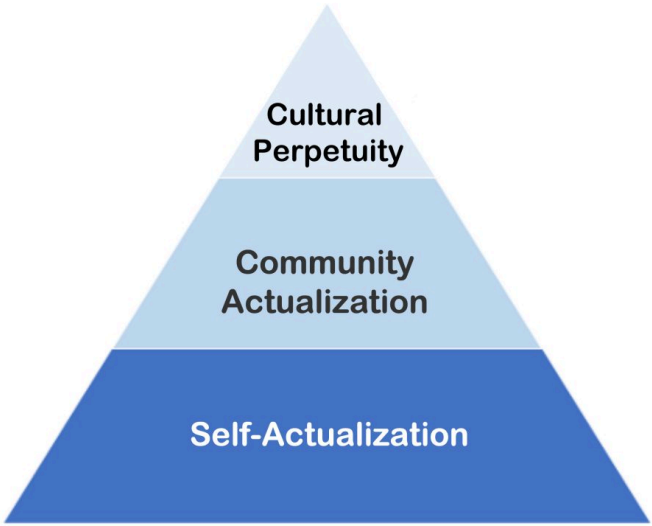


Figure EM.10. The Blackfoot model is illustrated here. This model was believed to be the primary basis for which Abraham Maslow built his model on.

Despite similarities, the Blackfoot and Maslow's models differ. In contrast to Maslow's model (Fig. EM.8), the Blackfoot model has three layers (Fig. EM.10). Compared to Maslow, who described **self-actualization** (top of the model) as a state achieved across time through a set series of stages, the Blackfoot model described self-actualization as a trait inherent to all, so it forms the base of the Blackfoot model (Brown, 2014). Unlike Maslow's model, the Blackfoot model includes **community actualization** (middle layer) and **cultural**

perpetuity (top layer). Community actualization can be defined as one's effort to continually and effectively help members of the family and community meet their basic needs, maintain physical well-being, and help create an environment that allows community members to fulfill roles and goals in community and in life. Above and beyond community actualization, cultural perpetuity is the idea that knowledge and wisdom within a community can live on in perpetuity (or live on forever). If an individual fulfilled their obligations within the community (e.g., story-telling of sacred traditions to younger generations), cultural perpetuity is more likely to be achieved. While it's clear that there are differences between models, there are also similarities. For example, Maslow would later include the concept of time in his model with the idea of **self-transcendence** (similar to cultural perpetuity), which is the idea that all self-actualized peoples would feel the need to pursue goals outside of the self, like those related to spiritual identity.

Extending beyond the Blackfoot peoples and model, similar ideas can be seen among other Indigenous groups in North America. For example, **Mi'kmaq (First Nations) peoples** (Meeg-mah), are the main Indigenous peoples of Atlantic Canada. Mi'kmaq peoples have an important concept of **Netukulimk** (Neh-doo-goo-limbk) in their culture. This concept highlights how communities are inseparable from the land and the land's resources, as they are interconnected and must support one another (Prosper, 2011). In this way, land

is community. This is expressed by the Mi'kmaq saying **Msit No'kmaq** (mm-sit-no-goh-mah), or "all my relations"; which means that all living things and pieces of the earth are Mi'kmaq relatives (Hurley & Jackson, 2020). Another value involving cultural perpetuity comes from the **Haudenosaunee** (Hoe-dee-no-show-nee) peoples, also known as Iroquois or the six nations, which are a group of Indigenous peoples living in the United States and in Canada. The Haudenosaunee peoples have the **Seven Generation Principle**, which is similar to that of cultural perpetuity, as this principle highlights how important it is for community members to make decisions that will result in a sustainable world for the next seven generations (Mclester, 2017). Overall, the Blackfoot model, the Netukulimk principle, the Seventh Generation principles and other cultural values that are not included in Maslow's model suggest that a universal understanding of human needs must extend beyond his work.

Figure EM.11. Maslow's model has often been regarded as being based on the Blackfoot model triangular shape which to the Blackfoot, actually represented traditional First Nations Blackfoot housing, moyís. (credit: Public domain image, creative commons)

TRICKY TOPIC: THEORIES OF MOTIVATION

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89.

HUNGER AND EATING

Learning Objectives

By the end of this section, you will be able to:

- Describe how hunger and eating are regulated
- Understand the role of the hypothalamus in hunger and eating
- Explain the health consequences resulting from anorexia and bulimia nervosa

Eating is essential for survival, and it is no surprise that a drive like hunger exists to ensure that we seek out sustenance. While this chapter will focus primarily on the physiological mechanisms that regulate hunger and eating, powerful social,

cultural, and economic influences also play important roles. This section will explain the regulation of hunger, eating, and body weight, and we will discuss the adverse consequences of disordered eating.

Physiological Mechanisms of Hunger and Eating

There are a number of physiological mechanisms that serve as the basis for hunger. When our stomachs are empty, they contract. Typically, a person then experiences hunger pangs. Chemical messages travel to the brain, and serve as a signal to initiate feeding behaviour. When our blood glucose levels drop, the pancreas and liver generate a number of chemical signals that induce hunger (Konturek et al., 2003; Novin, Robinson, Culbreth, & Tordoff, 1985) and thus initiate feeding behaviour.

For most people, once they have eaten, they feel **satiation**, or fullness and satisfaction, and their eating behaviour stops. Like the initiation of eating, satiation is also regulated by several physiological mechanisms. As blood glucose levels increase, the pancreas and liver send signals to shut off hunger and eating (Drazen & Woods, 2003; Druce, Small, & Bloom, 2004; Greary, 1990). The food's passage through the gastrointestinal tract also provides important satiety signals to the brain (Woods, 2004), and fat cells release **leptin**, a satiety hormone.

The various hunger and satiety signals that are involved in the regulation of eating are integrated in the brain. Research suggests that several areas of the hypothalamus and hindbrain are especially important sites where this integration occurs (Ahima & Antwi, 2008; Woods & D'Alessio, 2008). Ultimately, activity in the brain determines whether or not we engage in feeding behaviour (Figure EM.12).

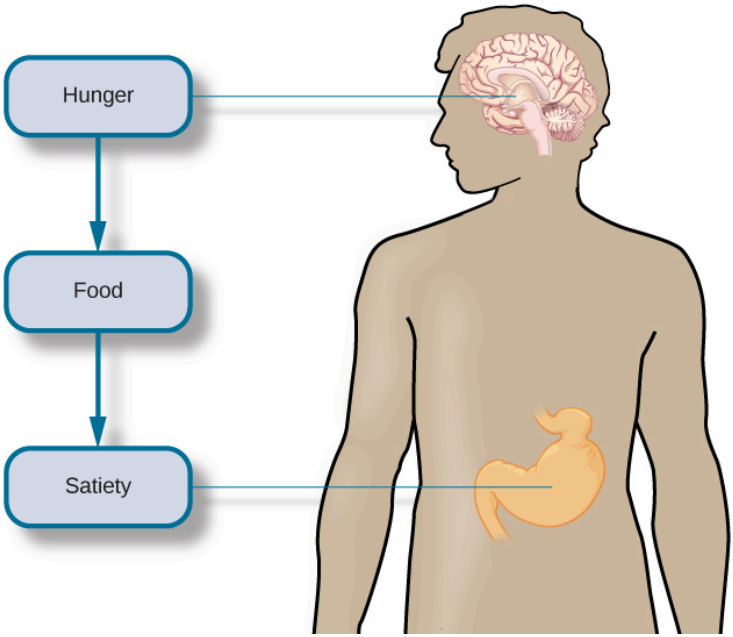

Figure EM.12 Hunger and eating are regulated by a complex interplay of hunger and satiety signals that are integrated in the brain

The Hypothalamus

The hypothalamus (located in the lower, central part of the

brain) plays a very important role in eating behaviour. It is responsible for synthesizing and secreting various hormones. The lateral hypothalamus (LH) is concerned largely with hunger and, in fact, lesions (i.e., damage) of the LH can eliminate the desire for eating entirely—to the point that animals starve themselves to death unless kept alive by force feeding (Anand & Brobeck, 1951). Additionally, artificially stimulating the LH, using electrical currents, can generate eating behaviour if food is available (Andersson, 1951).

Hunger is only part of the story of when and why we eat. A related process, satiation, refers to the decline of hunger and the eventual termination of eating behaviour. Whereas the feeling of hunger gets you to start eating, the feeling of satiation gets you to stop. Perhaps surprisingly, hunger and satiation are two distinct processes, controlled by different circuits in the brain and triggered by different cues. Distinct from the LH, which plays an important role in hunger, the ventromedial hypothalamus (VMH) plays an important role in satiety (more on this in the tricky topic below). Though lesions of the VMH can cause an animal to overeat to the point of obesity, the relationship between the LH and the VMB is quite complicated.

Hormones and Hormone Signalling

The physical sensation of hunger comes from contractions of the stomach muscles. These contractions are believed to be triggered by high concentrations of the hormone ghrelin. Two

other hormones, peptide YY and leptin, cause the physical sensations of being full. Ghrelin is released if blood sugar levels get low, a condition that can result from going long periods without eating.

Hormones can have a wide range of effects on hunger. The hormones insulin and cholecystokinin (CCK) are released from the GI tract during food absorption and act to suppress feelings of hunger. However, during fasting, glucagon and epinephrin levels rise and stimulate hunger. When blood sugar levels fall, the hypothalamus is stimulated. Ghrelin, a hormone produced by the stomach, triggers the release of orexin from the hypothalamus, signalling to the body that it is hungry.

Long-Term Hunger Regulation

The long-term regulation of hunger prevents energy shortfalls and is concerned with the regulation of body fat. Leptin, a hormone secreted exclusively by adipose cells in response to an increase in body-fat mass, helps regulate long-term hunger and food intake. Leptin serves as the brain's indicator of the body's total energy stores. The function of leptin is to suppress the release of neuropeptide Y (NPY), which in turn prevents the release of appetite-enhancing orexins from the lateral hypothalamus. This decreases appetite and food intake, promoting weight loss. Though rising blood levels of leptin do promote weight loss to some extent, its main role is to protect the body against weight loss in times of nutritional deprivation.

Short-Term Hunger Regulation

The short-term regulation of hunger deals with appetite and satiety. It involves neural signals from the GI tract, blood levels of nutrients, and GI-tract hormones.

Neural Signals from the GI Tract

The brain can evaluate the contents of the gut through vagal nerve fibres that carry signals between the brain and the gastrointestinal (GI) tract. Studies have shown that the brain can sense differences between macronutrients through these vagal nerve fibres. Stretch receptors (mechanoreceptors that respond to an organ being stretched or distended) work to inhibit appetite when the GI tract becomes distended. They send signals along the vagus nerve afferent pathway and ultimately inhibit the hunger centres of the hypothalamus.

Nutrient Signals

Blood levels of glucose, amino acids, and fatty acids provide a constant flow of information to the brain that may be linked to regulating hunger and energy intake. Nutrient signals indicate fullness. They inhibit hunger by raising blood glucose levels, elevating blood levels of amino acids, and affecting blood concentrations of fatty acids.

Metabolism and Body Weight

Our body weight is affected by a number of factors, including gene-environment interactions, and the number of calories we consume versus the number of calories we burn in daily activity. If our caloric intake exceeds our caloric use, our bodies store excess energy in the form of fat. If we consume fewer calories than we burn off, then stored fat will be converted to energy. Our energy expenditure is obviously affected by our levels of activity, but our body's **metabolic rate** also comes into play. A person's metabolic rate is the amount of energy that is expended in a given period of time, and there is tremendous individual variability in our metabolic rates. People with high rates of metabolism are able to burn off calories more easily than those with lower rates of metabolism.

We all experience fluctuations in our weight from time to time, but generally, most people's weights fluctuate within a narrow margin, in the absence of extreme changes in diet and/or physical activity. This observation led some to propose a **set-point theory** of body weight regulation. The set-point theory asserts that each individual has an ideal body weight, or set point, which is resistant to change. This set-point is genetically predetermined and efforts to move our weight significantly from the set-point are resisted by compensatory changes in energy intake and/or expenditure (Speakman et al., 2011).

Some of the predictions generated from this particular

theory have not received empirical support. For example, there are no changes in metabolic rate between individuals who had recently lost significant amounts of weight and a control group (Weinsier et al., 2000). In addition, the set-point theory fails to account for the influence of social and environmental factors in the regulation of body weight (Martin-Gronert & Ozanne, 2013; Speakman et al., 2011). Despite these limitations, set-point theory is still often used as a simple, intuitive explanation of how body weight is regulated. See Psychological Disorders for further discussion about eating disorders.

Obesity

Being extremely overweight or obese is a risk factor for several negative health consequences. These include, but are not limited to, an increased risk for cardiovascular disease, stroke, Type 2 diabetes, liver disease, sleep apnea, colon cancer, breast cancer, infertility, and arthritis. Given that it is estimated that in Canada more than a quarter (26.8%) of the adult population is obese and more than a third (36.3%) of adults and children (30%) qualify as overweight (StatCan, 2019), there is substantial interest in trying to understand how to combat this important public health concern.

Dig Deeper

Prader-Willi Syndrome

Prader-Willi Syndrome (PWS) is a genetic disorder that results in persistent feelings of intense hunger and reduced rates of metabolism. Typically, affected children have to be supervised around the clock to ensure that they do not engage in excessive eating. Currently, PWS is the leading genetic cause of morbid obesity in children, and it is associated with a number of cognitive deficits and emotional problems.

While genetic testing can be used to make a diagnosis, there are a number of behavioural diagnostic criteria associated with PWS. From birth to 2 years of age, lack of muscle tone and poor sucking behaviour may serve as early signs of PWS. Developmental delays are seen between the ages of 6 and 12, and excessive eating and cognitive deficits associated with PWS usually onset a little later.

While the exact mechanisms of PWS are not fully understood, there is evidence that affected individuals have hypothalamic abnormalities. This is not surprising, given the hypothalamus's role in regulating hunger and eating. However, as you will learn in the next section of this chapter, the hypothalamus is also involved in the regulation of sexual behaviour. Consequently, many individuals suffering from PWS fail to reach sexual maturity during adolescence.

There is no current treatment or cure for PWS. However, if weight can be controlled in these individuals, then their life expectancies are significantly increased (historically, sufferers of PWS often died in adolescence or early adulthood). Advances in the use of various psychoactive medications and growth hormones continue to enhance the quality of life for individuals with PWS (Cassidy & Driscoll, 2009; Prader-Willi Syndrome Association, 2012).

TRICKY TOPIC: HUNGER

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Eating Disorders

While more than a third of Canadian adults struggle with issues related to being overweight, a smaller, but significant, portion of the population has eating disorders that typically result in being normal weight or underweight. Often, these individuals are fearful of gaining weight. Individuals who suffer from bulimia nervosa and anorexia nervosa face many adverse health consequences (Mayo Clinic, 2012a, 2012b).

People suffering from **bulimia nervosa** engage in binge eating behaviour that is followed by an attempt to compensate for the large amount of food consumed. Purging the food by inducing vomiting or through the use of laxatives are two

common compensatory behaviours. Some affected individuals engage in excessive amounts of exercise to compensate for their binges. Bulimia is associated with many adverse health consequences that can include kidney failure, heart failure, and tooth decay. In addition, these individuals often suffer from anxiety and depression, and they are at an increased risk for substance abuse (Mayo Clinic, 2012b). The lifetime prevalence rate for bulimia nervosa is estimated at around 1% for women and less than 0.5% for men (Smink, van Hoeken, & Hoek, 2012).

As of the 2013 release of the *Diagnostic and Statistical Manual, fifth edition*, **Binge eating disorder** is a disorder recognized by the American Psychiatric Association (APA). Unlike with bulimia, eating binges are not followed by inappropriate behaviour, such as purging, but they are followed by distress, including feelings of guilt and embarrassment. The resulting psychological distress distinguishes binge eating disorder from overeating (American Psychiatric Association [APA], 2013).

Anorexia nervosa is an eating disorder characterized by the maintenance of a body weight well below average through starvation and/or excessive exercise. Individuals suffering from anorexia nervosa often have a **distorted body image**, referenced in literature as a type of body dysmorphia, meaning that they view themselves as overweight even though they are not. Like bulimia nervosa, anorexia nervosa is associated with a number of significant negative health outcomes: bone loss,

heart failure, kidney failure, amenorrhea (cessation of the menstrual period), reduced function of the gonads, and in extreme cases, death. Furthermore, there is an increased risk for a number of psychological problems, which include anxiety disorders, mood disorders, and substance abuse (Mayo Clinic, 2012a). Estimates of the prevalence of anorexia nervosa vary from study to study but generally range from just under one percent to just over four percent in women. Generally, prevalence rates are considerably lower for men (Smink et al., 2012).

While both anorexia and bulimia nervosa occur in people of many different cultures, Caucasian females from Western societies tend to be the most at-risk population. Recent research indicates that females between the ages of 15 and 19 are most at risk, and it has long been suspected that these eating disorders are culturally-bound phenomena that are related to messages of a thin ideal often portrayed in popular media and the fashion world (Figure EM.14) (Smink et al., 2012). While social factors play an important role in the development of eating disorders, there is also evidence that genetic factors may predispose people to these disorders (Collier & Treasure, 2004).

Figure EM.13 Young women in our society are inundated with images of extremely thin models (sometimes accurately depicted and sometimes digitally altered to make them look even thinner). These images may contribute to eating disorders. (credit: Peter Duhon)

90.

SEXUAL BEHAVIOUR

Learning Objectives

By the end of this section, you will be able to:

- Understand basic biological mechanisms regulating sexual behaviour and motivation
- Appreciate the importance of Alfred Kinsey's research on human sexuality
- Recognize the contributions that William Masters and Virginia Johnson's research made to our understanding of the sexual response cycle
- Define sexual orientation and gender identity

Like food, sex is an important part of our lives. From an

evolutionary perspective, the reason is obvious—perpetuation of the species. Sexual behaviour in humans, however, involves much more than reproduction. This section provides an overview of research that has been conducted on human sexual behaviour and motivation. This section will close with a discussion of issues related to gender and sexual orientation.

Physiological Mechanisms of Sexual Behaviour and Motivation

Much of what we know about the physiological mechanisms that underlie sexual behaviour and motivation comes from animal research. As you've learned, the hypothalamus plays an important role in motivated behaviours, and sex is no exception. In fact, lesions to an area of the hypothalamus called the medial preoptic area completely disrupt a male rat's ability to engage in sexual behaviour. Surprisingly, medial preoptic lesions do not change how hard a male rat is willing to work to gain access to a sexually receptive female (Figure EM.14). This suggests that the ability to engage in sexual behaviour and the motivation to do so may be mediated by neural systems distinct from one another. What is interesting, is that the medial preoptic area in males is larger and contains more cells, compared to females.

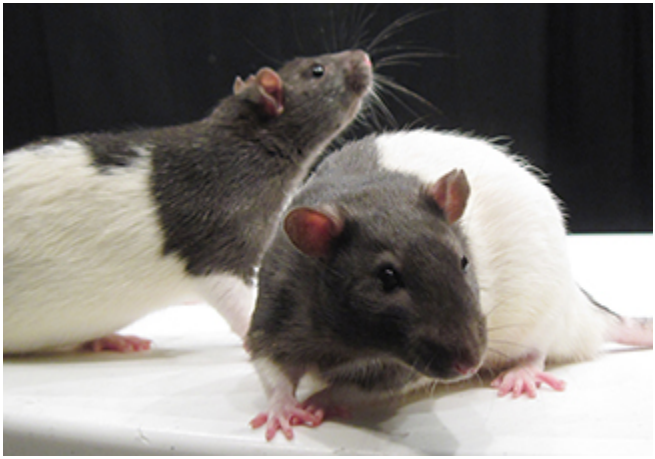

Figure EM.14 A male rat that cannot engage in sexual behavior still seeks receptive females, suggesting that the ability to engage in sexual behavior and the motivation to do so are mediated by different systems in the brain. (credit: Jason Snyder)

Animal research suggests that limbic system structures such as the amygdala and nucleus accumbens are especially important for sexual motivation. Damage to these areas results in a decreased motivation to engage in sexual behaviour, while leaving the ability to do so intact (Figure EM.15) (Everett, 1990). Similar dissociations of sexual motivation and sexual ability have also been observed in the female rat (Becker, Rudick, & Jenkins, 2001; Jenkins & Becker, 2001).

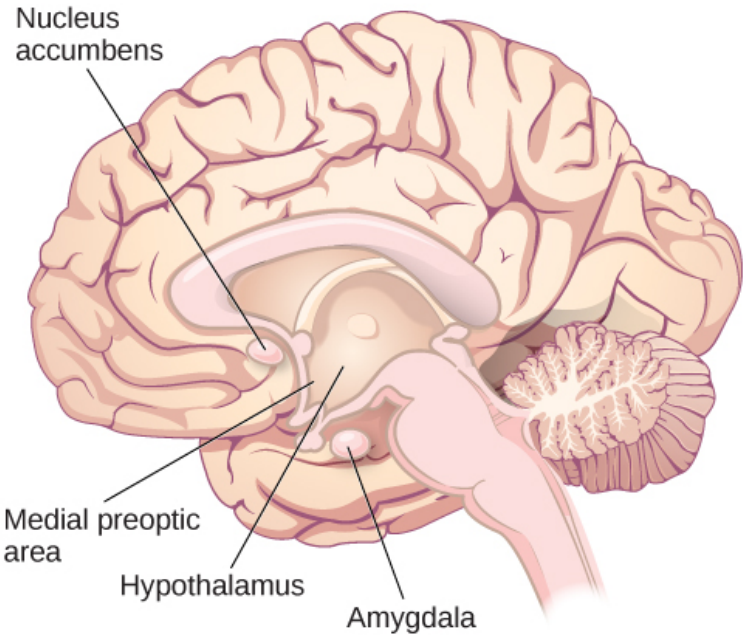

Figure EM.15 The medial preoptic area, an area of the hypothalamus, is involved in the ability to engage in sexual behaviour, but it does not affect sexual motivation. In contrast, the amygdala and nucleus accumbens are involved in motivation for sexual behaviour, but they do not affect the ability to engage in it.

Although human sexual behaviour is much more complex than that seen in rats, some parallels between animals and humans can be drawn from this research. The worldwide popularity of drugs used to treat erectile dysfunction (Conrad, 2005) speaks to the fact that sexual motivation and the ability to engage in sexual behaviour can also be dissociated in humans. Moreover, disorders that involve abnormal hypothalamic function are often associated with

hypogonadism (reduced function of the gonads) and reduced sexual function (e.g., Prader-Willi syndrome). Given the hypothalamus's role in endocrine function, it is not surprising that hormones secreted by the endocrine system also play important roles in sexual motivation and behaviour. For example, many animals show no sign of sexual motivation in the absence of the appropriate combination of sex hormones from their gonads. While this is not the case for humans, there is considerable evidence that sexual motivation for all humans varies as a function of circulating testosterone levels (Bhasin, Enzlin, Coviello, & Basson, 2007; Carter, 1992; Sherwin, 1988).

Kinsey's Research

Before the late 1940s, access to reliable, empirically-based information on sex was limited. Physicians were considered authorities on all issues related to sex, despite the fact that they had little to no training in these issues, and it is likely that most of what people knew about sex had been learned either through their own experiences or by talking with their peers. Convinced that people would benefit from a more open dialogue on issues related to human sexuality, Dr. Alfred Kinsey of Indiana University initiated large-scale survey research on the topic (Figure EM.16). The results of some of these efforts were published in two books—*Sexual Behavior in the Human Male* and *Sexual Behavior in the Human*

Female—which were published in 1948 and 1953, respectively (Bullough, 1998).

Figure EM.16 In 1947, Alfred Kinsey established The Kinsey Institute for Research, Sex, Gender and Reproduction at Indiana University, shown here in 2011. The Kinsey Institute has continued as a research site of important psychological studies for decades.

At the time, the Kinsey reports were quite sensational. Never before had the American public seen its private sexual behaviour become the focus of scientific scrutiny on such a large scale. The books, which were filled with statistics and scientific lingo, sold remarkably well to the general public, and people began to engage in open conversations about human sexuality. As you might imagine, not everyone was happy that this information was being published. In fact, these books were banned in some countries. Ultimately, the controversy resulted in Kinsey losing funding that he had secured from the

Rockefeller Foundation to continue his research efforts (Bancroft, 2004).

Although Kinsey's research has been widely criticized as being riddled with sampling and statistical errors (Jenkins, 2010), there is little doubt that this research was very influential in shaping future research on human sexual behaviour and motivation. Kinsey described a remarkably diverse range of sexual behaviours and experiences reported by the volunteers participating in his research. Behaviours that had once been considered exceedingly rare or problematic were demonstrated to be much more common and innocuous than previously imagined (Bancroft, 2004; Bullough, 1998).

Among the results of Kinsey's research were the findings that women are as interested and experienced in sex as their male counterparts, that both males and females masturbate without adverse health consequences, and that homosexual acts are fairly common (Bancroft, 2004). Kinsey also developed a continuum known as the Kinsey scale that is still commonly used today to categorize an individual's **sexual orientation** (Jenkins, 2010). According to that scale, sexual orientation is an individual's emotional and erotic attractions to same-sexed individuals (**homosexual**), opposite-sexed individuals (**heterosexual**), or both (**bisexual**).

Masters and Johnson's Research

In 1966, William Masters and Virginia Johnson published a

book detailing the results of their observations of nearly 700 people who agreed to participate in their study of physiological responses during sexual behaviour. Unlike Kinsey, who used personal interviews and surveys to collect data, Masters and Johnson observed people having intercourse in a variety of positions, and they observed people masturbating, manually or with the aid of a device. While this was occurring, researchers recorded measurements of physiological variables, such as blood pressure and respiration rate, as well as measurements of sexual arousal, such as vaginal lubrication and penile tumescence (swelling associated with an erection). In total, Masters and Johnson observed nearly 10,000 sexual acts as a part of their research (Hock, 2008).

Based on these observations, Masters and Johnson divided the **sexual response cycle** into four phases that are fairly similar across sexes: excitement, plateau, orgasm, and resolution (Figure EM.17). The **excitement** phase is the arousal phase of the sexual response cycle, and it is marked by erection of the penis or clitoris and lubrication and expansion of the vaginal canal. During **plateau**, there is further swelling of the vagina and increased blood flow to the labia minora, or full erection of the penis and often the release of pre-ejaculatory fluid. Most individuals experience increases in muscle tone during this time. **Orgasm** is marked by rhythmic contractions of the pelvis and in the uterus, along with increased muscle tension. In individuals with penises, pelvic contractions are accompanied by a buildup of seminal fluid

near the urethra that is ultimately forced out by contractions of genital muscles, (i.e., ejaculation). **Resolution** is the relatively rapid return to an unaroused state accompanied by a decrease in blood pressure and muscular relaxation. The **refractory period** is a period of time that follows an orgasm during which an individual is incapable of experiencing another orgasm. The duration of the refractory period can vary dramatically from individual to individual with some refractory periods as short as several minutes and others as long as a day.

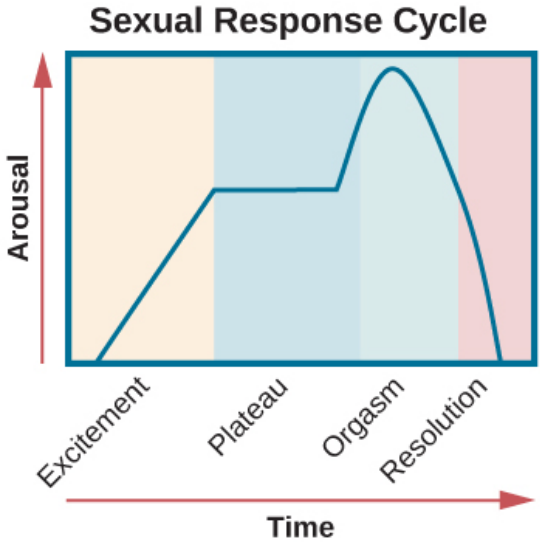

Figure EM.17 This graph illustrates the different phases of the sexual response cycle as described by Masters and Johnson.

In addition to the insights that their research provided with regards to the sexual response cycle, Masters and Johnson also

collected important information about reproductive anatomy. Their research demonstrated the oft-cited statistic of the average size of a flaccid and an erect penis (3 and 6 inches, respectively) as well as dispelling long-held beliefs about relationships between the size of a an erect penis and the ability to provide sexual pleasure to a partner. Furthermore, they determined that the vagina is a very elastic structure that can conform to various sizes (Hock, 2008).

Sexual Orientation

As mentioned earlier, a person's sexual orientation is their emotional and erotic attraction toward another individual (Figure EM.18). While the majority of people identify as heterosexual, there is a sizeable population of people who identify as homosexual, bisexual, pansexual, asexual, or other non-hetero sexualities. Research suggests that somewhere between 3% and 10% of the population identifies as homosexual (Kinsey, Pomeroy, & Martin, 1948; LeVay, 1996; Pillard & Bailey, 1995). Bisexual people are attracted to people of their own gender and another gender; pansexual people experience attraction without regard to sex, gender identity or gender expression; asexual people do not experience sexual attraction or have little or no interest in sexual activity.

Figure EM.18 Between 3% and 10% of the adult population identifies as homosexual. (credit: Till Krech)

Issues of sexual orientation have long fascinated scientists interested in determining what causes one individual to be straight while another is gay. For many years, people believed

that these differences arose because of different socialization and familial experiences. However, research has consistently demonstrated that the family backgrounds and experiences are very similar among heterosexuals and homosexuals (Bell, Weinberg, & Hammersmith, 1981; Ross & Arrindell, 1988).

Genetic and biological mechanisms have also been proposed, and the balance of research evidence suggests that sexual orientation has an underlying biological component. For instance, over the past 25 years, research has demonstrated gene-level contributions to sexual orientation (Bailey & Pillard, 1991; Hamer, Hu, Magnuson, Hu, & Pattatucci, 1993; Rodriguez-Larralde & Paradisi, 2009), with some researchers estimating that genes account for at least half of the variability seen in human sexual orientation (Pillard & Bailey, 1998). Other studies report differences in brain structure and function between heterosexuals and homosexuals (Allen & Gorski, 1992; Byne et al., 2001; Hu et al., 2008; LeVay, 1991; Ponseti et al., 2006; Rahman & Wilson, 2003a; Swaab & Hofman, 1990), and even differences in basic body structure and function have been observed (Hall & Kimura, 1994; Lippa, 2003; Loehlin & McFadden, 2003; McFadden & Champlin, 2000; McFadden & Pasanen, 1998; Rahman & Wilson, 2003b). In aggregate, the data suggest that to a significant extent, sexual orientations are something with which we are born.

Misunderstandings About Sexual

Orientation

Regardless of how sexual orientation is determined, research has made clear that sexual orientation is not a choice, but rather it is a relatively stable characteristic of a person that cannot be changed. Claims of successful gay conversion therapy have received wide criticism from the research community due to significant concerns with research design, recruitment of experimental participants, and interpretation of data. As such, there is no credible scientific evidence to suggest that individuals can change their sexual orientation (Jenkins, 2010).

Dr. Robert Spitzer, the author of one of the most widely-cited examples of successful conversion therapy, apologized to both the scientific community and the gay community for his mistakes, and he publicly recanted his own paper in a public letter addressed to the editor of *Archives of Sexual Behavior* in the spring of 2012 (Carey, 2012). In this letter, Spitzer wrote,

> I was considering writing something that would acknowledge that I now judge the major critiques of the study as largely correct. . . . I believe I owe the gay community an apology for my study making unproven claims of the efficacy of reparative therapy. I also apologize to any gay person who wasted time or energy undergoing some form of reparative therapy because they believed that I had proven that reparative therapy works with some "highly motivated" individuals. (Becker, 2012, pars. 2, 5)

Citing research that unequivocally shows that not only is

conversion therapy ineffective, but also incredibly harmful, legislative efforts to make such "therapy" illegal have been introduced in Canada and elsewhere (see Bill C-4 amendment to Criminal Code).

Gender Identity

Many people conflate sexual orientation with gender identity because of stereotypical attitudes that exist about gay and lesbian sexuality. In reality, these are two related, but different, issues. **Gender identity** refers to one's sense of being male or female. Generally, our gender identities correspond to our chromosomal and phenotypic sex, but this is not always the case. When individuals do not feel comfortable identifying with the gender associated with their biological sex, then they experience **gender dysphoria**. Gender dysphoria is a diagnostic category in the fifth edition of the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-5) that describes individuals who do not identify as the gender that most people would assume they are. This dysphoria must persist for at least six months and result in significant distress or dysfunction to meet DSM-5 diagnostic criteria. In order for children to be assigned this diagnostic category, they must verbalize their desire to become the other gender.

Many people who are classified as gender dysphoric seek to live their lives in ways that are consistent with their own gender identity. This involves dressing in opposite-sex clothing and

assuming an opposite-sex identity. These individuals may also undertake **transgender hormone therapy** in an attempt to make their bodies look more like the opposite sex, and in some cases, they elect to have surgeries to alter the appearance of their external genitalia to resemble that of their gender identity (Figure EM.19). While these may sound like drastic changes, gender dysphoric individuals take these steps because their bodies seem to them to be a mistake of nature, and they seek to correct this mistake.

Our scientific knowledge and general understanding about gender identity continue to evolve, and young people today have more opportunity to explore and openly express different ideas about what gender means than previous generations. Recent studies indicate that that majority of millennials (those ages 18–34) regard gender as a spectrum instead of a strict male/female binary, and that 12% identify as transgender or gender non-conforming. Additionally, over half of people ages 13–20 know people who use gender-neutral pronouns (such as they/them) (Kennedy, 2017). This change in language means that millennials and Generation Z people understand the experience of gender itself differently. As young people lead this change, other changes are emerging in a range of spheres, from public bathroom policies to retail organizations. For example, some retailers are starting to change traditional gender-based marketing of products, such as removing "pink and blue" clothing and toy aisles. Even with these changes, those who exist outside of traditional gender norms face

difficult challenges. Even people who vary slightly from traditional norms can be the target of discrimination and sometimes even violence.

Figure EM.19 Actress Laverne Cox, who is openly transgender, is the first transgender actress to portray a transgender character on a regular television series. She is also an advocate for LGBTQ+ issues outside of her career, such as in this "Ain't I a Woman?" speaking tour. (credit: modification of work by "KOMUnews_Flickr"/Flickr)

Link to Learning

Hear firsthand about the transgender experience – Alice Miller describes her journey and transition, Geena Rocero discusses the story of becoming who she always was, and Yee Won Chong shares his advice on how everyone can be allies to the transgender community.

Link to Learning

Watch as Fox Fisher explains his own journey and his mission to document the unique stories of gender-variant people.

Dig Deeper

The Case of David Reimer

In August of 1965, Janet and Ronald Reimer of Winnipeg, Canada, welcomed the birth of their twin sons, Bruce and Brian. Within a few months, the twins were experiencing urinary problems; doctors recommended the problems could be alleviated by having the boys circumcised. A malfunction of the medical equipment used to perform the circumcision resulted in Bruce's penis being irreparably damaged. Distraught, Janet and Ronald looked to expert advice on what to do with their baby boy. By happenstance, the couple became aware of Dr. John Money at Johns Hopkins University and his theory of psychosexual neutrality (Colapinto, 2000).

Dr. Money had spent a considerable amount of time researching transgender individuals and individuals born with ambiguous genitalia. As a result of this work, he developed a theory of psychosexual neutrality. His theory asserted that we are

essentially neutral at birth with regard to our gender identity and that we don't assume a concrete gender identity until we begin to master language. Furthermore, Dr. Money believed that the way in which we are socialized in early life is ultimately much more important than our biology in determining our gender identity (Money, 1962).

Dr. Money encouraged Janet and Ronald to bring the twins to Johns Hopkins University, and he convinced them that they should raise Bruce as a girl. Left with few other options at the time, Janet and Ronald agreed to have Bruce's testicles removed and to raise him as a girl. When they returned home to Canada, they brought with them Brian and his "sister," Brenda, along with specific instructions to never reveal to Brenda that she had been born a boy (Colapinto, 2000).

Early on, Dr. Money shared with the scientific community the great success of this natural experiment that seemed to fully support his theory of psychosexual neutrality (Money, 1975). Indeed, in early interviews with the children it appeared that Brenda was a typical little girl who liked to play with "girly" toys and do "girly" things.

However, Dr. Money was less than forthcoming

with information that seemed to argue against the success of the case. In reality, Brenda's parents were constantly concerned that their little girl wasn't really behaving as most girls did, and by the time Brenda was nearing adolescence, it was painfully obvious to the family that she was really having a hard time identifying as a female. In addition, Brenda was becoming increasingly reluctant to continue her visits with Dr. Money to the point that she threatened suicide if her parents made her go back to see him again.

At that point, Janet and Ronald disclosed the true nature of Brenda's early childhood to their daughter. While initially shocked, Brenda reported that things made sense to her now, and ultimately, by the time she was an adolescent, Brenda had decided to identify as a male. Thus, she became David Reimer.

David was quite comfortable in his masculine role. He made new friends and began to think about his future. Although his castration had left him infertile, he still wanted to be a father. In 1990, David married a single mother and loved his new role as a husband and father. In 1997, David was made aware that Dr. Money was continuing to publicize his case as a success supporting his theory of psychosexual

neutrality. This prompted David and his brother to go public with their experiences in attempt to discredit the doctor's publications. While this revelation created a firestorm in the scientific community for Dr. Money, it also triggered a series of unfortunate events that ultimately led to David committing suicide in 2004 (O'Connell, 2004).

This sad story speaks to the complexities involved in gender identity. While the Reimer case had earlier been paraded as a hallmark of how socialization trumped biology in terms of gender identity, the truth of the story made the scientific and medical communities more cautious in dealing with cases that involve intersex children and how to deal with their unique circumstances. In fact, stories like this one have prompted measures to prevent unnecessary harm and suffering to children who might have issues with gender identity. For example, in 2013, a law took effect in Germany allowing parents of intersex children to classify their children as indeterminate so that children can self-assign the appropriate gender once they have fully developed their own gender identities (Paramaguru, 2013).

91.

EMOTION

Learning Objectives

By the end of this section, you will be able to:

- Explain the major theories of emotion
- Describe the role that limbic structures play in emotional processing
- Understand the ubiquitous nature of producing and recognizing emotional expression

As we move through our daily lives, we experience a variety of emotions. An **emotion** is a subjective state of being that we often describe as our feelings. Emotions result from the combination of subjective experience, expression, cognitive

appraisal, and physiological responses (Levenson, Carstensen, Friesen, & Ekman, 1991). However, as discussed later in the chapter, the exact order in which the components occur is not clear, and some parts may happen at the same time. Generally, in the emotional process, we have some kind of antecedent event and this triggers the emotion. This antecedent event prompts our appraisal, which is the step where we try to make sense of the event. Depending on how we appraise the event, we get a different emotional response. The emotional response is comprised of three components: physiological changes, behavioural/expressive changes, and subjective changes (described in more detail in the tricky topic below).

The words emotion and mood are sometimes used interchangeably, but psychologists use these words to refer to two different things. Typically, the word emotion indicates a subjective, affective state that is relatively intense and that occurs in response to something we experience (Figure EM.20). Emotions are often thought to be consciously experienced and intentional. Mood, on the other hand, refers to a prolonged, less intense, affective state that does not occur in response to something we experience. Mood states may not be consciously recognized and do not carry the intentionality that is associated with emotion (Beedie, Terry, Lane, & Devonport, 2011). Here we will focus on emotion, and you will learn more about mood in the chapter that covers psychological disorders.

(a) (b)

Figure EM.20 Toddlers can cycle through emotions quickly, being (a) extremely happy one moment and (b) extremely sad the next. (credit a: modification of work by Kerry Ceszyk; credit b: modification of work by Kerry Ceszyk)

This section will outline some of the most well-known theories explaining our emotional experience and provide insight into the biological bases of emotion. This section closes with a discussion of the ubiquitous nature of facial expressions of emotion and our abilities to recognize those expressions in others.

Theories of Emotion

Our emotional states are combinations of physiological arousal, psychological appraisal, and subjective experiences. Together, these are the **components of emotion**, and our

experiences, backgrounds, and cultures inform our emotions. Therefore, different people may have different emotional experiences even when faced with similar circumstances. Over time, several different theories of emotion, shown in Figure EM.21, have been proposed to explain how the various components of emotion interact with one another.

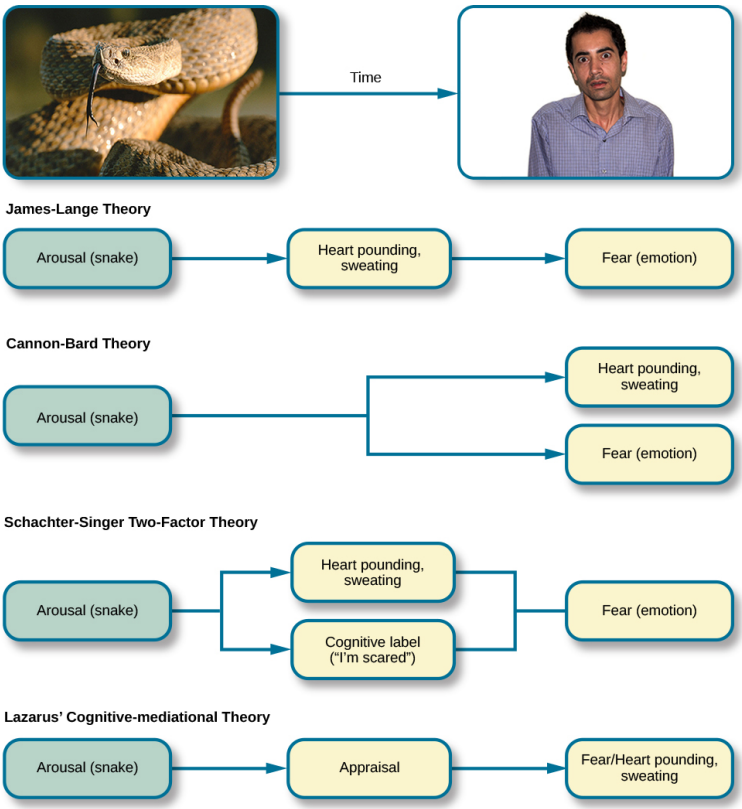

Figure EM.21 This figure illustrates the major assertions of the James-Lange, Cannon-Bard, and Schachter-Singer two-factor theories of emotion. (credit "snake": modification of work by "tableatny"/Flickr; credit "face": modification of work by Cory Zanker)

The James-Lange Theory

The **James-Lange theory** of emotion asserts that emotions arise from physiological arousal. Recall what you have learned about the sympathetic nervous system and our fight or flight

response when threatened. If you were to encounter some threat in your environment, like a venomous snake in your backyard, your sympathetic nervous system would initiate significant physiological arousal, which would make your heart race and increase your respiration rate. According to the James-Lange theory of emotion, you would only experience a feeling of fear after this physiological arousal had taken place. Furthermore, different arousal patterns would be associated with different feelings.

The Cannon-Bard Theory

Other theorists, however, doubted that the physiological arousal that occurs with different types of emotions is distinct enough to result in the wide variety of emotions that we experience. Thus, the **Cannon-Bard theory** of emotion was developed. According to this view, physiological arousal and emotional experience occur simultaneously, yet independently (Lang, 1994). So, when you see the venomous snake, you feel fear at exactly the same time that your body mounts its fight or flight response. This emotional reaction would be separate and independent of the physiological arousal, even though they co-occur.

Does smiling make you happy? Alternatively, does being happy make you smile? The facial feedback hypothesis proposes that your facial expression can actually affect your emotional experience (Adelman & Zajonc, 1989; Boiger & Mesquita, 2012; Buck, 1980; Capella, 1993; Soussignan, 2001;

Strack, Martin, & Stepper, 1988). Research investigating the facial feedback hypothesis suggested that suppression of facial expression of emotion lowered the intensity of some emotions experienced by participants (Davis, Senghas, & Ochsner, 2009). Havas, Glenberg, Gutowski, Lucarelli, and Davidson (2010) used Botox injections to paralyze facial muscles and limit facial expressions, including frowning, and they found that depressed people reported less depression after their frowning muscles were paralyzed. Other research found that the intensities of facial expressions affected the emotional reactions (Soussignan, 2002; Strack, Martin, & Stepper, 1988). In other words, if something insignificant occurs and you smile as if you just won lottery, you will actually be happier about the little thing than you would be if you only had a tiny smile. Conversely, if you walk around frowning all the time, it might cause you to have less positive emotions than you would if you had smiled. Interestingly, Soussignan (2002) also reported physiological arousal differences associated with the intensities of one type of smile.

The Schacter-Singer Two Factor Theory

The **Schachter-Singer two-factor theory** of emotion is another variation on theories of emotions that takes into account both physiological arousal and the emotional experience. According to this theory, emotions are composed of two factors: physiological and cognitive. In other words, physiological arousal is interpreted in context to produce the

emotional experience. In revisiting our example involving the venomous snake in your backyard, the two-factor theory maintains that the snake elicits sympathetic nervous system activation that is labeled as fear given the context, and our experience is that of fear. If you had labeled your sympathetic nervous system activation as joy, you would have experienced joy. The Schachter-Singer two-factor theory depends on labeling the physiological experience, which is a type of cognitive appraisal.

Magda Arnold was the first theorist to offer an exploration of the meaning of appraisal, and to present an outline of what the appraisal process might be and how it relates to emotion (Roseman & Smith, 2001). The key idea of appraisal theory is that you have thoughts (a cognitive appraisal) before you experience an emotion, and the emotion you experience depends on the thoughts you had (Frijda, 1988; Lazarus, 1991). If you think something is positive, you will have more positive emotions about it than if your appraisal was negative, and the opposite is true. Appraisal theory explains the way two people can have two completely different emotions regarding the same event. For example, suppose your psychology instructor selected you to lecture on emotion; you might see that as positive, because it represents an opportunity to be the center of attention, and you would experience happiness. However, if you dislike speaking in public, you could have a negative appraisal and experience discomfort.

Schachter and Singer believed that physiological arousal is

very similar across the different types of emotions that we experience, and therefore, the cognitive appraisal of the situation is critical to the actual emotion experienced. In fact, it might be possible to misattribute arousal to an emotional experience if the circumstances were right (Schachter & Singer, 1962). They performed a clever experiment to test their idea. Participants were randomly assigned to one of several groups. Some of the participants received injections of epinephrine that caused bodily changes that mimicked the fight-or-flight response of the sympathetic nervous system; however, only some of these participants were told to expect these reactions as side effects of the injection. The other participants that received injections of epinephrine were told either that the injection would have no side effects or that it would result in a side effect unrelated to a sympathetic response, such as itching feet or headache. After receiving these injections, participants waited in a room with someone else they thought was another subject in the research project. In reality, the other person was a confederate of the researcher. The confederate engaged in scripted displays of euphoric or angry behaviour (Schachter & Singer, 1962).

When those participants who were told that they should expect to feel symptoms of physiological arousal were asked about any emotional changes that they had experienced related to either euphoria or anger (depending on the way the confederate behaved), they reported none. However, the participants who weren't expecting physiological arousal as a

function of the injection were more likely to report that they experienced euphoria or anger as a function of their assigned confederate's behaviour. While everyone who received an injection of epinephrine experienced the same physiological arousal, only those who were not expecting the arousal used context to interpret the arousal as a change in emotional state (Schachter & Singer, 1962).

Strong emotional responses are associated with strong physiological arousal, which caused some theorists to suggest that the signs of physiological arousal, including increased heart rate, respiration rate, and sweating, might be used to determine whether someone is telling the truth or not. The assumption is that most of us would show signs of physiological arousal if we were being dishonest with someone. A **polygraph**, or lie detector test, measures the physiological arousal of an individual responding to a series of questions. Someone trained in reading these tests would look for answers to questions that are associated with increased levels of arousal as potential signs that the respondent may have been dishonest on those answers. While polygraphs are still commonly used, their validity and accuracy are highly questionable because there is no evidence that lying is associated with any particular pattern of physiological arousal (Saxe & Ben-Shakhar, 1999).

The Cognitive-Mediational Model

The relationship between our experiencing of emotions and our cognitive processing of them, and the order in which these

occur, remains a topic of research and debate. Lazarus (1991) developed the **cognitive-mediational theory** that asserts our emotions are determined by our appraisal of the stimulus. This appraisal mediates between the stimulus and the emotional response, and it is immediate and often unconscious. In contrast to the Schachter-Singer model, the appraisal precedes a cognitive label. You will learn more about Lazarus's appraisal concept when you study stress, health, and lifestyle. However, there are other views of emotions that also emphasize the cognitive processes.

Return to the example of being asked to lecture by your professor. Even if you do not enjoy speaking in public, you probably could manage to do it. You would purposefully control your emotions, which would allow you to speak, but we constantly regulate our emotions, and much of our emotion regulation occurs without us actively thinking about it. Mauss and her colleagues studied automatic emotion regulation (AER), which refers to the non-deliberate control of emotions. It is simply not reacting with your emotions, and AER can affect all aspects of emotional processes. AER can influence the things you attend to, your appraisal, your choice to engage in an emotional experience, and your behaviours after an emotion is experienced (Mauss, Bunge, & Gross, 2007; Mauss, Levenson, McCarter, Wilhelm, & Gross, 2005). AER is similar to other automatic cognitive processes in which sensations activate knowledge structures that affect

functioning. These knowledge structures can include concepts, schemas, or scripts.

The idea of AER is that people develop an automatic process that works like a script or schema, and the process does not require deliberate thought to regulate emotions. AER works like riding a bicycle. Once you develop the process, you just do it without thinking about it. AER can be adaptive or maladaptive and has important health implications (Hopp, Troy, & Mauss, 2011). Adaptive AER leads to better health outcomes than maladaptive AER, primarily due to experiencing or mitigating stressors better than people with maladaptive AERs (Hopp, Troy, & Mauss, 2011). Alternatively, maladaptive AERs may be critical for maintaining some psychological disorders (Hopp, Troy, & Mauss, 2011). Mauss and her colleagues found that strategies could reduce negative emotions, which in turn should increase psychological health (Mauss, Cook, Cheng, & Gross, 2007; Mauss, Cook, & Gross, 2007; Shallcross, Troy, Boland, & Mauss, 2010; Troy, Shallcross, & Mauss, 2013; Troy, Wilhelm, Shallcross, & Mauss, 2010). Mauss has also suggested there are problems with the way emotions are measured, but she believes most of the aspects of emotions that are typically measured are useful (Mauss, et al., 2005; Mauss & Robinson, 2009). However, another way of considering emotions challenges our entire understanding of emotions.

After about three decades of interdisciplinary research, Barrett argued that we do not understand emotions. She

proposed that emotions were not built into your brain at birth, but rather they were constructed based on your experiences. Emotions in the constructivist theory are predictions that construct your experience of the world. In chapter 7 you learned that concepts are categories or groupings of linguistic information, images, ideas, or memories, such as life experiences. Barrett extended that to include emotions as concepts that are predictions (Barrett, 2017). Two identical physiological states can result in different emotional states depending on your predictions. For example, your brain predicting a churning stomach in a bakery could lead to you constructing hunger. However, your brain predicting a churning stomach while you were waiting for medical test results could lead your brain to construct worry. Thus, you can construct two different emotions from the same physiological sensations. Rather than emotions being something over which you have no control, you can control and influence your emotions.

TRICKY TOPIC: THEORIES OF EMOTION

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For a full transcript of this video, click here

Two other prominent views arise from the work of Robert Zajonc and Joseph LeDoux. Zajonc asserted that some emotions occur separately from or prior to our cognitive interpretation of them, such as feeling fear in response to an unexpected loud sound (Zajonc, 1998). He also believed in what we might casually refer to as a gut feeling—that we can experience an instantaneous and unexplainable like or dislike for someone or something (Zajonc, 1980). LeDoux also views some emotions as requiring no cognition: some emotions completely bypass contextual interpretation. His research into the neuroscience of emotion has demonstrated the amygdala's primary role in fear (Cunha, Monfils, & LeDoux, 2010; LeDoux 1996, 2002). A fear stimulus is processed by the brain through one of two paths: from the thalamus (where it is perceived) directly to the amygdala or from the thalamus through the cortex and then to the amygdala. The first path is quick, while the second enables more processing about details

of the stimulus. In the following section, we will look more closely at the neuroscience of emotional response.

Link to Learning

Watch this video in which Dr. Lisa Feldman Barrett explains constructed emotions, to learn more.

The Biology of Emotions

The limbic system, which is the area of the brain involved in emotion and memory (Figure EM.22) includes the hypothalamus, thalamus, amygdala, and the hippocampus. The hypothalamus plays a role in the activation of the sympathetic nervous system that is a part of any given emotional reaction. The thalamus serves as a sensory relay centre whose neurons project to both the amygdala and the higher cortical regions for further processing. The amygdala plays a role in processing emotional information and sending that information on (Fossati, 2012).The hippocampus

integrates emotional experience with cognition (Femenía, Gómez-Galán, Lindskog, & Magara, 2012).

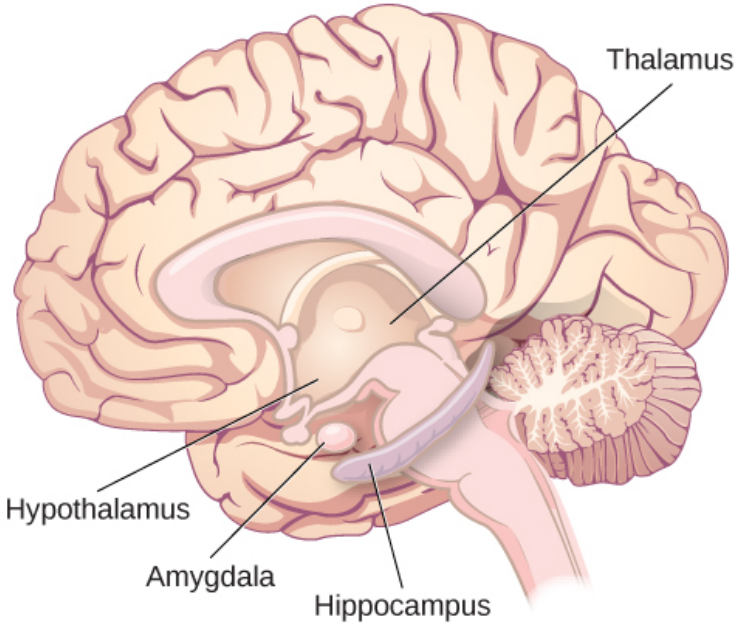

Figure EM.22 The limbic system, which includes the hypothalamus, thalamus, amygdala, and the hippocampus, is involved in mediating emotional response and memory.

Link to Learning

Explore this interactive 3D brain simulator from Open Colleges, for a refresher on the brain's parts and functions. To begin, click the 'start exploring' button. To access the limbic system, click the "+" symbol in the right-hand menu (set of three tabs).

Amygdala

The amygdala has received a great deal of attention from researchers interested in understanding the biological basis for emotions, especially fear and anxiety (Blackford & Pine, 2012; Goosens & Maren, 2002; Maren, Phan, & Liberzon, 2013). The amygdala is composed of various subnuclei, including the basolateral complex and the central nucleus (Figure EM.23). The **basolateral complex** has dense connections with a variety of sensory areas of the brain. It is critical for classical conditioning and for attaching emotional value to learning processes and memory. The **central nucleus** plays a role in attention, and it has connections with the hypothalamus and

various brainstem areas to regulate the autonomic nervous and endocrine systems' activity (Pessoa, 2010).

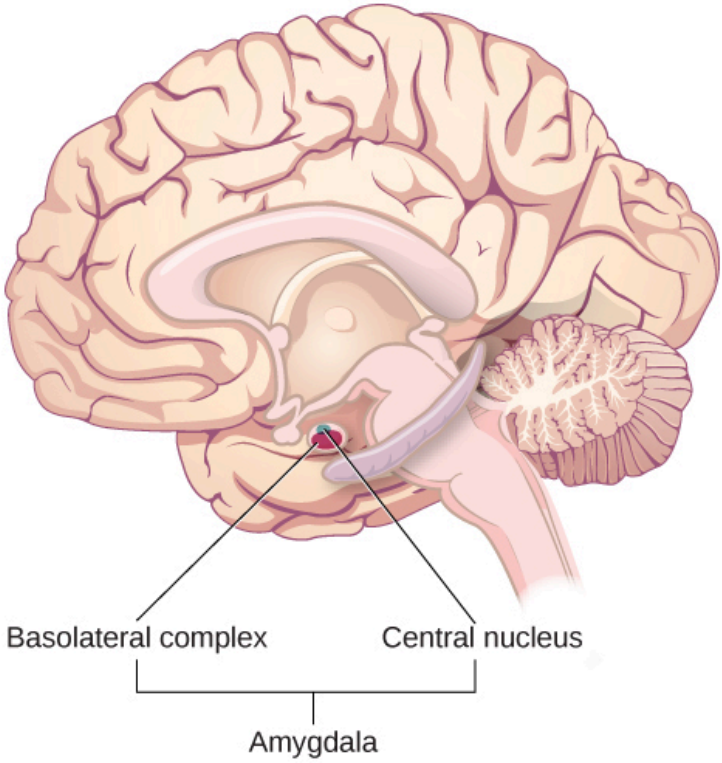

Figure EM.23 The anatomy of the basolateral complex and central nucleus of the amygdala are illustrated in this diagram.

Animal research has demonstrated that there is increased activation of the amygdala in rat pups that have odour cues paired with electrical shock when their birth parent is absent. This leads to an aversion to the odour cue that suggests the rats learned to fear the odour cue. Interestingly, when the birth

parent was present, the rats actually showed a preference for the odour cue despite its association with an electrical shock. This preference was associated with no increases in amygdala activation. This suggests a differential effect on the amygdala by the *context* (the presence or absence of the mother) determined whether the pups learned to fear the odour or to be attracted to it (Moriceau & Sullivan, 2006).

Raineki, Cortés, Belnoue, and Sullivan (2012) demonstrated that, in rats, negative early life experiences could alter the function of the amygdala and result in adolescent patterns of behaviour that mimic human mood disorders. In this study, rat pups received either abusive or normal treatment during postnatal days 8–12. There were two forms of abusive treatment. The first form of abusive treatment had an insufficient bedding condition. The mother rat had insufficient bedding material in their cage to build a proper nest that resulted in them spending more time away from the pups trying to construct a nest and less times nursing the pups. The second form of abusive treatment had an associative learning task that involved pairing odours and an electrical stimulus in the absence of the mother, as described above. The control group was in a cage with sufficient bedding and was left undisturbed with their parents during the same time period. The rat pups that experienced abuse were much more likely to exhibit depressive-like symptoms during adolescence when compared to controls. These depressive-like behaviours were associated with increased activation of the amygdala.

Human research also suggests a relationship between the amygdala and psychological disorders of mood or anxiety. Changes in amygdala structure and function have been demonstrated in adolescents who are either at-risk or have been diagnosed with various mood and/or anxiety disorders (Miguel-Hidalgo, 2013; Qin et al., 2013). It has also been suggested that functional differences in the amygdala could serve as a biomarker to differentiate individuals suffering from bipolar disorder from those suffering from major depressive disorder (Fournier, Keener, Almeida, Kronhaus, & Phillips, 2013).

Hippocampus

As mentioned earlier, the hippocampus is also involved in emotional processing. Like the amygdala, research has demonstrated that hippocampal structure and function are linked to a variety of mood and anxiety disorders. Individuals suffering from posttraumatic stress disorder (PTSD) show marked reductions in the volume of several parts of the hippocampus, which may result from decreased levels of neurogenesis and dendritic branching (the generation of new neurons and the generation of new dendrites in existing neurons, respectively) (Wang et al., 2010). While it is impossible to make a causal claim with correlational research like this, studies have demonstrated behavioural improvements and hippocampal volume increases following either pharmacological or cognitive-behavioural therapy in

individuals suffering from PTSD (Bremner & Vermetten, 2004; Levy-Gigi, Szabó, Kelemen, & Kéri, 2013).

Facial Expression and Recognition of Emotions

Culture can impact the way in which people display emotion. A **cultural display rule** is one of a collection of culturally specific standards that govern the types and frequencies of displays of emotions that are acceptable (Malatesta & Haviland, 1982). Therefore, people from varying cultural backgrounds can have very different cultural display rules of emotion. For example, research has shown that individuals from the United States express negative emotions like fear, anger, and disgust both alone and in the presence of others, while Japanese individuals only do so while alone (Matsumoto, 1990). Furthermore, individuals from cultures that tend to emphasize social cohesion are more likely to engage in suppression of emotional reaction so they can evaluate which response is most appropriate in a given context (Matsumoto, Yoo, & Nakagawa, 2008).

Other distinct cultural characteristics might be involved in emotionality. For instance, there may be gender differences involved in emotional processing. While research into gender differences in emotional display is equivocal, there is some evidence that men and women may differ in regulation of emotions (McRae, Ochsner, Mauss, Gabrieli, & Gross, 2008).

Paul Ekman (1972) researched a New Guinea man who was living in a preliterate culture using stone implements, and which was isolated and had never seen any outsiders before. Ekman asked the man to show what his facial expression would be if: (1) friends visited, (2) his child had just died, (3) he was about to fight, (4) he stepped on a smelly dead pig. After Ekman's return from New Guinea, he researched facial expressions for more than four decades. Despite different emotional display rules, our ability to recognize and produce facial expressions of emotion appears to be universal. In fact, even congenitally blind individuals produce the same facial expression of emotions, despite their never having the opportunity to observe these facial displays of emotion in other people. This would seem to suggest that the pattern of activity in facial muscles involved in generating emotional expressions is universal, and indeed, this idea was suggested in the late 19th century in Charles Darwin's book *The Expression of Emotions in Man and Animals* (1872). In fact, there is substantial evidence for seven universal emotions that are each associated with distinct facial expressions. These include: happiness, surprise, sadness, fright (fear), disgust, contempt, and anger (Figure EM.24) (Ekman & Keltner, 1997).

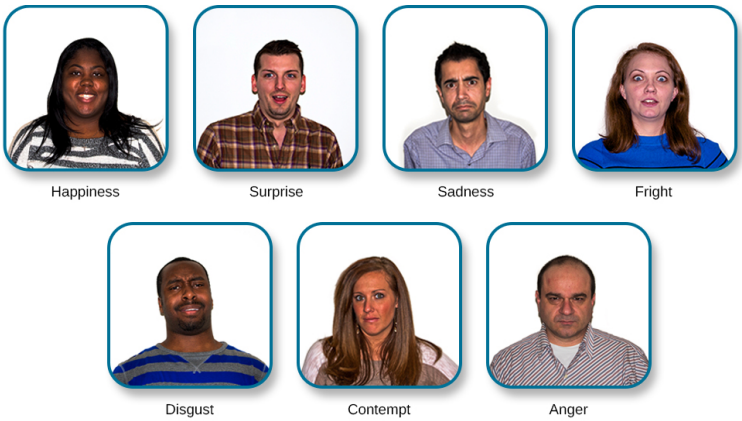

Figure EM.24 The seven universal facial expressions of emotion are shown. (credit: modification of work by Cory Zanker)

Of course, emotion is not only displayed through facial expression. We also use the tone of our voices, various behaviours, and body language to communicate information about our emotional states. **Body language** is the expression of emotion in terms of body position or movement. Research suggests that we are quite sensitive to the emotional information communicated through body language, even if we're not consciously aware of it (de Gelder, 2006; Tamietto et al., 2009).

TRICKY TOPIC: THE EMOTIONAL RESPONSE

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92.

KEY TERMS FOR MOTIVATION AND EMOTION

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anorexia nervosa
: eating disorder characterized by an individual maintaining body weight that is well below average through starvation and/or excessive exercise

basolateral complex
: part of the brain with dense connections with a variety of sensory areas of the brain; it is critical for classical conditioning and attaching emotional value to memory

binge eating disorder
: type of eating disorder characterized by binge eating and associated distress

bisexual
: emotional and erotic attractions to both same-sexed individuals and opposite-sexed individuals

body language
: emotional expression through body position or movement

bulimia nervosa

type of eating disorder characterized by binge eating followed by purging

Cannon-Bard theory of emotion

physiological arousal and emotional experience occur at the same time

central nucleus

part of the brain involved in attention and has connections with the hypothalamus and various brainstem areas to regulate the autonomic nervous and endocrine systems' activity

cognitive-mediational theory

our emotions are determined by our appraisal of the stimulus

components of emotion

physiological arousal, psychological appraisal, and subjective experience

cultural display rule

one of the culturally specific standards that govern the types and frequencies of emotions that are acceptable

distorted body image

individuals view themselves as overweight even though they are not

drive theory

deviations from homeostasis create physiological needs that result in psychological drive states that direct behaviour to meet the need and ultimately bring the

system back to homeostasis

emotion

subjective state of being often described as feelings

excitement

phase of the sexual response cycle that involves sexual arousal

extrinsic motivation

motivation that arises from external factors or rewards

facial feedback hypothesis

facial expressions are capable of influencing our emotions

gender dysphoria

diagnostic category in DSM-5 for individuals who do not identify as the gender associated with their biological sex

gender identity

individual's sense of having a particular gender

habit

pattern of behaviour in which we regularly engage

heterosexual

emotional and erotic attractions to opposite-sexed individuals

hierarchy of needs

spectrum of needs ranging from basic biological needs to social needs to self-actualization

homosexual

emotional and erotic attractions to same-sexed

individuals

instinct

species-specific pattern of behaviour that is unlearned

intrinsic motivation

motivation based on internal feelings rather than external rewards

James-Lange theory of emotion

emotions arise from physiological arousal

leptin

satiety hormone

metabolic rate

amount of energy that is expended in a given period of time

motivation

wants or needs that direct behaviour toward some goal

orgasm

peak phase of the sexual response cycle associated with rhythmic muscle contractions (and ejaculation)

overweight

adult with a BMI between 25 and 29.9

plateau

phase of the sexual response cycle that falls between excitement and orgasm

polygraph

lie detector test that measures physiological arousal of individuals as they answer a series of questions

refractory period
time immediately following an orgasm during which an individual is incapable of experiencing another orgasm

resolution
phase of the sexual response cycle following orgasm during which the body returns to its unaroused state

satiation
fullness; satisfaction

Schachter-Singer two-factor theory of emotion
emotions consist of two factors: physiological and cognitive

self-efficacy
individual's belief in their own capabilities or capacities to complete a task

set point theory
assertion that each individual has an ideal body weight, or set point, that is resistant to change

sexual orientation
one's emotional and erotic attraction to others

sexual response cycle
divided into 4 phases including excitement, plateau, orgasm, and resolution

hormone therapy
use of hormones to change the appearance of one's body, often used to treat gender dysphoria

Yerkes-Dodson law
simple tasks are performed best when arousal levels are

relatively high, while complex tasks are best performed when arousal is lower

93.

SUMMARY FOR MOTIVATION AND EMOTION

EM.1 Motivation

Motivation to engage in a given behaviour can come from internal and/or external factors. Multiple theories have been put forward regarding motivation. More biologically oriented theories deal with the ways that instincts and the need to maintain bodily homeostasis motivate behaviour. Bandura postulated that our sense of self-efficacy motivates behaviours, and there are a number of theories that focus on a variety of social motives. Abraham Maslow's hierarchy of needs is a model that shows the relationship among multiple motives that range from lower-level physiological needs to the very high level of self-actualization.

EM.2 Hunger and Eating

Hunger and satiety are highly regulated processes that result

in a person maintaining a fairly stable weight that is resistant to change. When more calories are consumed than expended, a person will store excess energy as fat. Hunger and satiety are influenced by the hypothalamus and other signals within the body. Sociocultural factors that emphasize thinness as a beauty ideal and a genetic predisposition contribute to the development of eating disorders in many young females, though eating disorders span ages and genders.

EM.3 Sexual Behaviour

The hypothalamus and structures of the limbic system are important in sexual behaviour and motivation. There is evidence to suggest that our motivation to engage in sexual behaviour and our ability to do so are related, but separate, processes. Alfred Kinsey conducted large-scale survey research that demonstrated the incredible diversity of human sexuality. William Masters and Virginia Johnson observed individuals engaging in sexual behaviour in developing their concept of the sexual response cycle. While often confused, sexual orientation and gender identity are related, but distinct, concepts.

EM.4 Emotion

Emotions are subjective experiences that consist of physiological arousal and cognitive appraisal. Various theories

have been put forward to explain our emotional experiences. The James-Lange theory asserts that emotions arise as a function of physiological arousal. The Cannon-Bard theory maintains that emotional experience occurs simultaneous to and independent of physiological arousal. The Schachter-Singer two-factor theory suggests that physiological arousal receives cognitive labels as a function of the relevant context and that these two factors together result in an emotional experience.

The limbic system is the brain's emotional circuit, which includes the amygdala and the hippocampus. Both of these structures are implicated in playing a role in normal emotional processing as well as in psychological mood and anxiety disorders. Increased amygdala activity is associated with learning to fear, and it is seen in individuals who are at risk for or suffering from mood disorders. The volume of the hippocampus has been shown to be reduced in individuals suffering from posttraumatic stress disorder.

The ability to produce and recognize facial expressions of emotions seems to be universal regardless of cultural background. However, there are cultural display rules which influence how often and under what circumstances various emotions can be expressed. Tone of voice and body language also serve as a means by which we communicate information about our emotional states.

94.

REVIEW QUESTIONS FOR EMOTION AND MOTIVATION

Click here for Answer Key

Multiple Choice Questions

1. Need for _____ refers to maintaining positive relationships with others.

A. achievement
B. affiliation
C. intimacy
D. power

2. _____ proposed the hierarchy of needs.

A. William James
B. David McClelland
C. Abraham Maslow
D. Albert Bandura

3. _____ is an individual's belief in their capability to complete some task.

A. physiological needs
B. self-esteem
C. self-actualization
D. self-efficacy

4. Riley mows the yard of their elderly neighbor each week for $20. What type of motivation is this?

A. extrinsic
B. intrinsic
C. drive
D. biological

5. _____ is a chemical messenger secreted by fat cells that acts as an appetite suppressant.

A. orexin
B. angiotensin
C. leptin
D. ghrelin

6. _____ is characterized by episodes of binge eating followed by attempts to compensate for the excessive amount of food that was consumed.

A. Prader-Willi syndrome
B. morbid obesity
C. anorexia nervosa
D. bulimia nervosa

7. Animal research suggests that in male rats the _____ is critical for the ability to engage in sexual behaviour, but not for the motivation to do so.

A. nucleus accumbens
B. amygdala
C. medial preoptic area of the hypothalamus
D. hippocampus

8. During the _____ phase of the sexual response cycle, individuals experience rhythmic contractions of the pelvis that are accompanied by uterine contractions in those with vaginas and ejaculation in those with penises.

A. excitement
B. plateau
C. orgasm
D. resolution

9. Which of the following findings was not a result of the Kinsey study?

A. Sexual desire and sexual ability can be separate functions.
B. Females enjoy sex as much as males.
C. Homosexual behaviour is fairly common.
D. Masturbation has no adverse consequences.

10. If someone is uncomfortable identifying with the gender normally associated with their biological sex, then they could be classified as experiencing _____.

A. homosexuality
B. bisexuality
C. asexuality
D. gender dysphoria

11. Individuals suffering from posttraumatic stress disorder have been shown to have reduced volumes of the _____.

A. amygdala
B. hippocampus
C. hypothalamus
D. thalamus

12. According to the _____ theory of emotion, emotional experiences arise from physiological arousal.

A. James-Lange
B. Cannon-Bard

C. Schachter-Singer two-factor
D. Darwinian

13. Which of the following is not one of the seven universal emotions described in this chapter?

A. contempt
B. disgust
C. melancholy
D. anger

14. Which of the following theories of emotion would suggest that polygraphs should be quite accurate at differentiating one emotion from another?

A. Cannon-Bard theory
B. James-Lange theory
C. Schachter-Singer two-factor theory
D. Darwinian theory

Critical Thinking Questions

15. How might someone espousing an arousal theory of motivation explain visiting an amusement park?

16. Schools often use concrete rewards to increase adaptive behaviours. How might this be a disadvantage for students intrinsically motivated to learn? What are educational

implications of the potential for concrete rewards to diminish intrinsic motivation for a given task?

17. As indicated in this section, Caucasian women from industrialized, Western cultures tend to be at the highest risk for eating disorders like anorexia and bulimia nervosa. Why might this be?

18. While much research has been conducted on how an individual develops a given sexual orientation, many people question the validity of this research citing that the participants used may not be representative. Why do you think this might be a legitimate concern?

19. There is no reliable scientific evidence that gay conversion therapy actually works. What kinds of evidence would you need to see in order to be convinced by someone arguing that she had successfully converted her sexual orientation?

20. Imagine you find a venomous snake crawling up your leg just after taking a drug that prevented sympathetic nervous system activation. What would the James-Lange theory predict about your experience?

21. Why can we not make causal claims regarding the relationship between the volume of the hippocampus and PTSD?

Personal Application Questions

22. Can you think of recent examples of how Maslow's hierarchy of needs might have affected your behaviour in some way?

23. Think about popular television programs on the air right now. What do the people in these programs look like? What kinds of messages do you think the media is sending about the people in our society?

24. Think about times in your life when you have been absolutely elated (e.g., perhaps your school's basketball team just won a closely contested ballgame for the national championship) and very fearful (e.g., you are about to give a speech in your public speaking class to a roomful of 100 strangers). How would you describe how your arousal manifested itself physically? Were there marked differences in physiological arousal associated with each emotional state?

95.

ACKNOWLEDGEMENTS & ATTRIBUTIONS

Motivation

Jocelyn Paul revised and rewrote the Hierarchy of Needs portion of this section. This new section now explores a more inclusive understanding of needs models, expanding beyond the narrow scope of Maslow. Jocelyn added new content highlighting Maslow's influence from his time with the Blackfoot Nation, as well as related concepts from the Mi'kmaq and Haudenosaunee peoples. Editing work on this section was completed by **Max Dysart**.

CHAPTER XI
PERSONALITY

96.

INTRODUCTION TO PERSONALITY

Chapter Outline

- What Is Personality?
- Freud and the Psychodynamic Perspective
- Neo-Freudians: Adler, Erikson, Jung, and Horney
- Approaches to Personality
- Trait Theorists
- Cultural Understandings of Personality
- Personality Assessment

Figure P.1 What makes two individuals have different personalities? (credit: modification of work by Nicolas Alejandro)

Three months before William Jefferson Blythe III was born, his father died in a car accident. He was raised by his mother, Virginia Dell, and grandparents, in Hope, Arkansas. When he turned 4, his mother married Roger Clinton, Jr., an alcoholic who was physically abusive to William's mother. Six years later, Virginia gave birth to another son, Roger. William, who later took the last name Clinton from his stepfather, became the 42nd president of the United States. While Bill Clinton was making his political ascendance, his half-brother, Roger Clinton, was arrested numerous times for drug charges, including possession, conspiracy to distribute cocaine, and driving under the influence, serving time in jail. Two brothers, raised by the same people, took radically different paths in their lives. Why did they make the choices they did? What internal

forces shaped their decisions? Personality psychology can help us answer these questions and more.

97.

WHAT IS PERSONALITY?

Learning Objectives

By the end of this section, you will be able to:

- Define personality
- Describe early theories about personality development

Personality refers to the long-standing traits and patterns that propel individuals to consistently think, feel, and behave in specific ways. Our personality is what makes us unique individuals. Each person has an idiosyncratic pattern of enduring, long-term characteristics and a manner in which they interacts with other individuals and the world around

them. Our personalities are thought to be long term, stable, and not easily changed. The word *personality* comes from the Latin word *persona*. In the ancient world, a persona was a mask worn by an actor. While we tend to think of a mask as being worn to conceal one's identity, the theatrical mask was originally used to either represent or project a specific personality trait of a character (Figure P.2).

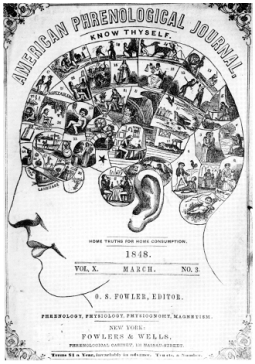
Figure P.2 Happy, sad, impatient, shy, fearful, curious, helpful. What characteristics describe your personality?

Historical Perspectives

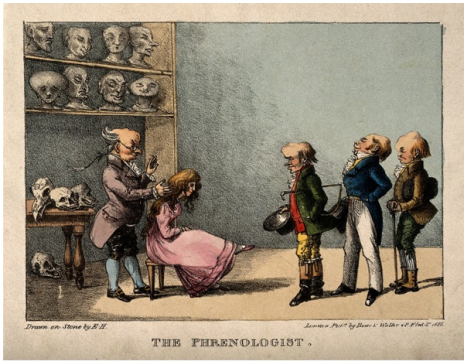
The concept of personality has been studied for at least 2,000 years, beginning with Hippocrates in 370 BCE (Fazeli, 2012). Hippocrates theorized that personality traits and human behaviours are based on four separate temperaments associated with four fluids ("humors") of the body: choleric temperament (yellow bile from the liver), melancholic

temperament (black bile from the kidneys), sanguine temperament (red blood from the heart), and phlegmatic temperament (white phlegm from the lungs) (Clark & Watson, 2008; Eysenck & Eysenck, 1985; Lecci & Magnavita, 2013; Noga, 2007). Centuries later, the influential Greek physician and philosopher Galen built on Hippocrates's theory, suggesting that both diseases and personality differences could be explained by imbalances in the humors and that each person exhibits one of the four temperaments. For example, the choleric person is passionate, ambitious, and bold; the melancholic person is reserved, anxious, and unhappy; the sanguine person is joyful, eager, and optimistic; and the phlegmatic person is calm, reliable, and thoughtful (Clark & Watson, 2008; Stelmack & Stalikas, 1991). Galen's theory was prevalent for over 1,000 years and continued to be popular through the Middle Ages.

In 1780, Franz Gall, a German physician, proposed that the distances between bumps on the skull reveal a person's personality traits, character, and mental abilities (Figure P.3). According to Gall, measuring these distances revealed the sizes of the brain areas underneath, providing information that could be used to determine whether a person was friendly, prideful, murderous, kind, good with languages, and so on. Initially, phrenology was very popular; however, it was soon discredited for lack of empirical support and has long been relegated to the status of pseudoscience (Fancher, 1979).



(a)



(b)

Figure P.3 The pseudoscience of measuring the areas of a person's skull is known as phrenology. (a) Gall developed a chart that depicted which areas of the skull corresponded to particular personality traits or characteristics (Hothersall, 1995). (b) An 1825 lithograph depicts Gall examining the skull of a young woman. (credit b: modification of work by Wellcome Library, London)

In the centuries after Galen, other researchers contributed to the development of his four primary temperament types, most prominently Immanuel Kant (in the 18th century) and psychologist Wilhelm Wundt (in the 19th century) (Eysenck, 2009; Stelmack & Stalikas, 1991; Wundt, 1874/1886) (Figure P.4). Kant agreed with Galen that everyone could be sorted into one of the four temperaments and that there was no overlap between the four categories (Eysenck, 2009). He developed a list of traits that could be used to describe the personality of a person from each of the four temperaments. However, Wundt suggested that a better description of personality could be achieved using two major axes:

emotional/nonemotional and changeable/unchangeable. The first axis separated strong from weak emotions (the melancholic and choleric temperaments from the phlegmatic and sanguine). The second axis divided the changeable temperaments (choleric and sanguine) from the unchangeable ones (melancholic and phlegmatic) (Eysenck, 2009).

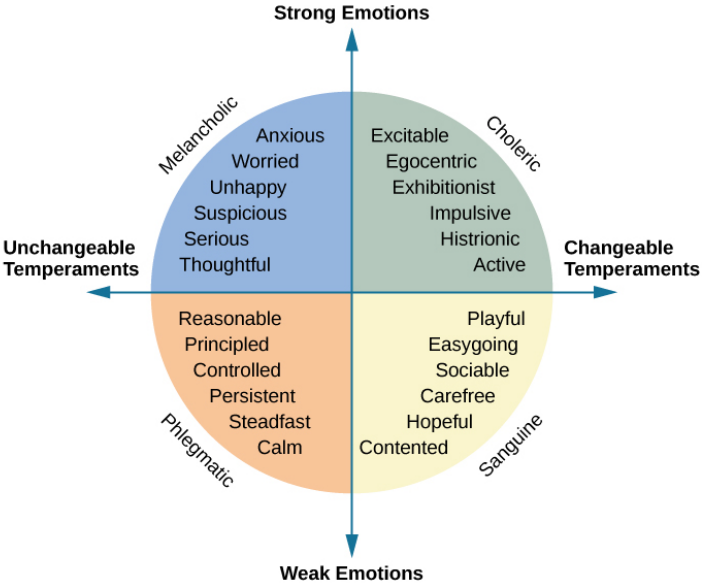


Figure P.4 Developed from Galen's theory of the four temperaments, Kant proposed trait words to describe each temperament. Wundt later suggested the arrangement of the traits on two major axes.

Sigmund Freud's psychodynamic perspective of personality was the first comprehensive theory of personality, explaining a wide variety of both normal and abnormal behaviours.

According to Freud, unconscious drives influenced by sex and aggression, along with childhood sexuality, are the forces that influence our personality. Freud attracted many followers who modified his ideas to create new theories about personality. These theorists, referred to as neo-Freudians, generally agreed with Freud that childhood experiences matter, but they reduced the emphasis on sex and focused more on the social environment and effects of culture on personality. The perspective of personality proposed by Freud and his followers was the dominant theory of personality for the first half of the 20th century.

Other major theories then emerged, including the learning, humanistic, biological, evolutionary, trait, and cultural perspectives. In this chapter, we will explore these various perspectives on personality in depth.

Link to Learning

Watch this video for an overview of Personality Psychology from the Society for Personality and Social Psychology, to learn more.

98.

FREUD AND THE PSYCHOANALYTIC PERSPECTIVE

Learning Objectives

By the end of this section, you will be able to:

- Describe the assumptions of the psychoanalytic perspective on personality development
- Define and describe the nature and function of the id, ego, and superego
- Define and describe the defence mechanisms

Sigmund Freud (1856–1939) is probably the most controversial and misunderstood psychological theorist. When reading Freud's theories, it is important to remember that he was a medical doctor, not a psychologist. There was no such thing as a degree in psychology at the time that he received his education, which can help us understand some of the controversy over his theories today. However, Freud was the first to systematically study and theorize the workings of the unconscious mind in the manner that we associate with modern psychology.

In the early years of his career, Freud worked with Josef Breuer, a Viennese physician. During this time, Freud became intrigued by the story of one of Breuer's patients, Bertha Pappenheim, who was referred to by the pseudonym Anna O. (Launer, 2005). Anna O. had been caring for her dying father when she began to experience symptoms such as partial paralysis, headaches, blurred vision, amnesia, and hallucinations (Launer, 2005). In Freud's day, these symptoms were commonly referred to as hysteria. Anna O. turned to Breuer for help. He spent 2 years (1880–1882) treating Anna O. and discovered that allowing her to talk about her experiences seemed to bring some relief of her symptoms. Anna O. called his treatment the "talking cure" (Launer, 2005). Despite the fact the Freud never met Anna O., her story served as the basis for the 1895 book, *Studies on Hysteria*, which he co-authored with Breuer. Based on Breuer's description of Anna O.'s treatment, Freud concluded that

hysteria was the result of sexual abuse in childhood and that these traumatic experiences had been hidden from consciousness. Breuer disagreed with Freud, which soon ended their work together. However, Freud continued to work to refine talk therapy and build his theory on personality.

TRICKY TOPIC: FREUD'S THEORY OF PERSONALITY

One or more interactive elements has been excluded from this version of the text. You can view them online here: https://caul-cbua.pressbooks.pub/intropsychneuro/?p=506#oembed-1

If the video above does not load, click here: https://youtu.be/qWY-JQ7etKo
For a full transcript of this video, click here

Levels of Consciousness

To explain the concept of conscious versus unconscious experience, Freud compared the mind to an iceberg (Figure P.5). He said that only about one-tenth of our mind is **conscious**, and the rest of our mind is **unconscious**. Our

unconscious refers to that mental activity of which we are unaware and are unable to access (Freud, 1923). According to Freud, unacceptable urges and desires are kept in our unconscious through a process called repression. For example, we sometimes say things that we don't intend to say by unintentionally substituting another word for the one we meant. You've probably heard of a Freudian slip, the term used to describe this. Freud suggested that slips of the tongue are actually sexual or aggressive urges, accidentally slipping out of our unconscious. Speech errors such as this are quite common. Seeing them as a reflection of unconscious desires, linguists today have found that slips of the tongue tend to occur when we are tired, nervous, or not at our optimal level of cognitive functioning (Motley, 2002).

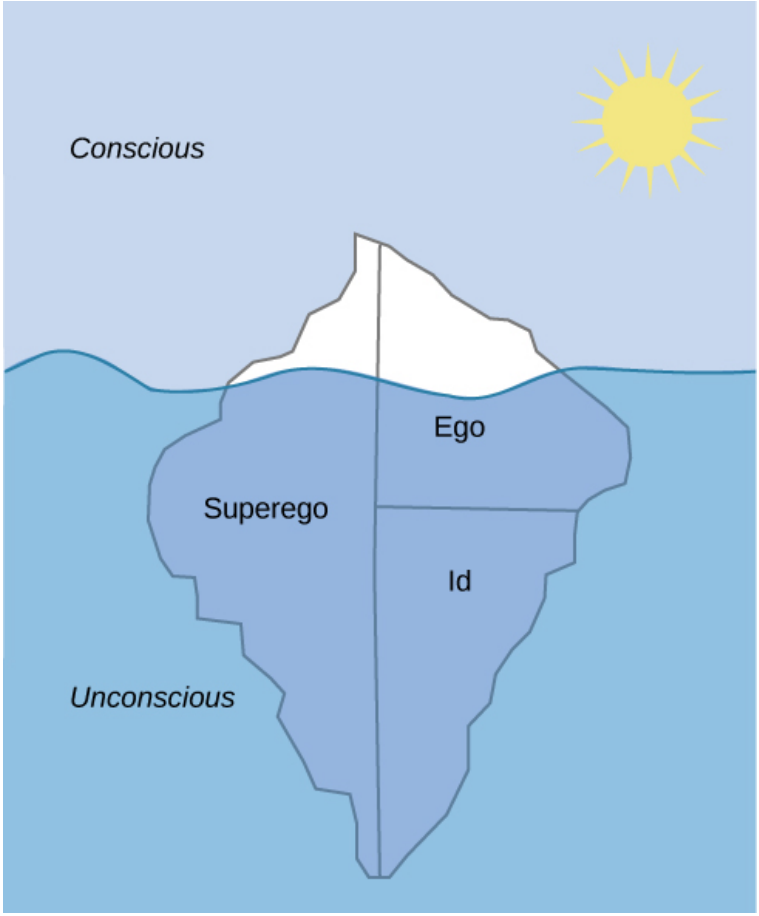


Figure P.5 Freud believed that we are only aware of a small amount of our mind's activities and that most of it remains hidden from us in our unconscious. The information in our unconscious affects our behaviour, although we are unaware of it.

According to Freud, our personality develops from a conflict between two forces: our biological aggressive and pleasure-

seeking drives versus our internal (socialized) control over these drives. Our personality is the result of our efforts to balance these two competing forces. Freud suggested that we can understand this by imagining three interacting systems within our minds. He called them the id, ego, and superego (Figure P.6).

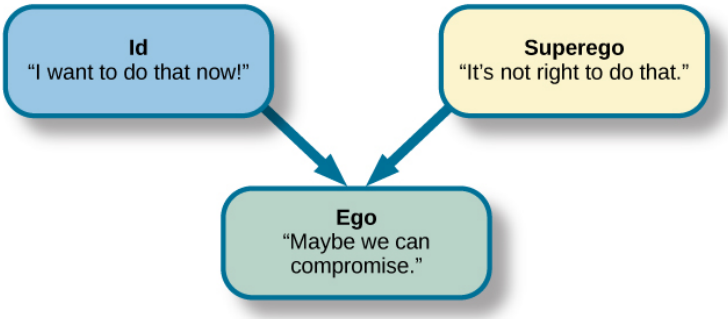


Figure P.6 The job of the ego, or self, is to balance the aggressive/pleasure-seeking drives of the id with the moral control of the superego.

The unconscious **id** contains our most primitive drives or urges, and is present from birth. It directs impulses for hunger, thirst, and sex. Freud believed that the id operates on what he called the "pleasure principle," in which the id seeks immediate gratification. Through social interactions with parents and others in a child's environment, the ego and superego develop to help control the id.

The **superego** develops as a child interacts with others, learning the social rules for right and wrong. The superego

acts as our conscience; it is our moral compass that tells us how we should behave. It strives for perfection and judges our behaviour, leading to feelings of pride or—when we fall short of the ideal—feelings of guilt. In contrast to the instinctual id and the rule-based superego, the **ego** is the rational part of our personality. It's what Freud considered to be the self, and it is the part of our personality that is seen by others. Its job is to balance the demands of the id and superego in the context of reality; thus, it operates on what Freud called the "reality principle." The ego helps the id satisfy its desires in a realistic way.

The id and superego are in constant conflict, because the id wants instant gratification regardless of the consequences, but the superego tells us that we must behave in socially acceptable ways. Thus, the ego's job is to find the middle ground. It helps satisfy the id's desires in a rational way that will not lead us to feelings of guilt. According to Freud, a person who has a strong ego, which can balance the demands of the id and the superego, has a healthy personality. Freud maintained that imbalances in the system can lead to **neurosis** (a tendency to experience negative emotions), anxiety disorders, or unhealthy behaviours. For example, a person who is dominated by their id might be narcissistic and impulsive. A person with a dominant superego might be controlled by feelings of guilt and deny themselves even socially acceptable pleasures; conversely, if the superego is weak or absent, a person might

become a psychopath. An overly dominant superego might be seen in an over-controlled individual whose rational grasp on reality is so strong that they are unaware of their emotional needs, or, in a neurotic who is overly defensive (overusing ego defence mechanisms).

Defence Mechanisms

Freud believed that feelings of anxiety result from the ego's inability to mediate the conflict between the id and superego. When this happens, Freud believed that the ego seeks to restore balance through various protective measures known as **defence mechanisms** (Figure P.7). When certain events, feelings, or yearnings cause an individual anxiety, the individual wishes to reduce that anxiety. To do that, the individual's unconscious mind uses ego defence mechanisms, unconscious protective behaviours that aim to reduce anxiety. The ego, usually conscious, resorts to unconscious strivings to protect the ego from being overwhelmed by anxiety. When we use defence mechanisms, we are unaware that we are using them. Further, they operate in various ways that distort reality. According to Freud, we all use ego defence mechanisms.

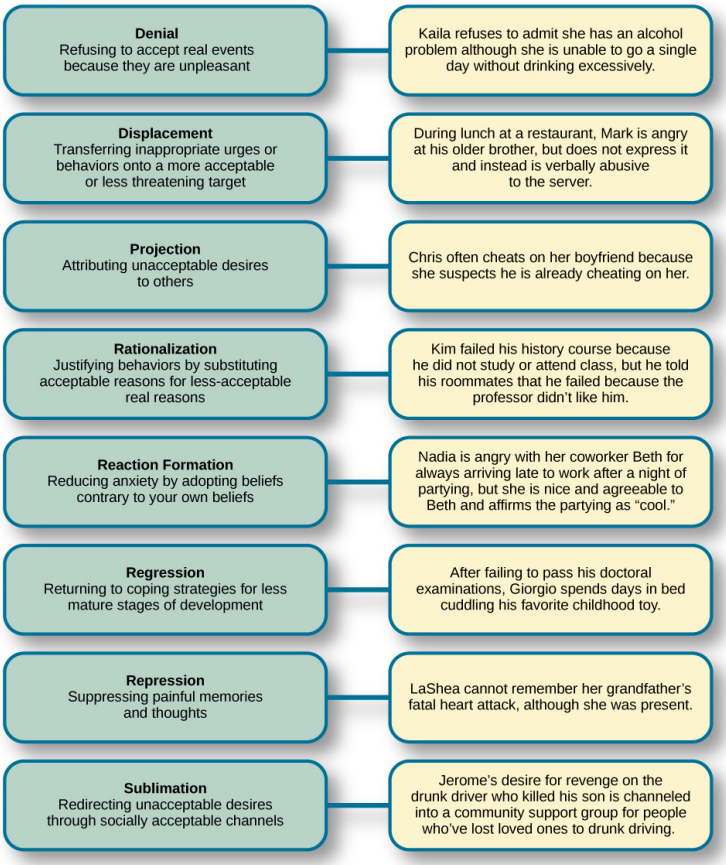


Figure P.7 Defence mechanisms are unconscious protective behaviours that work to reduce anxiety.

While everyone uses defence mechanisms, Freud believed that overuse of them may be problematic. For example, let's say Joe is a high school football player. Deep down, Joe feels sexually attracted to males. His conscious belief is that being gay is immoral and that if he were gay, his family would

disown him and he would be ostracized by his peers. Therefore, there is a conflict between his conscious beliefs (being gay is wrong and will result in being ostracized) and his unconscious urges (attraction to males). The idea that he might be gay causes Joe to have feelings of anxiety. How can he decrease his anxiety? Joe may find himself acting very "macho," making gay jokes, and picking on a school peer who is gay. This way, Joe's unconscious impulses are further submerged.

There are several different types of defence mechanisms. For instance, in repression, anxiety-causing memories from consciousness are blocked. As an analogy, let's say your car is making a strange noise, but because you do not have the money to get it fixed, you just turn up the radio so that you no longer hear the strange noise. Eventually you forget about it. Similarly, in the human psyche, if a memory is too overwhelming to deal with, it might be **repressed** and thus removed from conscious awareness (Freud, 1920). This repressed memory might cause symptoms in other areas.

Another defence mechanism is **reaction formation**, in which someone expresses feelings, thoughts, and behaviours opposite to their inclinations. In the above example, Joe made fun of a gay peer while himself being attracted to males. In regression, an individual acts much younger than their age. For example, a four-year-old child who resents the arrival of a newborn sibling may act like a baby and revert to drinking

out of a bottle. In **projection**, a person refuses to acknowledge her own unconscious feelings and instead sees those feelings in someone else. Other defence mechanisms include **rationalization, displacement, and sublimation**.

99.

NEO-FREUDIANS: ADLER, ERICKSON, JUNG, AND HORNEY

Learning Objectives

By the end of this section, you will be able to:

- Discuss the concept of the inferiority complex
- Discuss the core differences between Erikson's and Freud's views on personality
- Discuss Jung's ideas of the collective unconscious and archetypes
- Discuss the work of Karen Horney, including her revision of Freud's "penis envy"

Freud attracted many followers who modified his ideas to create new theories about personality. These theorists, referred to as neo-Freudians, generally agreed with Freud that childhood experiences matter, but deemphasized sex, focusing more on the social environment and effects of culture on personality. Four notable neo-Freudians include Alfred Adler, Erik Erikson, Carl Jung (pronounced "Yoong"), and Karen Horney (pronounced "HORN-eye").

Alfred Adler

Alfred Adler, a colleague of Freud's and the first president of the Vienna Psychoanalytical Society (Freud's inner circle of colleagues), was the first major theorist to break away from Freud (Figure P.8). He subsequently founded a school of psychology called **individual psychology**, which focuses on our drive to compensate for feelings of inferiority. Adler (1937, 1956) proposed the concept of the **inferiority complex.** An inferiority complex refers to a person's feelings that they lack worth and don't measure up to the standards of others or of society. Adler's ideas about inferiority represent a major difference between his thinking and Freud's. Freud believed that we are motivated by sexual and aggressive urges, but Adler (1930, 1961) believed that feelings of inferiority in childhood are what drive people to attempt to gain superiority and that this striving is the force behind all of our thoughts, emotions, and behaviours.

Figure P.8 Alfred Adler proposed the concept of the inferiority complex.

Adler also believed in the importance of social connections, seeing childhood development emerging through social development rather than the sexual stages Freud outlined. Adler noted the inter-relatedness of humanity and the need to work together for the betterment of all. He said, "The happiness of mankind lies in working together, in living as if each individual had set himself the task of contributing to the common welfare" (Adler, 1964, p. 255) with the main goal of psychology being "to recognize the equal rights and equality of others" (Adler, 1961, p. 691).

With these ideas, Adler identified three fundamental social tasks that all of us must experience: occupational tasks

(careers), societal tasks (friendship), and love tasks (finding an intimate partner for a long-term relationship). Rather than focus on sexual or aggressive motives for behaviour as Freud did, Adler focused on social motives. He also emphasized conscious rather than unconscious motivation, since he believed that the three fundamental social tasks are explicitly known and pursued. That is not to say that Adler did not also believe in unconscious processes—he did—but he felt that conscious processes were more important.

One of Adler's major contributions to personality psychology was the idea that our birth order shapes our personality. He proposed that older siblings, who start out as the focus of their parents' attention but must share that attention once a new child joins the family, compensate by becoming overachievers. The youngest children, according to Adler, may be spoiled, leaving the middle child with the opportunity to minimize the negative dynamics of the youngest and oldest children. Despite popular attention, research has not conclusively confirmed Adler's hypotheses about birth order.

Erik Erikson

As an art school dropout with an uncertain future, young Erik Erikson met Freud's daughter, Anna Freud, while he was tutoring the children of an American couple undergoing psychoanalysis in Vienna. It was Anna Freud who encouraged

Erikson to study psychoanalysis. Erikson received his diploma from the Vienna Psychoanalytic Institute in 1933, and as Nazism spread across Europe, he fled the country and immigrated to the United States that same year. As you learned when you studied lifespan development, Erikson later proposed a psychosocial theory of development, suggesting that an individual's personality develops throughout the lifespan—a departure from Freud's view that personality is fixed in early life. In his theory, Erikson emphasized the social relationships that are important at each stage of personality development, in contrast to Freud's emphasis on sex. Erikson identified eight stages, each of which represents a conflict or developmental task (Table P.1). The development of a healthy personality and a sense of competence depend on the successful completion of each task.

Table P.1 Erikson's Psychosocial Stages of Development

Stage	Age (years)	Developmental Task	Description
1	0–1	Trust vs. mistrust	Trust (or mistrust) that basic needs, such as nourishment and affection, will be met
2	1–3	Autonomy vs. shame/doubt	Sense of independence in many tasks develops
3	3–6	Initiative vs. guilt	Take initiative on some activities, may develop guilt when success not met or boundaries overstepped
4	7–11	Industry vs. inferiority	Develop self-confidence in abilities when competent or sense of inferiority when not
5	12–18	Identity vs. confusion	Experiment with and develop identity and roles
6	19–29	Intimacy vs. isolation	Establish intimacy and relationships with others
7	30–64	Generativity vs. stagnation	Contribute to society and be part of a family
8	65–	Integrity vs. despair	Assess and make sense of life and meaning of contributions

Carl Jung

Carl Jung (Figure P.9) was a Swiss psychiatrist and protégé of Freud, who later split off from Freud and developed his own theory, which he called **analytical psychology**. The focus of

analytical psychology is on working to balance opposing forces of conscious and unconscious thought, and experience within one's personality. According to Jung, this work is a continuous learning process—mainly occurring in the second half of life—of becoming aware of unconscious elements and integrating them into consciousness.

Figure P.9 Carl Jung was interested in exploring the collective unconscious.

Jung's split from Freud was based on two major disagreements. First, Jung, like Adler and Erikson, did not accept that sexual drive was the primary motivator in a person's mental life. Second, although Jung agreed with Freud's concept of a

personal unconscious, he thought it to be incomplete. In addition to the personal unconscious, Jung focused on the collective unconscious.

The **collective unconscious** is a universal version of the personal unconscious, holding mental patterns, or memory traces, which are common to all of us (Jung, 1928). These ancestral memories, which Jung called **archetypes**, are represented by universal themes in various cultures, as expressed through literature, art, and dreams (Jung). Jung said that these themes reflect common experiences of people the world over, such as facing death, becoming independent, and striving for mastery. Jung (1964) believed that through biology, each person is handed down the same themes and that the same types of symbols—such as the hero, the maiden, the sage, and the trickster—are present in the folklore and fairy tales of every culture. In Jung's view, the task of integrating these unconscious archetypal aspects of the self is part of the self-realization process in the second half of life. With this orientation toward self-realization, Jung parted ways with Freud's belief that personality is determined solely by past events and anticipated the humanistic movement with its emphasis on self-actualization and orientation toward the future.

Jung also proposed two attitudes or approaches toward life: extroversion and introversion (Jung, 1923) (Table P.2). These ideas are considered Jung's most important contributions to the field of personality psychology, as almost all models of

personality now include these concepts. If you are an extrovert, then you are a person who is energized by being outgoing and socially oriented: You derive your energy from being around others. If you are an introvert, then you are a person who may be quiet and reserved, or you may be social, but your energy is derived from your inner psychic activity. Jung believed a balance between extroversion and introversion best served the goal of self-realization.

Table P.2 Introverts and Extroverts

Introvert	Extrovert
Energized by being alone	Energized by being with others
Avoids attention	Seeks attention
Speaks slowly and softly	Speaks quickly and loudly
Thinks before speaking	Thinks out loud
Stays on one topic	Jumps from topic to topic
Prefers written communication	Prefers verbal communication
Pays attention easily	Distractible
Cautious	Acts first, thinks later

Another concept proposed by Jung was the persona, which he referred to as a mask that we adopt. According to Jung, we consciously create this persona; however, it is derived from both our conscious experiences and our collective unconscious. What is the purpose of the persona? Jung

believed that it is a compromise between who we really are (our true self) and what society expects us to be. We hide those parts of ourselves that are not aligned with society's expectations.

Link to Learning

Jung's view of extroverted and introverted types serves as a basis of the Myers-Briggs Type Indicator (MBTI). This questionnaire describes a person's degree of introversion versus extroversion, thinking versus feeling, intuition versus sensation, and judging versus perceiving. Take this modified questionnaire based on the MBTI, to learn more.

Karen Horney

Karen Horney (Figure P.10) was one of the first women trained as a Freudian psychoanalyst. During the Great Depression, Horney moved from Germany to the United States, and subsequently moved away from Freud's teachings. Like Jung, Horney believed that each individual has the potential for self-realization and that the goal of psychoanalysis

should be moving toward a healthy self rather than exploring early childhood patterns of dysfunction. Horney also disagreed with the Freudian idea that girls have penis envy and are jealous of male biological features. According to Horney, any jealousy is most likely culturally based, due to the greater privileges that males often have, meaning that the differences between men's and women's personalities are culturally based, not biologically based. She further suggested that men have womb envy, because they cannot give birth.

P.10 Psychoanalyst Karen Horney (source: Creative Commons)

Horney's theories focused on the role of unconscious anxiety.

She suggested that normal growth can be blocked by basic anxiety stemming from needs not being met, such as childhood experiences of loneliness and/or isolation. How do children learn to handle this anxiety? Horney suggested three styles of coping (Table P.3). The first coping style, *moving toward people*, relies on affiliation and dependence. These children become dependent on their parents and other caregivers in an effort to receive attention and affection, which provides relief from anxiety (Burger, 2008). When these children grow up, they tend to use this same coping strategy to deal with relationships, expressing an intense need for love and acceptance (Burger, 2008). The second coping style, *moving against people*, relies on aggression and assertiveness. Children with this coping style find that fighting is the best way to deal with an unhappy home situation, and they deal with their feelings of insecurity by bullying other children (Burger, 2008). As adults, people with this coping style tend to lash out with hurtful comments and exploit others (Burger, 2008). The third coping style, *moving away from people*, centres on detachment and isolation. These children handle their anxiety by withdrawing from the world. They need privacy and tend to be self-sufficient. When these children are adults, they continue to avoid such things as love and friendship, and they also tend to gravitate toward careers that require little interaction with others (Burger, 2008).

Table P.3 Horney's Coping Styles

Coping Style	Description	Example
Moving toward people	Affiliation and dependence	Child seeking positive attention and affection from parent; adult needing love
Moving against people	Aggression and manipulation	Child fighting or bullying other children; adult who is abrasive and verbally hurtful, or who exploits others
Moving away from people	Detachment and isolation	Child withdrawn from the world and isolated; adult loner

Horney believed these three styles are ways in which people typically cope with day-to-day problems; however, the three coping styles can become neurotic strategies if they are used rigidly and compulsively, leading a person to become alienated from others.

100.

APPROACHES TO PERSONALITY

Learning Objectives

By the end of this section, you will be able to:

- Describe the behaviourist, cognitive, social cognitive, and humanist perspectives on personality
- Discuss the findings of the Minnesota Study of Twins Reared Apart as they relate to personality and genetics
- Discuss temperament and describe the three infant temperaments identified by Thomas and Chess

- Discuss the evolutionary perspective on personality development

In contrast to the psychodynamic approaches of Freud and the neo-Freudians, which relate personality to inner (and hidden) processes, the learning approaches focus only on observable behaviour. This illustrates one significant advantage of the learning approaches over psychodynamics: Because learning approaches involve observable, measurable phenomena, they can be scientifically tested.

The Behavioural Perspective

Behaviourists do not believe in biological determinism: They do not see personality traits as inborn. Instead, they view personality as significantly shaped by the reinforcements and consequences outside of the organism. In other words, people behave in a consistent manner based on prior learning. B. F. Skinner, a strict behaviourist, believed that environment was solely responsible for all behaviour, including the enduring, consistent behaviour patterns studied by personality theorists.

As you may recall from your study on the psychology of learning, Skinner proposed that we demonstrate consistent behaviour patterns because we have developed certain response

tendencies (Skinner, 1953). In other words, we *learn* to behave in particular ways. We increase the behaviours that lead to positive consequences, and we decrease the behaviours that lead to negative consequences. Skinner disagreed with Freud's idea that personality is fixed in childhood. He argued that personality develops over our entire life, not only in the first few years. Our responses can change as we come across new situations; therefore, we can expect more variability over time in personality than Freud would anticipate. For example, consider a young adult, Jayden, a risk taker. Jayden drives fast and participates in dangerous sports such as hang gliding and kiteboarding. But after Jayden gets married and has children, the system of reinforcements and punishments in their environment changes. Speeding and extreme sports are no longer reinforced, so Jayden no longer engages in those behaviours. In fact, Jayden now describes themselves as a cautious person.

The Social-Cognitive Perspective

Albert Bandura agreed with Skinner that personality develops through learning. He disagreed, however, with Skinner's strict behaviourist approach to personality development, because he felt that thinking and reasoning are important components of learning. He presented a **social-cognitive theory** of personality that emphasizes both learning and cognition as sources of individual differences in personality. In social-

cognitive theory, the concepts of reciprocal determinism, observational learning, and self-efficacy all play a part in personality development.

Reciprocal Determinism

In contrast to Skinner's idea that the environment alone determines behaviour, Bandura (1990) proposed the concept of **reciprocal determinism**, in which cognitive processes, behaviour, and context all interact, each factor influencing and being influenced by the others simultaneously (Figure P.11). *Cognitive processes* refer to all characteristics previously learned, including beliefs, expectations, and personality characteristics. *Behaviour* refers to anything that we do that may be rewarded or punished. Finally, the *context* in which the behaviour occurs refers to the environment or situation, which includes rewarding/punishing stimuli.

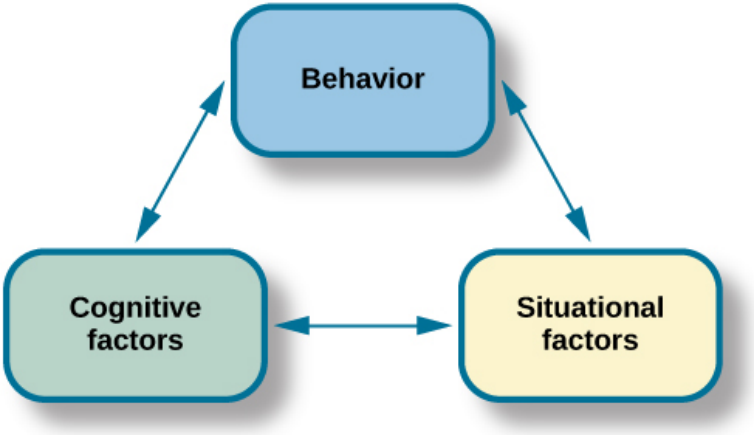


Figure P.11 Bandura proposed the idea of reciprocal determinism: Our behaviour, cognitive processes, and situational context all influence each other.

Consider, for example, that you're at a festival and one of the attractions is bungee jumping from a bridge. Do you do it? In this example, the behaviour is bungee jumping. Cognitive factors that might influence this behaviour include your beliefs and values, and your past experiences with similar behaviours. Finally, context refers to the reward structure for the behaviour. According to reciprocal determinism, all of these factors are in play.

Observational Learning

Bandura's key contribution to learning theory was the idea that much learning is vicarious. We learn by observing someone else's behaviour and its consequences, which

Bandura called observational learning. He felt that this type of learning also plays a part in the development of our personality. Just as we learn individual behaviours, we learn new behaviour patterns when we see them performed by other people or models. Drawing on the behaviourists' ideas about reinforcement, Bandura suggested that whether we choose to imitate a model's behaviour depends on whether we see the model reinforced or punished. Through observational learning, we come to learn what behaviours are acceptable and rewarded in our culture, and we also learn to inhibit deviant or socially unacceptable behaviours by seeing what behaviours are punished.

We can see the principles of reciprocal determinism at work in observational learning. For example, personal factors determine which behaviours in the environment a person chooses to imitate, and those environmental events in turn are processed cognitively according to other personal factors. One person may experience receiving attention as reinforcing, and that person may be more inclined to imitate behaviours such as boasting when a model has been reinforced. For others, boasting may be viewed negatively, despite the attention that might result—or receiving heightened attention may be perceived as being scrutinized. In either case, the person may be less likely to imitate those behaviours even though the reasons for not doing so would be different.

Self-Efficacy

Bandura (1977, 1995) has studied a number of cognitive and personal factors that affect learning and personality development, and most recently has focused on the concept of self-efficacy. **Self-efficacy**is our level of confidence in our own abilities, developed through our social experiences. Self-efficacy affects how we approach challenges and reach goals. In observational learning, self-efficacy is a cognitive factor that affects which behaviours we choose to imitate as well as our success in performing those behaviours.

People who have high self-efficacy believe that their goals are within reach, have a positive view of challenges seeing them as tasks to be mastered, develop a deep interest in and strong commitment to the activities in which they are involved, and quickly recover from setbacks. Conversely, people with low self-efficacy avoid challenging tasks because they doubt their ability to be successful, tend to focus on failure and negative outcomes, and lose confidence in their abilities if they experience setbacks. Feelings of self-efficacy can be specific to certain situations. For instance, a student might feel confident in their ability in English class but much less so in math class.

Julian Rotter and Locus of Control

Julian Rotter (1966) proposed the concept of locus of control, another cognitive factor that affects learning and personality

development. Distinct from self-efficacy, which involves our belief in our own abilities, **locus of control r**efers to our beliefs about the power we have over our lives. In Rotter's view, people possess either an internal or an external locus of control (Figure P.12). Those of us with an internal locus of control ("internals") tend to believe that most of our outcomes are the direct result of our efforts. Those of us with an external locus of control ("externals") tend to believe that our outcomes are outside of our control. Externals see their lives as being controlled by other people, luck, or chance. For example, say you didn't spend much time studying for your psychology test and went out to dinner with friends instead. When you receive your test score, you see that you earned a D. If you possess an internal locus of control, you would most likely admit that you failed because you didn't spend enough time studying and decide to study more for the next test. On the other hand, if you possess an external locus of control, you might conclude that the test was too hard and not bother studying for the next test, because you figure you will fail it anyway. Researchers have found that people with an internal locus of control perform better academically, achieve more in their careers, are more independent, are healthier, are better able to cope, and are less depressed than people who have an external locus of control (Benassi, Sweeney, & Durfour, 1988; Lefcourt, 1982; Maltby, Day, & Macaskill, 2007; Whyte, 1977, 1978, 1980).

Figure P.12 Locus of control occurs on a continuum from internal to external.

Link to Learning

Take the Locus of Control questionnaire, to learn more. Scores range from 0 to 13. A low score on this questionnaire indicates an internal locus of control, and a high score indicates an external locus of control.

Walter Mischel and the Person-Situation Debate

Walter Mischel was a student of Julian Rotter and taught for years at Stanford, where he was a colleague of Albert Bandura. Mischel surveyed several decades of empirical psychological literature regarding trait prediction of behaviour, and his

conclusion shook the foundations of personality psychology. Mischel found that the data did not support the central principle of the field—that a person's personality traits are consistent across situations. His report triggered a decades-long period of self-examination, known as the person-situation debate, among personality psychologists.

Mischel suggested that perhaps we were looking for consistency in the wrong places. He found that although behaviour was inconsistent across different situations, it was much more consistent within situations—so that a person's behaviour in one situation would likely be repeated in a similar one. And as you will see next regarding his famous "marshmallow test," Mischel also found that behaviour is consistent in equivalent situations across time.

One of Mischel's most notable contributions to personality psychology was his ideas on self-regulation. According to Lecci & Magnavita (2013), "Self-regulation is the process of identifying a goal or set of goals and, in pursuing these goals, using both internal (e.g., thoughts and affect) and external (e.g., responses of anything or anyone in the environment) feedback to maximize goal attainment" (p. 6.3). Self-regulation is also known as will power. When we talk about will power, we tend to think of it as the ability to delay gratification. For example, Addison's teenage child made strawberry cupcakes, and they looked delicious. However, Addison forfeited the pleasure of eating one, because Addison is training for a 5K race and wants to be fit and do well in the race. Would you be

able to resist getting a small reward now in order to get a larger reward later? This is the question Mischel investigated in his now-classic marshmallow test.

Mischel designed a study to assess self-regulation in young children. In the marshmallow study, Mischel and his colleagues placed a preschool child in a room with one marshmallow on the table. The children were told they could either eat the marshmallow now, or wait until the researcher returned to the room, and then they could have two marshmallows (Mischel, Ebbesen & Raskoff, 1972). This was repeated with hundreds of preschoolers. What Mischel and his team found was that young children differ in their degree of self-control. Mischel and his colleagues continued to follow this group of preschoolers through high school, and what do you think they discovered? The children who had more self-control in preschool (the ones who waited for the bigger reward) were more successful in high school. They had higher SAT scores, had positive peer relationships, and were less likely to have substance abuse issues; as adults, they also had more stable marriages (Mischel, Shoda, & Rodriguez, 1989; Mischel et al., 2010). On the other hand, those children who had poor self-control in preschool (the ones who grabbed the one marshmallow) were not as successful in high school, and they were found to have academic and behavioural problems. A more recent study using a larger and more representative sample found associations between early delay of gratification (Watts, Duncan, & Quan, 2018) and measures of achievement

in adolescence. However, researchers also found that the associations were not as strong as those reported during Mischel's initial experiment and were quite sensitive to situational factors such as early measures of cognitive capacity, family background, and home environment. This research suggests that consideration of situational factors is important to better understand behaviour.

Link to Learning

Watch Joachim de Posada's TED Talk about the marshmallow test, to learn more and to see some footage of children taking the test.

Today, the debate is mostly resolved, and most psychologists consider both the situation and personal factors in understanding behaviour. For Mischel (1993), people are situation processors. The children in the marshmallow test each processed, or interpreted, the rewards structure of that situation in their own way. Mischel's approach to personality stresses the importance of both the situation and the way the person perceives the situation. Instead of behaviour being

determined by the situation, people use cognitive processes to interpret the situation and then behave in accordance with that interpretation.

Humanism

As the "third force" in psychology, **humanism** is touted as a reaction both to the pessimistic determinism of psychoanalysis, with its emphasis on psychological disturbance, and to the behaviourists' view of humans passively reacting to the environment, which has been criticized as making people out to be personality-less robots. It does not suggest that psychoanalytic, behaviourist, and other points of view are incorrect but argues that these perspectives do not recognize the depth and meaning of human experience, and fail to recognize the innate capacity for self-directed change and transforming personal experiences. This perspective focuses on how healthy people develop.

One pioneering humanist, Abraham Maslow, studied people who he considered to be healthy, creative, and productive, including Albert Einstein, Eleanor Roosevelt, Thomas Jefferson, Abraham Lincoln, and others. Maslow (1950, 1970) found that such people share similar characteristics, such as being open, creative, loving, spontaneous, compassionate, concerned for others, and accepting of themselves. When you studied motivation, you learned about one of the best-known humanistic theories,

Maslow's hierarchy of needs theory (Figure P.13), in which Maslow proposes that human beings have certain needs in common and that these needs must be met in a certain order. The highest need is the need for self-actualization, which is the achievement of our fullest potential. Maslow differentiated between needs that motivate us to fulfill something that is missing and needs that inspire us to grow. He believed that many emotional and behavioural concerns arise as a result of failing to meet these hierarchical needs.

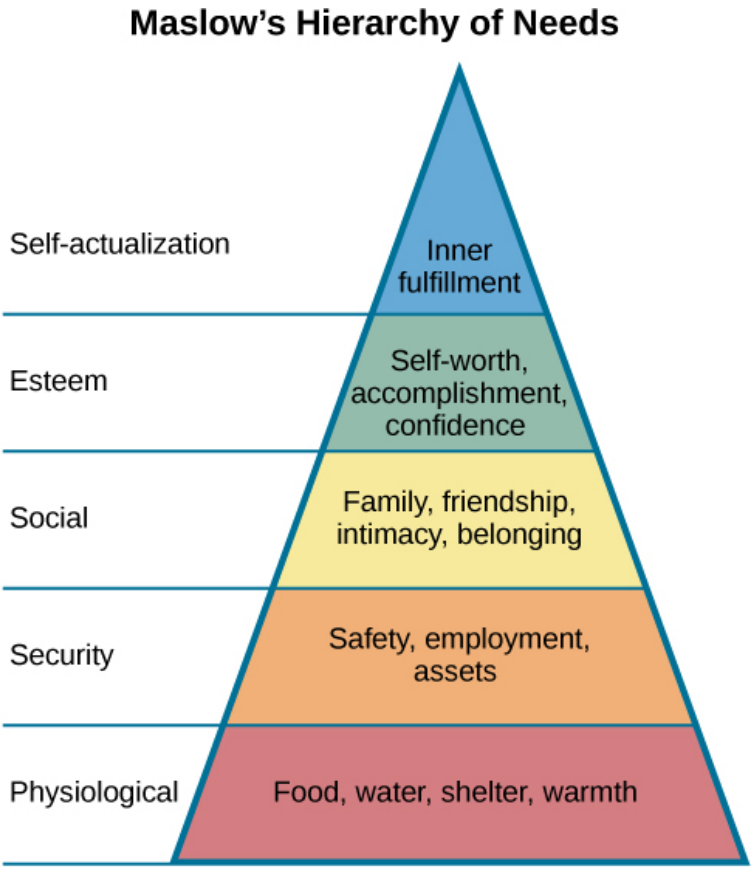


Figure P.13 Maslow's hierarchy of needs is shown.

Carl Rogers (1902–1987) was also an American psychologist who, like Maslow, emphasized the potential for good that exists within all people (Figure P.14). Rogers used a therapeutic technique known as client-centred therapy in helping his clients deal with problematic issues that resulted in their seeking psychotherapy. Unlike a psychoanalytic approach

in which the therapist plays an important role in interpreting what conscious behaviour reveals about the unconscious mind, client-centred therapy involves the patient taking a lead role in the therapy session. Rogers believed that a therapist needed to display three features to maximize the effectiveness of this particular approach: unconditional positive regard, genuineness, and empathy. Unconditional positive regard refers to the fact that the therapist accepts their client for who they are, no matter what the patient might say. Provided these factors, Rogers believed that people were more than capable of dealing with and working through their own issues (Thorne & Henley, 2005).

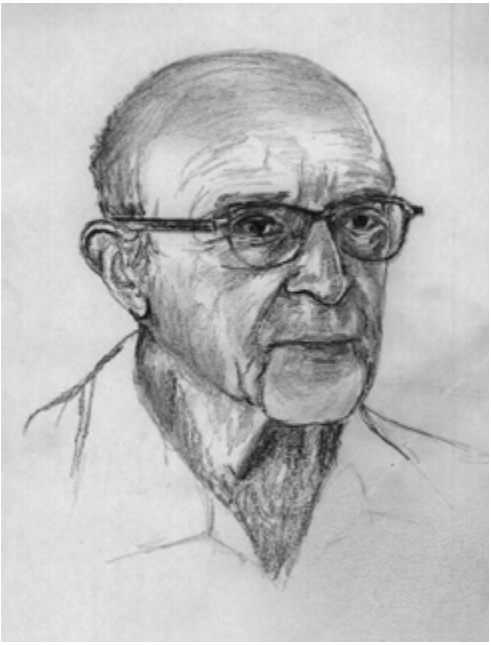


Figure P.14 Carl Rogers, shown in this portrait, developed a client-centred therapy method that has been influential in clinical settings. (credit: "Didius"/Wikimedia Commons)

One of Rogers's main ideas about personality regards **self-concept**, our thoughts and feelings about ourselves. How would you respond to the question, "Who am I?" Your answer can show how you see yourself. If your response is primarily positive, then you tend to feel good about who you are, and you see the world as a safe and positive place. If your response is mainly negative, then you may feel unhappy with who you are. Rogers further divided the self into two

categories: the ideal self and the real self. The **ideal self** is the person that you would like to be; the **real self** is the person you actually are. Rogers focused on the idea that we need to achieve consistency between these two selves. We experience **congruence** when our thoughts about our real self and ideal self are very similar—in other words, when our self-concept is accurate**.** High congruence leads to a greater sense of self-worth and a healthy, productive life. Parents can help their children achieve this by giving them unconditional positive regard, or unconditional love. According to Rogers (1980), "As persons are accepted and prized, they tend to develop a more caring attitude towards themselves" (p. 116). Conversely, when there is a great discrepancy between our ideal and actual selves, we experience a state Rogers called **incongruence**, which can lead to maladjustment. Both Rogers's and Maslow's theories focus on individual choices and do not believe that biology is deterministic.

Biological Approach

How much of our personality is in-born and biological, and how much is influenced by the environment and culture we are raised in? Psychologists who favour the biological approach believe that inherited predispositions as well as physiological processes can be used to explain differences in our personalities (Burger, 2008).

Evolutionary psychology relative to personality

development looks at personality traits that are universal, as well as differences across individuals. In this view, adaptive differences have evolved and then provide a survival and reproductive advantage. Individual differences are important from an evolutionary viewpoint for several reasons. Certain individual differences, and the heritability of these characteristics, have been well documented. David Buss has identified several theories to explore this relationship between personality traits and evolution, such as life-history theory, which looks at how people expend their time and energy (such as on bodily growth and maintenance, reproduction, or parenting). Another example is costly signalling theory, which examines the honesty and deception in the signals people send one another about their quality as a mate or friend (Buss, 2009).

In the field of behavioural genetics, the Minnesota Study of Twins Reared Apart—a well-known study of the genetic basis for personality—conducted research with twins from 1979 to 1999. In studying 350 pairs of twins, including pairs of identical and fraternal twins reared together and apart, researchers found that identical twins, whether raised together or apart, have very similar personalities (Bouchard, 1994; Bouchard, Lykken, McGue, Segal, & Tellegen, 1990; Segal, 2012). These findings suggest the heritability of some personality traits. **Heritability** refers to the proportion of difference among people that is attributed to genetics. Some of the traits that the study reported as having more than a 0.50

heritability ratio include leadership, obedience to authority, a sense of well-being, alienation, resistance to stress, and fearfulness. The implication is that some aspects of our personalities are largely controlled by genetics; however, it's important to point out that traits are not determined by a single gene, but by a combination of many genes, as well as by epigenetic factors that control whether the genes are expressed.

Other research that has examined the link between personality and other factors has identified and studied Type A and Type B personalities, which you will learn more about in the chapter on Stress, Health, and Lifestyle.

Link to Learning

Watch this video about the influence of genes on personality, to learn more.

Temperament

Most contemporary psychologists believe temperament has a biological basis due to its appearance very early in our lives

(Rothbart, 2011). As you learned when you studied lifespan development, Thomas and Chess (1977) found that babies could be categorized into one of three temperaments: easy, difficult, or slow to warm up. However, environmental factors (family interactions, for example) and maturation can affect the ways in which children's personalities are expressed (Carter et al., 2008).

Research suggests that there are two dimensions of our temperament that are important parts of our adult personality—reactivity and self-regulation (Rothbart, Ahadi, & Evans, 2000). Reactivity refers to how we respond to new or challenging environmental stimuli; self-regulation refers to our ability to control that response (Rothbart & Derryberry, 1981; Rothbart, Sheese, Rueda, & Posner, 2011). For example, one person may immediately respond to new stimuli with a high level of anxiety, while another barely notices it.

101.

TRAIT THEORIES

Learning Objectives

By the end of this section, you will be able to:

- Discuss early trait theories of Cattell and Eysenck
- Discuss the Big Five factors and describe someone who is high and low on each of the five factors

Trait theorists believe personality can be understood via the approach that all people have certain **traits,** or characteristic ways of behaving. Do you tend to be sociable or shy? Passive or aggressive? Optimistic or pessimistic? Moody or even-tempered? Early trait theorists tried to describe all human

personality traits. For example, one trait theorist, Gordon Allport (Allport & Odbert, 1936), found 4,500 words in the English language that could describe people. He organized these personality traits into three categories: cardinal traits, central traits, and secondary traits. A cardinal trait is one that dominates your entire personality, and hence your life—such as Ebenezer Scrooge's greed and Mother Theresa's altruism. Cardinal traits are not very common: Few people have personalities dominated by a single trait. Instead, our personalities typically are composed of multiple traits. Central traits are those that make up our personalities (such as loyal, kind, agreeable, friendly, sneaky, wild, and grouchy). Secondary traits are those that are not quite as obvious or as consistent as central traits. They are present under specific circumstances and include preferences and attitudes. For example, one person gets angry when people try to tickle them; another can only sleep on the left side of the bed; and yet another always orders their salad dressing on the side. And you—although not normally an anxious person—feel nervous before making a speech in front of your English class.

In an effort to make the list of traits more manageable, Raymond Cattell (1946, 1957) narrowed down the list to about 171 traits. However, saying that a trait is either present or absent does not accurately reflect a person's uniqueness, because all of our personalities are actually made up of the same traits; we differ only in the degree to which each trait is expressed. Cattell (1957) identified 16 factors or dimensions

of personality: warmth, reasoning, emotional stability, dominance, liveliness, rule-consciousness, social boldness, sensitivity, vigilance, abstractedness, privateness, apprehension, openness to change, self-reliance, perfectionism, and tension (Table P.4). He developed a personality assessment based on these 16 factors, called the 16PF. Instead of a trait being present or absent, each dimension is scored over a continuum, from high to low. For example, your level of warmth describes how warm, caring, and nice to others you are. If you score low on this index, you tend to be more distant and cold. A high score on this index signifies you are supportive and comforting.

Table P.4: Personality Factors Measured by the 16PF Questionnaire

Factor	Low Score	High Score
Warmth	Reserved, detached	Outgoing, supportive
Intellect	Concrete thinker	Analytical
Emotional stability	Moody, irritable	Stable, calm
Aggressiveness	Docile, submissive	Controlling, dominant
Liveliness	Somber, prudent	Adventurous, spontaneous
Dutifulness	Unreliable	Conscientious
Social assertiveness	Shy, restrained	Uninhibited, bold
Sensitivity	Tough-minded	Sensitive, caring
Paranoia	Trusting	Suspicious
Abstractness	Conventional	Imaginative
Introversion	Open, straightforward	Private, shrewd
Anxiety	Confident	Apprehensive
Openmindedness	Closeminded, traditional	Curious, experimental
Independence	Outgoing, social	Self-sufficient
Perfectionism	Disorganized, casual	Organized, precise
Tension	Relaxed	Stressed

Link to Learning

Take this assessment, based on Cattell's 16PF questionnaire, to see which personality traits may dominate your personality.

Psychologists Hans and Sybil Eysenck were personality theorists (Figure P.14) who focused on **temperament**, the inborn, genetically based personality differences that you studied earlier in the chapter. They believed personality is largely governed by biology. The Eysencks (Eysenck, 1990, 1992; Eysenck & Eysenck, 1963) viewed people as having two specific personality dimensions: extroversion/introversion and neuroticism/stability.

Figure P.14 Hans and Sybil Eysenck believed that our personality traits are influenced by our genetic inheritance. (credit: "Sirswindon"/Wikimedia Commons)

According to their theory, people high on the trait of extroversion are sociable and outgoing, and readily connect with others, whereas people high on the trait of introversion

have a higher need to be alone, engage in solitary behaviours, and limit their interactions with others. In the neuroticism/stability dimension, people high on neuroticism tend to be anxious; they tend to have an overactive sympathetic nervous system and, even with low stress, their bodies and emotional state tend to go into a flight-or-fight reaction. In contrast, people high on stability tend to need more stimulation to activate their flight-or-fight reaction and are considered more emotionally stable. Based on these two dimensions, the Eysencks' theory divides people into four quadrants. These quadrants are sometimes compared with the four temperaments described by the Greeks: melancholic, choleric, phlegmatic, and sanguine (Figure P.15).

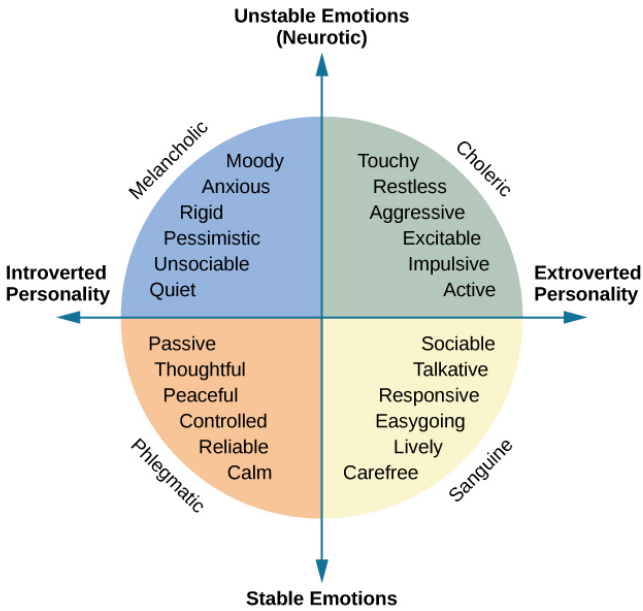


Figure P.15 The Eysencks described two factors to account for variations in our personalities: extroversion/introversion and emotional stability/instability.

Later, the Eysencks added a third dimension: psychoticism versus superego control (Eysenck, Eysenck & Barrett, 1985). In this dimension, people who are high on psychoticism tend to be independent thinkers, cold, nonconformists, impulsive, antisocial, and hostile, whereas people who are high on superego control tend to have high impulse control—they are more altruistic, empathetic, cooperative, and conventional (Eysenck, Eysenck & Barrett, 1985).

While Cattell's 16 factors may be too broad, the Eysenck's two-factor system has been criticized for being too narrow.

Another personality theory, called the **Big Five**, effectively hits a middle ground, with its five factors referred to as the Big Five personality factors. It is the most popular theory in personality psychology today and the most accurate approximation of the basic personality dimensions (Funder, 2001). The five factors are openness to experience, conscientiousness, extroversion, agreeableness, and neuroticism (Figure P.16). A helpful way to remember the factors is by using the mnemonic OCEAN.

TRICKY TOPIC: BIG 5 PERSONALITY TRAITS

One or more interactive elements has been excluded from this version of the text. You can view them online here: https://caul-cbua.pressbooks.pub/intropsychneuro/?p=512#oembed-1

If the video above does not load, click here: https://youtu.be/wGihkf7rrtU
For a full transcript of this video, click here

In the Big Five, each person has each factor, but they occur along a spectrum. Openness to experience is characterized by imagination, feelings, actions, and ideas. People who score high

on this factor tend to be curious and have a wide range of interests. Conscientiousness is characterized by competence, self-discipline, thoughtfulness, and achievement-striving (goal-directed behaviour). People who score high on this factor are hardworking and dependable. Numerous studies have found a positive correlation between conscientiousness and academic success (Akomolafe, 2013; Chamorro-Premuzic & Furnham, 2008; Conrad & Patry, 2012; Noftle & Robins, 2007; Wagerman & Funder, 2007). Extroversion is characterized by sociability, assertiveness, excitement-seeking, and emotional expression. People who score high on this factor are usually described as outgoing and warm. Not surprisingly, people who score high on both extroversion and openness are more likely to participate in adventure and risky sports due to their curious and excitement-seeking nature (Tok, 2011). The fourth factor is agreeableness, which is the tendency to be pleasant, cooperative, trustworthy, and good-natured. People who score low on agreeableness tend to be described as rude and uncooperative, yet one recent study reported that men who scored low on this factor actually earned more money than men who were considered more agreeable (Judge, Livingston, & Hurst, 2012). The last of the Big Five factors is neuroticism, which is the tendency to experience negative emotions. People high on neuroticism tend to experience emotional instability and are characterized as angry, impulsive, and hostile. Watson and Clark (1984) found that people reporting high levels of neuroticism also tend to report feeling anxious and unhappy.

In contrast, people who score low in neuroticism tend to be calm and even-tempered.

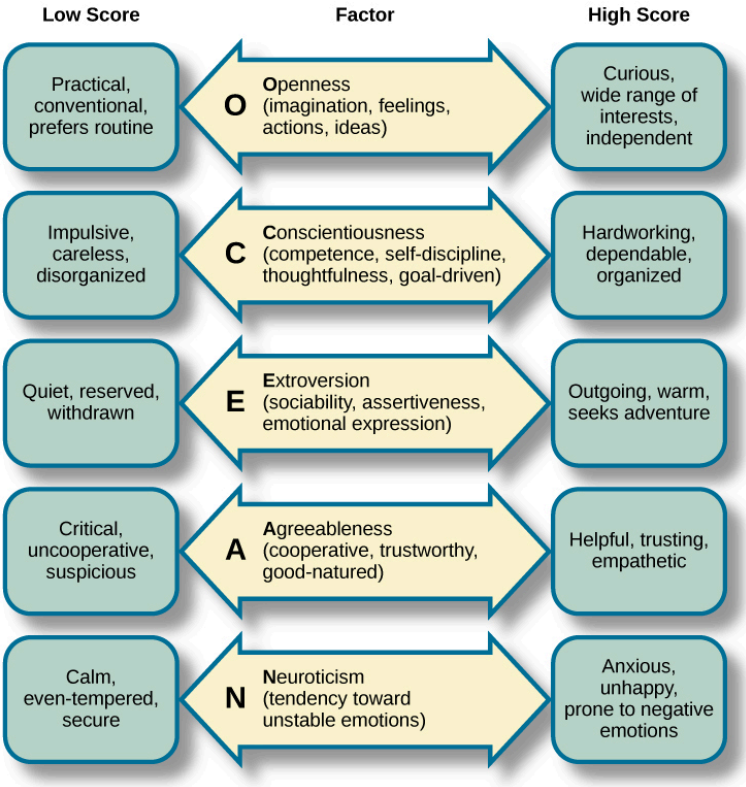


Figure P.16 In the Big Five, each person has five factors, each scored on a continuum from high to low. In the center column, notice that the first letter of each factor spells the mnemonic OCEAN.

The Big Five personality factors each represent a range between two extremes. In reality, most of us tend to lie somewhere midway along the continuum of each factor,

rather than at polar ends. It's important to note that the Big Five factors are relatively stable over our lifespan, with some tendency for the factors to increase or decrease slightly. Researchers have found that conscientiousness increases through young adulthood into middle age, as we become better able to manage our personal relationships and careers (Donnellan & Lucas, 2008). Agreeableness also increases with age, peaking between 50 to 70 years (Terracciano, McCrae, Brant, & Costa, 2005). Neuroticism and extroversion tend to decline slightly with age (Donnellan & Lucas; Terracciano et al.). Additionally, The Big Five factors have been shown to exist across ethnicities, cultures, and ages, and may have substantial biological and genetic components (Jang, Livesley, & Vernon, 1996; Jang et al., 2006; McCrae & Costa, 1997; Schmitt et al., 2007).

Another model of personality traits is the HEXACO model. HEXACO is an acronym for six broad traits: honesty-humility, emotionality, extraversion, agreeableness, conscientiousness, and openness to experience (Anglim & O'Connor, 2018). Table P.5 provides a brief overview of each trait.

Table P.5 The HEXACO Traits

Trait	Example Aspects of Trait
(H) Honesty-humility	Sincerity, modesty, faithfulness
(E) Emotionality	Sentimentality, anxiety, sensitivity
(X) Extraversion	Sociability, talkativeness, boldness
(A) Agreeableness	Patience, tolerance, gentleness
(C) Conscientiousness	Organization, thoroughness, precision
(O) Openness	Creativity, inquisitiveness, innovativeness

Link to Learning

Take the Big Five Personality test, to find out about your personality and where you might fall on the Big Five Factors.

102.

CULTURAL UNDERSTANDINGS OF PERSONALITY

Learning Objectives

By the end of this section you should be able to:

- Discuss personality differences of people from collectivist and individualist cultures
- Discuss the three approaches to studying personality in a cultural context

As you have learned in this chapter, personality is shaped by both genetic and environmental factors. The culture in which

you live is one of the most important environmental factors that shapes your personality (Triandis & Suh, 2002). The term culture refers to all of the beliefs, customs, art, and traditions of a particular society. Culture is transmitted to people through language as well as through the modelling of culturally acceptable and non-acceptable behaviours that are either rewarded or punished (Triandis & Suh, 2002). With these ideas in mind, personality psychologists have become interested in the role of culture in understanding personality. They ask whether personality traits are the same across cultures or if there are variations. It appears that there are both universal and culture-specific aspects that account for variation in people's personalities.

Why might it be important to consider cultural influences on personality? Western ideas about personality may not be applicable to other cultures (Benet-Martinez & Oishi, 2008). In fact, there is evidence that the strength of personality traits varies across cultures. Let's take a look at some of the Big Five factors (conscientiousness, neuroticism, openness, and extroversion) across cultures. As you will learn when you study social psychology, Asian cultures are more collectivist, and people in these cultures tend to be less extroverted. People in Central and South American cultures tend to score higher on openness to experience, whereas Europeans score higher on neuroticism (Benet-Martinez & Karakitapoglu-Aygun, 2003).

According to a study by Rentfrow and colleagues, there also seem to be regional personality differences within the United

States (Figure P.17). Researchers analyzed responses from over 1.5 million individuals in the United States and found that there are three distinct regional personality clusters: Cluster 1, which is in the Upper Midwest and Deep South, is dominated by people who fall into the "friendly and conventional" personality; Cluster 2, which includes the West, is dominated by people who are more relaxed, emotionally stable, calm, and creative; and Cluster 3, which includes the Northeast, has more people who are stressed, irritable, and depressed. People who live in Clusters 2 and 3 are also generally more open (Rentfrow et al., 2013).

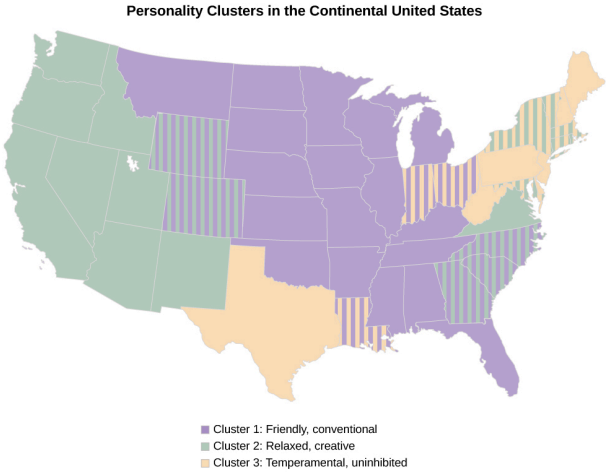


Figure P.17 Researchers found three distinct regional personality clusters in the United States. People tend to be friendly and conventional in the Upper Midwest and Deep South; relaxed, emotionally stable, and creative in the West; and stressed, irritable, and depressed in the Northeas

t (Rentfrow et al., 2013).

One explanation for the regional differences is selective migration (Rentfrow et al., 2013). Selective migration is the concept that people choose to move to places that are compatible with their personalities and needs. For example, a person high on the agreeable scale would likely want to live near family and friends, and would choose to settle or remain in such an area. In contrast, someone high on openness would prefer to settle in a place that is recognized as diverse and innovative (such as California). Further, Rentfrow, Jost, Gosling, & Potter (2009) noted an overlap between geographical regions and personality characteristics that goes beyond the often-used explanations of religion, racial diversity, and education. Their research suggests that the psychological profile of a region is closely related to that of its residents. They found that levels of openness and conscientiousness in a state may predict voting patterns, indicating that there are correlations between geographic regions and personality differences between liberals and conservatives relating to political views, levels of economic vitality, and entrepreneurial rates.

Personality in Individualist and Collectivist Cultures

Individualist cultures and collectivist cultures place emphasis on different basic values. People who live in individualist cultures tend to believe that independence, competition, and

personal achievement are important. Individuals in Western nations such as the United States, England, and Australia score high on individualism (Oyserman, Coon, & Kemmelmier, 2002). People who live in collectivist cultures value social harmony, respectfulness, and group needs over individual needs. Individuals who live in countries in Asia, Africa, and South America score high on collectivism (Hofstede, 2001; Triandis, 1995). These values influence personality. For example, Yang (2006) found that people in individualist cultures displayed more personally oriented personality traits, whereas people in collectivist cultures displayed more socially oriented personality traits. Frewer and Bleus (1991) conducted a study of the Eysenk Personality Inventory in a collectivist culture using Papua New Guinean university students. They found that the results of the personality inventory were only relevant when analyzed within the context of a collectivist society. Similarly, Dana (1986) suggested that personality assessment services for Native Americans are often provided without a proper recognition of culture-specific responses and a tribe-specific frame of reference. Assessors need to have more than a general knowledge of history, tribal differences, contemporary culture on reservations, and levels of acculturation in order to interpret psychological test responses with a minimal bias.

Approaches to Studying Personality in a Cultural Context

There are three approaches that can be used to study personality in a cultural context, the *cultural-comparative approach*; the *indigenous approach*; and the *combined approach*, which incorporates elements of both views. Since ideas about personality have a Western basis, the cultural-comparative approach seeks to test Western ideas about personality in other cultures to determine whether they can be generalized and if they have cultural validity (Cheung van de Vijver, & Leong, 2011). For example, recall from the previous section on the trait perspective that researchers used the cultural-comparative approach to test the universality of McCrae and Costa's Five Factor Model. They found applicability in numerous cultures around the world, with the Big Five factors being stable in many cultures (McCrae & Costa, 1997; McCrae et al., 2005). The indigenous approach came about in reaction to the dominance of Western approaches to the study of personality in non-Western settings (Cheung et al., 2011). Because Western-based personality assessments cannot fully capture the personality constructs of other cultures, the indigenous model has led to the development of personality assessment instruments that are based on constructs relevant to the culture being studied (Cheung et al., 2011). The third approach to cross-cultural studies of personality is the combined approach, which serves

as a bridge between Western and indigenous psychology as a way of understanding both universal and cultural variations in personality (Cheung et al., 2011).

103.

PERSONALITY ASSESSMENT

Learning Objectives

By the end of this section, you will be able to:

- Discuss the Minnesota Multiphasic Personality Inventory
- Recognize and describe common projective tests used in personality assessment

Camille, Nikola, and Ellison are college friends and all want to be police officers. Camille is quiet and shy, lacks self-confidence, and usually follows others. He is a kind person, but lacks motivation. Nikola is loud and boisterous, a leader.

He works hard, but is impulsive and drinks too much on the weekends. Ellison is thoughtful and well liked. She is trustworthy, but sometimes she has difficulty making quick decisions. Of these three, who would make the best police officer? What qualities and personality factors make someone a good police officer? What makes someone a bad or dangerous police officer?

A police officer's job is very high in stress, and law enforcement agencies want to make sure they hire the right people. Personality testing is often used for this purpose—to screen applicants for employment and job training. Personality tests are also used in criminal cases and custody battles, and to assess psychological disorders. This section explores the best known among the many different types of personality tests.

Self-Report Inventories

Self-report inventories are a kind of objective test used to assess personality. They typically use multiple-choice items or numbered scales, which represent a range from 1 (strongly disagree) to 5 (strongly agree). They often are called Likert scales after their developer, Rensis Likert (1932) (Figure P.18). Self-report inventories are generally easy to administer and cost effective. There is also an increased likelihood of test takers being inclined to answer in ways that are intentionally or unintentionally more socially desirable, exaggerated, biased, or misleading. For example, someone applying for a job will likely

try to present themselves in a positive light, perhaps as an even better candidate than they actually are.

	Strongly Disagree	Somewhat Disagree	No Opinion	Somewhat Agree	Strongly Agree
I am easygoing.	O	O	O	O	O
I have high standards.	O	O	O	O	O
I enjoy time alone.	O	O	O	O	O
I work well with others.	O	O	O	O	O
I dislike confrontation.	O	O	O	O	O
I prefer crowds over intimacy.	O	O	O	O	O

Figure P.18 If you've ever taken a survey, you are probably familiar with Likert-type scale questions. Most personality inventories employ these types of response scales.

One of the most widely used personality inventories is the **Minnesota Multiphasic Personality Inventory (MMPI)**, first published in 1943, with 504 true/false questions, and updated to the MMPI-2 in 1989, with 567 questions. The original MMPI was based on a small, limited sample, composed mostly of Minnesota farmers and psychiatric patients; the revised inventory was based on a more representative, national sample to allow for better standardization. The MMPI-2 takes 1–2 hours to complete. Responses are scored to produce a clinical profile composed of 10 scales: hypochondriasis, depression, hysteria, psychopathic deviance (social deviance), masculinity versus femininity,

paranoia, psychasthenia (obsessive/compulsive qualities), schizophrenia, hypomania, and social introversion. There is also a scale to ascertain risk factors for alcohol abuse. In 2008, the test was again revised, using more advanced methods, to the MMPI-2-RF. This version takes about one-half the time to complete and has only 338 questions (Figure P.19). Despite the new test's advantages, the MMPI-2 is more established and is still more widely used. Typically, the tests are administered by computer. Although the MMPI was originally developed to assist in the clinical diagnosis of psychological disorders, it is now also used for occupational screening, such as in law enforcement, and in college, career, and marital counselling (Ben-Porath & Tellegen, 2008).

	True	False
1. I like gardening magazines.	O	O
2. I am unhappy with my sex life.	O	O
3. I feel like no one understands me.	O	O
4. I think I would enjoy the work of a teacher.	O	O
5. I am not easily awakened by noise.	O	O

Figure P.19 These true/false questions resemble the kinds of questions you would find on the MMPI.

In addition to clinical scales, the tests also have validity and reliability scales. (Recall the concepts of reliability and validity from your study of psychological research.) One of the validity

scales, the Lie Scale (or "L" Scale), consists of 15 items and is used to ascertain whether the respondent is "faking good" (underreporting psychological problems to appear healthier). For example, if someone responds "yes" to a number of unrealistically positive items such as "I have never told a lie," they may be trying to "fake good" or appear better than they actually are.

Reliability scales test an instrument's consistency over time, assuring that if you take the MMPI-2-RF today and then again 5 years later, your two scores will be similar. Beutler, Nussbaum, and Meredith (1988) gave the MMPI to newly recruited police officers and then to the same police officers 2 years later. After 2 years on the job, police officers' responses indicated an increased vulnerability to alcoholism, somatic symptoms (vague, unexplained physical complaints), and anxiety. When the test was given an additional 2 years later (4 years after starting on the job), the results suggested high risk for alcohol-related difficulties.

Projective Tests

Another method for assessment of personality is **projective testing.** This kind of test relies on one of the defence mechanisms proposed by Freud—projection—as a way to assess unconscious processes. During this type of testing, a series of ambiguous cards is shown to the person being tested, who then is encouraged to project their feelings, impulses, and

desires onto the cards—by telling a story, interpreting an image, or completing a sentence. Many projective tests have undergone standardization procedures (for example, Exner, 2002) and can be used to access whether someone has unusual thoughts or a high level of anxiety, or is likely to become volatile. Some examples of projective tests are the Rorschach Inkblot Test, the Thematic Apperception Test (TAT), the Contemporized-Themes Concerning Blacks test, the TEMAS (Tell-Me-A-Story), and the Rotter Incomplete Sentence Blank (RISB). Projective tests are less subject to intentional distortion; it is hard to fake "good" because it is not obvious what a "good" answer is. Projective tests are more time consuming for the evaluator than self-report inventories. If an evaluator scores the Rorschach using the Exner scoring system, the test is considered a valid and reliable measure. However, the validity of the other projective tests is questionable, and the results are often not usable for court cases (Goldstein, n.d.).

The **Rorschach Inkblot Test** was developed in 1921 by a Swiss psychologist named Hermann Rorschach (pronounced "ROAR-shock"). It is a series of symmetrical inkblot cards that are presented to a client by a psychologist. Upon presentation of each card, the psychologist asks the client, "What might this be?" What the test-taker sees reveals unconscious feelings and struggles (Piotrowski, 1987; Weiner, 2003). The Rorschach has been standardized using the Exner system and is effective in measuring depression, psychosis, and anxiety.

A second projective test is the **Thematic Apperception Test (TAT)**, created in the 1930s by Henry Murray, an American psychologist, and a psychoanalyst named Christiana Morgan. A person taking the TAT is shown 8–12 ambiguous pictures and is asked to tell a story about each picture (Figure P.20). The stories give insight into their social world, revealing hopes, fears, interests, and goals. The storytelling format helps to lower a person's resistance divulging unconscious personal details (Cramer, 2004). The TAT has been used in clinical settings to evaluate psychological disorders; more recently, it has been used in counselling settings to help clients gain a better understanding of themselves and achieve personal growth. Standardization of test administration is virtually nonexistent among clinicians, and the test tends to be modest to low on validity and reliability (Aronow, Weiss, & Rezinkoff, 2001; Lilienfeld, Wood, & Garb, 2000). Despite these shortcomings, the TAT has been one of the most widely used projective tests.

Figure P.20 This image from the Thematic Apperception Tests (TAT) can be used in counselling settings.

A third projective test is the **Rotter Incomplete Sentence Blank (RISB)** developed by Julian Rotter in 1950 (recall his theory of locus of control, covered earlier in this chapter). There are three forms of this test for use with different age groups: the school form, the college form, and the adult form. The tests include 40 incomplete sentences that people are asked to complete as quickly as possible (Figure P.21). The average time for completing the test is approximately 20 minutes, as responses are only 1–2 words in length. This test is similar to a word association test, and like other types of projective tests, it is presumed that responses will reveal desires, fears, and struggles. The RISB is used in screening college

students for adjustment problems and in career counselling (Holaday, Smith, & Sherry, 2010; Rotter & Rafferty 1950).

1. I feel...	
2. I regret...	
3. At home...	
4. My mother...	
5. My greatest worry...	

Figure P.21 These incomplete sentences resemble the types of questions on the RISB. How would you complete these sentences?

For many decades, these traditional projective tests have been used in cross-cultural personality assessments. However, it was found that test bias limited their usefulness (Hoy-Watkins & Jenkins-Moore, 2008). It is difficult to assess the personalities and lifestyles of members of widely divergent ethnic/cultural groups using personality instruments based on data from a single culture or race (Hoy-Watkins & Jenkins-Moore, 2008). For example, when the TAT was used with African-American test takers, the result was often shorter story length and low levels of cultural identification (Duzant, 2005). Therefore, it was vital to develop other personality assessments that explored factors such as race, language, and level of acculturation (Hoy-Watkins & Jenkins-Moore, 2008). To address this need, Robert Williams developed the first

culturally specific projective test designed to reflect the everyday life experiences of African Americans (Hoy-Watkins & Jenkins-Moore, 2008). The updated version of the instrument is the **Contemporized-Themes Concerning Blacks Test (C-TCB)** (Williams, 1972). The C-TCB contains 20 colour images that show scenes of African-American lifestyles. When the C-TCB was compared with the TAT for African Americans, it was found that use of the C-TCB led to increased story length, higher degrees of positive feelings, and stronger identification with the C-TCB (Hoy, 1997; Hoy-Watkins & Jenkins-Moore, 2008).

The **TEMAS Multicultural Thematic Apperception Test** is another tool designed to be culturally relevant to minority groups, especially Hispanic youths. TEMAS—standing for "Tell Me a Story" but also a play on the Spanish word *temas* (themes)—uses images and storytelling cues that relate to minority culture (Constantino, 1982).

Link to Learning

Watch as Hank Green, host of Crash Course, describes the different ways we measure personality, to learn more.

104.

KEY TERMS FOR PERSONALITY

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anal stage
: psychosexual stage in which children experience pleasure in their bowel and bladder movements

analytical psychology
: Jung's theory focusing on the balance of opposing forces within one's personality and the significance of the collective unconscious

archetype
: pattern that exists in our collective unconscious across cultures and societies

Big Five
: theory that personality is composed of five factors, including openness, conscientiousness, extroversion, agreeableness, and neuroticism

collective unconscious
common psychological tendencies that have been passed down from one generation to the next

congruence

state of being in which our thoughts about our real and ideal selves are very similar

conscious

mental activity (thoughts, feelings, and memories) that we can access at any time

Contemporized-Themes Concerning Blacks Test (C-TCB)

projective test designed to be culturally relevant to African Americans, using images that relate to African-American culture

culture

all of the beliefs, customs, art, and traditions of a particular society

defense mechanism

unconscious protective behaviours designed to reduce ego anxiety

displacement

ego defense mechanism in which a person transfers inappropriate urges or behaviours toward a more acceptable or less threatening target

ego

aspect of personality that represents the self, or the part of one's personality that is visible to others

genital stage

psychosexual stage in which the focus is on mature sexual interests

heritability

proportion of difference among people that is attributed to genetics

id

aspect of personality that consists of our most primitive drives or urges, including impulses for hunger, thirst, and sex

ideal self

person we would like to be

incongruence

state of being in which there is a great discrepancy between our real and ideal selves

individual psychology

school of psychology proposed by Adler that focuses on our drive to compensate for feelings of inferiority

inferiority complex

refers to a person's feelings that they lack worth and don't measure up to others' or to society's standards

latency period

psychosexual stage in which sexual feelings are dormant

locus of control

beliefs about the power we have over our lives; an external locus of control is the belief that our outcomes are outside of our control; an internal locus of control is the belief that we control our own outcomes

Minnesota Multiphasic Personality Inventory (MMPI)

personality test composed of a series of true/false

questions in order to establish a clinical profile of an individual

neurosis

tendency to experience negative emotions

oral stage

psychosexual stage in which an infant's pleasure is focused on the mouth

personality

long-standing traits and patterns that propel individuals to consistently think, feel, and behave in specific ways

phallic stage

psychosexual stage in which the focus is on the genitals

projection

ego defense mechanism in which a person confronted with anxiety disguises their unacceptable urges or behaviours by attributing them to other people

Projective test

personality assessment in which a person responds to ambiguous stimuli, revealing hidden feelings, impulses, and desires

psychosexual stages of development

stages of child development in which a child's pleasure-seeking urges are focused on specific areas of the body called erogenous zones

rationalization

ego defense mechanism in which a person confronted with anxiety makes excuses to justify behaviour

reaction formation

ego defense mechanism in which a person confronted with anxiety swaps unacceptable urges or behaviours for their opposites

real self

person who we actually are

reciprocal determinism

belief that one's environment can determine behaviour, but at the same time, people can influence the environment with both their thoughts and behaviours

regression

ego defense mechanism in which a person confronted with anxiety returns to a more immature behavioural state

repression

ego defense mechanism in which anxiety-related thoughts and memories are kept in the unconscious

Rorschach Inkblot Test

projective test that employs a series of symmetrical inkblot cards that are presented to a client by a psychologist in an effort to reveal the person's unconscious desires, fears, and struggles

Rotter Incomplete Sentence Blank (RISB)

projective test that is similar to a word association test in which a person completes sentences in order to reveal their unconscious desires, fears, and struggles

selective migration

concept that people choose to move to places that are compatible with their personalities and needs

self-concept

our thoughts and feelings about ourselves

self-efficacy

someone's level of confidence in their own abilities

social-cognitive theory

Bandura's theory of personality that emphasizes both cognition and learning as sources of individual differences in personality

sublimation

ego defense mechanism in which unacceptable urges are channeled into more appropriate activities

superego

aspect of the personality that serves as one's moral compass, or conscience

TEMAS Multicultural Thematic Apperception Test

projective test designed to be culturally relevant to minority groups, especially Hispanic youths, using images and storytelling that relate to minority culture

temperament

how a person reacts to the world, including their activity level, starting when they are very young

Thematic Apperception Test (TAT)

projective test in which people are presented with ambiguous images, and they then make up stories to go

with the images in an effort to uncover their unconscious desires, fears, and struggles

traits

characteristic ways of behaving

unconscious

mental activity of which we are unaware and unable to access

105.

SUMMARY FOR PERSONALITY

11.1 What Is Personality?

Personality has been studied for over 2,000 years, beginning with Hippocrates. More recent theories of personality have been proposed, including Freud's psychodynamic perspective, which holds that personality is formed through early childhood experiences. Other perspectives then emerged in reaction to the psychodynamic perspective, including the learning, humanistic, biological, trait, and cultural perspectives.

11.2 Freud and the Psychodynamic Perspective

Sigmund Freud presented the first comprehensive theory of personality. He was also the first to recognize that much of our mental life takes place outside of our conscious awareness. Freud also proposed three components to our personality: the id, ego, and superego. The job of the ego is to balance the

sexual and aggressive drives of the id with the moral ideal of the superego. Freud also said that personality develops through a series of psychosexual stages. In each stage, pleasure focuses on a specific erogenous zone. Failure to resolve a stage can lead one to become fixated in that stage, leading to unhealthy personality traits. Successful resolution of the stages leads to a healthy adult.

11.3 Neo-Freudians: Adler, Erikson, Jung, and Horney

The neo-Freudians were psychologists whose work followed from Freud's. They generally agreed with Freud that childhood experiences matter, but they decreased the emphasis on sex and focused more on the social environment and effects of culture on personality. Some of the notable neo-Freudians are Alfred Adler, Carl Jung, Erik Erikson, and Karen Horney. The neo-Freudian approaches have been criticized, because they tend to be philosophical rather than based on sound scientific research. For example, Jung's conclusions about the existence of the collective unconscious are based on myths, legends, dreams, and art. In addition, as with Freud's psychoanalytic theory, the neo-Freudians based much of their theories of personality on information from their patients.

11.4 Learning Approaches

Behavioural theorists view personality as significantly shaped and impacted by the reinforcements and consequences outside of the organism. People behave in a consistent manner based on prior learning. B. F. Skinner, a prominent behaviourist, said that we demonstrate consistent behaviour patterns, because we have developed certain response tendencies. Mischel focused on how personal goals play a role in the self-regulation process. Albert Bandura said that one's environment can determine behaviour, but at the same time, people can influence the environment with both their thoughts and behaviours, which is known as reciprocal determinism. Bandura also emphasized how we learn from watching others. He felt that this type of learning also plays a part in the development of our personality. Bandura discussed the concept of self-efficacy, which is our level of confidence in our own abilities. Finally, Rotter proposed the concept of locus of control, which refers to our beliefs about the power we have over our lives. He said that people fall along a continuum between a purely internal and a purely external locus of control.

11.5 Humanistic Approaches

Humanistic psychologists Abraham Maslow and Carl Rogers focused on the growth potential of healthy individuals. They believed that people strive to become self-actualized. Both

Rogers's and Maslow's theories greatly contributed to our understanding of the self. They emphasized free will and self-determination, with each individual desiring to become the best person they can become.

11.6 Biological Approaches

Some aspects of our personalities are largely controlled by genetics; however, environmental factors (such as family interactions) and maturation can affect the ways in which children's personalities are expressed.

11.7 Trait Theorists

Trait theorists attempt to explain our personality by identifying our stable characteristics and ways of behaving. They have identified important dimensions of personality. The Five Factor Model is the most widely accepted theory today. The five factors are openness, conscientiousness, extroversion, agreeableness, and neuroticism. These factors occur along a continuum.

11.8 Cultural Understandings of Personality

The culture in which you live is one of the most important environmental factors that shapes your personality. Western

ideas about personality may not be applicable to other cultures. In fact, there is evidence that the strength of personality traits varies across cultures. Individualist cultures and collectivist cultures place emphasis on different basic values. People who live in individualist cultures tend to believe that independence, competition, and personal achievement are important. People who live in collectivist cultures value social harmony, respectfulness, and group needs over individual needs. There are three approaches that can be used to study personality in a cultural context: the cultural-comparative approach, the indigenous approach, and the combined approach, which incorporates both elements of both views.

11.9 Personality Assessment

Personality tests are techniques designed to measure one's personality. They are used to diagnose psychological problems as well as to screen candidates for college and employment. There are two types of personality tests: self-report inventories and projective tests. The MMPI is one of the most common self-report inventories. It asks a series of true/false questions that are designed to provide a clinical profile of an individual. Projective tests use ambiguous images or other ambiguous stimuli to assess an individual's unconscious fears, desires, and challenges. The Rorschach Inkblot Test, the TAT, the RISB, and the C-TCB are all forms of projective tests.

106.

REVIEW QUESTIONS FOR PERSONALITY

Click here for Answer Key

Multiple Choice Questions

1. Personality is thought to be _____.

a. short term and easily changed
b. a pattern of short-term characteristics
c. unstable and short term
d. long term, stable and not easily changed

2. The long-standing traits and patterns that propel individuals to consistently think, feel, and behave in specific ways are known as _____.

a. psychodynamic
b. temperament
c. humors
d. personality

3. _____ is credited with the first comprehensive theory of personality.

a. Hippocrates
b. Gall
c. Wundt
d. Freud

4. An early science that tried to correlate personality with measurements of parts of a person's skull is known as _____.

a. phrenology
b. psychology
c. physiology
d. personality psychology

5. The id operates on the _____ principle.

a. reality
b. pleasure
c. instant gratification
d. guilt

6. The ego defense mechanism in which a person who is confronted with anxiety returns to a more immature behavioural stage is called _____.

a. repression
b. regression
c. reaction formation
d. rationalization

7. The Oedipus complex occurs in the _____ stage of psychosexual development.

a. oral
b. anal
c. phallic
d. latency

8. The universal bank of ideas, images, and concepts that have been passed down through the generations from our ancestors refers to _____.

a. archetypes
b. intuition
c. collective unconscious
d. personality types

9. Self-regulation is also known as _____.

a. self-efficacy
b. will power
c. internal locus of control

d. external locus of control

10. Your level of confidence in your own abilities is known as _____.

a. self-efficacy
b. self-concept
c. self-control
d. self-esteem

11. Giang believes that they got a bad grade on their psychology paper because their professor doesn't like them. Giang most likely has an _____ locus of control.

a. internal
b. external
c. intrinsic
d. extrinsic

12. Self-concept refers to _____.

a. our level of confidence in our own abilities
b. all of our thoughts and feelings about ourselves
c. the belief that we control our own outcomes
d. the belief that our outcomes are outside of our control

13. The idea that people's ideas about themselves should match their actions is called _____.

a. confluence
b. conscious
c. conscientiousness
d. congruence

14. The way a person reacts to the world, starting when they are very young, including the person's activity level is known as _____.

a. traits
b. temperament
c. heritability
d. personality

15. Sandeep is 18 months old. Sandeep cries frequently, is hard to soothe, and wakes frequently during the night. According to Thomas and Chess, Sandeep would be considered _____.

a. an easy baby
b. a difficult baby
c. a slow to warm up baby
d. a colicky baby

16. According to the findings of the Minnesota Study of Twins Reared Apart, identical twins, whether raised together or apart have _____ personalities.

a. slightly different
b. very different
c. slightly similar
d. very similar

17. Temperament refers to _____.

a. inborn, genetically based personality differences
b. characteristic ways of behaving
c. conscientiousness, agreeableness, neuroticism, openness, and extroversion
d. degree of introversion-extroversion

18. According to the Eysencks' theory, people who score high on neuroticism tend to be _____.

a. calm
b. stable
c. outgoing
d. anxious

19. The United States is considered a _____ culture.

a. collectivistic
b. individualist
c. traditional
d. nontraditional

20. The concept that people choose to move to places that are compatible with their personalities and needs is known as _____.

a. selective migration
b. personal oriented personality
c. socially oriented personality
d. individualism

21. Which of the following is NOT a projective test?

a. Minnesota Multiphasic Personality Inventory (MMPI)
b. Rorschach Inkblot Test
c. Thematic Apperception Test (TAT)
d. Rotter Incomplete Sentence Blank (RISB)

22. A personality assessment in which a person responds to ambiguous stimuli, revealing unconscious feelings, impulses, and desires _____.

a. self-report inventory
b. projective test
c. Minnesota Multiphasic Personality Inventory (MMPI)
d. Myers-Briggs Type Indicator (MBTI)

23. Which personality assessment employs a series of true/false questions?

a. Minnesota Multiphasic Personality Inventory (MMPI)
b. Thematic Apperception Test (TAT)
c. Rotter Incomplete Sentence Blank (RISB)
d. Myers-Briggs Type Indicator (MBTI)

Critical Thinking Questions

24. What makes a personal quality part of someone's personality?

25. Describe the difference between extroverts and introverts in terms of what is energizing to each.

26. Discuss Horney's perspective on Freud's concept of penis envy.

27. Compare the personalities of someone who has high self-efficacy to someone who has low self-efficacy.

28. Compare and contrast Skinner's perspective on personality development to Freud's.

29. How might a temperament mix between parent and child affect family life?

30. How stable are the Big Five factors over one's lifespan?

31. Compare the personality of someone who scores high on agreeableness to someone who scores low on agreeableness.

32. Why might it be important to consider cultural influences on personality?

33. Why might a prospective employer screen applicants using personality assessments?

34. Why would a clinician give someone a projective test?

Personal Application Questions

35. How would you describe your own personality? Do you think that friends and family would describe you in much the same way? Why or why not?

36. How would you describe your personality in an online dating profile?

37. What are some of your positive and negative personality qualities? How do you think these qualities will affect your choice of career?

38. What are some examples of defence mechanisms that you have used yourself or have witnessed others using?

39. What is your birth order? Do you agree or disagree with Adler's description of your personality based on his birth order theory, as described in the Link to Learning? Provide examples for support.

40. Would you describe yourself as an extrovert or an introvert? Does this vary based on the situation? Provide examples to support your points.

41. Select an epic story that is popular in contemporary society (such as *Harry Potter* or *Star Wars*) and explain it terms of Jung's concept of archetypes.

42. Do you have an internal or an external locus of control? Provide examples to support your answer.

43. Respond to the question, "Who am I?" Based on your response, do you have a negative or a positive self-concept? What are some experiences that led you to develop this particular self-concept?

44. Research suggests that many of our personality characteristics have a genetic component. What traits do you think you inherited from your parents? Provide examples. How might modelling (environment) influenced your characteristics as well?

45. Review the Big Five personality factors shown in Figure 11.14. On which areas would you expect you'd score high? In which areas does the low score more accurately describe you?

46. According to the work of Rentfrow and colleagues, personalities are not randomly distributed. Instead they fit into distinct geographic clusters. Based on where you live, do

you agree or disagree with the traits associated with yourself and the residents of your area of the country? Why or why not?

47. How objective do you think you can be about yourself in answering questions on self-report personality assessment measures? What implications might this have for the validity of the personality test?

107.

ACKNOWLEDGEMENTS & ATTRIBUTIONS

CHAPTER XII
SOCIAL PSYCHOLOGY

108.

INTRODUCTION TO SOCIAL PSYCHOLOGY

Chapter Outline

- What Is Social Psychology?
- Self-presentation
- Attitudes and Persuasion
- Conformity, Compliance, and Obedience
- Prejudice and Oppression
- Aggression
- Prosocial Behaviour

Figure SP.1 Trayvon Martin, 17, was shot to death at the hands of George Zimmerman, a volunteer neighbourhood watchman, in 2012. Was his death the result of self-defence or racial bias? That question drew hundreds of people to rally on each side of this heated debate. (credit "signs": modification of work by David Shankbone; credit "walk": modification of work by "Fibonacci Blue"/Flickr)

On the night of February 26, 2012, Trayvon Martin, a 17-year-old African American high school student, was shot by a neighbourhood watch volunteer, George Zimmerman, in a predominantly White neighbourhood. Zimmerman grew suspicious of the boy dressed in a hoodie and pursued Martin. A physical altercation ended with Zimmerman fatally shooting Martin. Zimmerman claimed that he acted in defence. Martin was unarmed, and after his death, there was a nationwide outcry. A Florida jury found Zimmerman not guilty of second degree murder nor of manslaughter. George Zimmerman was a resident in the housing complex, not on the job, when the shooting occurred.

There have also been tragic situations with deadly consequences in which police officers have shot innocent

civilians. In 2019, Atatiana Jefferson's neighbour used a non-emergency line to call the police because Jefferson's front door was open in the late hours of the night. The police arrived and an officer went to the back of the yard. Jefferson, not knowing that the police had been called, reached into her purse and got out her legally owned gun. The officer perceived a threat and fired upon Jefferson, killing her. Her 8-year-old nephew witnessed the incident, as he was playing video games with his aunt. Why did each of these nights end so tragically for those involved? What dynamics contributed to the outcomes? How can these deaths be prevented?

Social psychologists examine how the presence of others impacts how a person behaves and reacts, whether that person is an athlete playing a game, a police officer on the job, or a worshiper attending a religious service. Social psychologists believe that a person's behaviour is influenced by who else is present in a given situation and the composition of social groups.

109.

WHAT IS SOCIAL PSYCHOLOGY?

Learning Objectives

By the end of this section, you will be able to:

- Define social psychology
- Describe situational versus dispositional influences on behaviour
- Describe the fundamental attribution error
- Explain actor-observer bias
- Describe self-serving bias
- Explain the just-world hypothesis

Social psychology examines how people affect one another,

and it looks at the power of the situation. According to the American Psychological Association (n.d.), social psychologists "are interested in all aspects of personality and social interaction, exploring the influence of interpersonal and group relationships on human behaviour." Throughout this chapter, we will examine how the presence of other individuals and groups of people impacts a person's behaviours, thoughts, and feelings. Essentially, people will change their behaviour to align with the social situation at hand. If we are in a new situation or are unsure how to behave, we will take our cues from other individuals.

The field of social psychology studies topics at both the intra- and interpersonal levels. Intrapersonal topics (those that pertain to the individual) include emotions and attitudes, the self, and social cognition (the ways in which we think about ourselves and others). Interpersonal topics (those that pertain to dyads and groups) include helping behaviour (Figure SP.2), aggression, prejudice and discrimination, attraction and close relationships, and group processes and intergroup relationships.

Figure SP.2 Social psychology deals with all kinds of interactions between people, spanning a wide range of how we connect: from moments of confrontation to moments of working together and helping others, as shown here. (credit: Sgt. Derec Pierson, U.S. Army)

Social psychologists focus on how people conceptualize and interpret situations and how these interpretations influence their thoughts, feelings, and behaviours (Ross & Nisbett, 1991). Thus, social psychology studies individuals in a social context and how situational variables interact to influence behaviour. In this chapter, we discuss the intrapersonal processes of self-presentation, cognitive dissonance and attitude change, and the interpersonal processes of conformity and obedience, aggression and altruism, and, finally, love and attraction.

Situational and Dispositional Influences on Behaviour

Behaviour is a product of both the situation (e.g., cultural influences, social roles, and the presence of bystanders) and of the person (e.g., personality characteristics). Subfields of psychology tend to focus on one influence or behaviour over others. **Situationism** is the view that our behaviour and actions are determined by our immediate environment and surroundings. In contrast, **dispositionism** holds that our behaviour is determined by internal factors (Heider, 1958). An **internal factor** is an attribute of a person and includes personality traits and temperament. Social psychologists have tended to take the situationist perspective, whereas personality psychologists have promoted the dispositionist perspective. Modern approaches to social psychology, however, take both the situation and the individual into account when studying human behaviour (Fiske, Gilbert, & Lindzey, 2010). In fact, the field of social-personality psychology has emerged to study the complex interaction of internal and situational factors that affect human behaviour (Mischel, 1977; Richard, Bond, & Stokes-Zoota, 2003).

Fundamental Attribution Error

In the United States, the predominant culture tends to favour a dispositional approach in explaining human behaviour. Why

do you think this is? We tend to think that people are in control of their own behaviours, and, therefore, any behaviour change must be due to something internal, such as their personality, habits, or temperament. According to some social psychologists, people tend to overemphasize internal factors as explanations—or attributions—for the behaviour of other people. They tend to assume that the behaviour of another person is a *trait* of that person, and to underestimate the power of the situation on the behaviour of others. They tend to fail to recognize when the behaviour of another is due to situational variables, and thus to the person's *state*. This erroneous assumption is called the **fundamental attribution error** (Ross, 1977; Riggio & Garcia, 2009). To better understand, imagine this scenario: Jamie returns home from work, and opens the front door to a happy greeting from their spouse Morgan who inquires how the day has been. Instead of returning their spouse's kind greeting, Jamie yells, "Leave me alone!" Why did Jamie yell? How would someone committing the fundamental attribution error explain Jamie's behaviour? The most common response is that Jamie is a mean, angry, or unfriendly person (traits). This is an internal or dispositional explanation. However, imagine that Jamie was just laid off from work due to company downsizing. Would your explanation for Jamie's behaviour change? Your revised explanation might be that Jamie was frustrated and disappointed about being laid off and was therefore in a bad

mood (state). This is now an external or situational explanation for Jamie's behaviour.

The fundamental attribution error is so powerful that people often overlook obvious situational influences on behaviour. A classic example was demonstrated in a series of experiments known as the quizmaster study (Ross, Amabile, & Steinmetz, 1977). Student participants were randomly assigned to play the role of a questioner (the quizmaster) or a contestant in a quiz game. Questioners developed difficult questions to which they knew the answers, and they presented these questions to the contestants. The contestants answered the questions correctly only 4 out of 10 times. After the task, the questioners and contestants were asked to rate their own general knowledge compared to the average student. Questioners did not rate their general knowledge higher than the contestants, but the contestants rated the questioners' intelligence higher than their own. In a second study, observers of the interaction also rated the questioner as having more general knowledge than the contestant. The obvious influence on performance is the situation. The questioners wrote the questions, so of course they had an advantage. Both the contestants and observers made an internal attribution for the performance. They concluded that the questioners must be more intelligent than the contestants.

As demonstrated in the examples above, the fundamental attribution error is considered a powerful influence in how we explain the behaviours of others. However, it should be noted

that some researchers have suggested that the fundamental attribution error may not be as powerful as it is often portrayed. In fact, a recent review of more than 173 published studies suggests that several factors (e.g., high levels of idiosyncrasy of the character and how well hypothetical events are explained) play a role in determining just how influential the fundamental attribution error is (Malle, 2006).

Is the Fundamental Attribution Error a Universal Phenomenon?

You may be able to think of examples of the fundamental attribution error in your life. Do people in all cultures commit the fundamental attribution error? Research suggests that they do not. People from an **individualistic culture**, that is, a culture that focuses on individual achievement and autonomy, have the greatest tendency to commit the fundamental attribution error. Individualistic cultures, which tend to be found in western countries (such as North America and the United Kingdom), promote a focus on the individual. Therefore, a person's disposition is thought to be the primary explanation for her behaviour. In contrast, people from a **collectivistic culture** (such as countries located in Asia), that is, a culture that focuses on communal relationships with others, such as family, friends, and community (Figure SP.3), are less likely to commit the fundamental attribution error (Markus & Kitayama, 1991; Triandis, 2001).

(a) (b) (c)

Figure SP.3 People from collectivistic cultures, such as some Asian cultures, are more likely to emphasize relationships with others than to focus primarily on the individual. Activities such as (a) preparing a meal, (b) hanging out, and (c) playing a game engage people in a group. (credit a: modification of work by Arian Zwegers; credit b: modification of work by "conbon33"/Flickr; credit c: modification of work by Anja Disseldorp)

Why do you think this is the case? Collectivistic cultures, which tend to be found in east Asian countries and in Latin American and African countries, focus on the group more than on the individual (Nisbett, Peng, Choi, & Norenzayan, 2001). This focus on others provides a broader perspective that takes into account both situational and cultural influences on behaviour; thus, a more nuanced explanation of the causes of others' behaviour becomes more likely. Table SP.1 summarizes compares individualistic and collectivist cultures.

Table SP.1 Characteristics of Individualistic and Collectivistic Cultures

Individualistic Culture	Collectivistic Culture
Achievement oriented	Relationship oriented
Focus on autonomy	Focus on group harmony
Dispositional perspective	Situational perspective
Independent	Interdependent
Analytic thinking style	Holistic thinking style

Masuda and Nisbett (2001) demonstrated that the kinds of information that people attend to when viewing visual stimuli (e.g., an aquarium scene) can differ significantly depending on whether the observer comes from a collectivistic versus an individualistic culture. Japanese participants were much more likely to recognize objects that were presented when they occurred in the same context in which they were originally viewed. Manipulating the context in which object recall occurred had no such impact on American participants. Other researchers have shown similar differences across cultures. For example, Zhang, Fung, Stanley, Isaacowitz, and Zhang (2014) demonstrated differences in the ways that holistic thinking might develop between Chinese and American participants, and Ramesh and Gelfand (2010) demonstrated that job turnover rates are more related to the fit between a person and the organization in which they work in an Indian sample, but the fit between the person and their

specific job was more predictive of turnover in an American sample.

TRICKY TOPIC: FUNDAMENTAL ATTRIBUTION ERROR

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For a full transcript of this video, click here

Actor-Observer Bias

Returning to our earlier example, Jamie was laid off, but an observer would not know. So a naïve observer would tend to attribute Jamie's hostile behaviour to Jamie's disposition rather than to the true, situational cause. Why do you think we underestimate the influence of the situation on the behaviours of others? One reason is that we often don't have all the

information we need to make a situational explanation for another person's behaviour. The only information we might have is what is observable. Due to this lack of information we have a tendency to assume the behaviour is due to a dispositional, or internal, factor. When it comes to explaining our own behaviours, however, we have much more information available to us. If you came home from school or work angry and yelled at your dog or a loved one, what would your explanation be? You might say you were very tired or feeling unwell and needed quiet time—a situational explanation. The **actor-observer bias** is the phenomenon of attributing other people's behaviour to internal factors (fundamental attribution error) while attributing our own behaviour to situational forces (Jones & Nisbett, 1971; Nisbett, Caputo, Legant, & Marecek, 1973; Choi & Nisbett, 1998). As actors of behaviour, we have more information available to explain our own behaviour. However as observers, we have less information available; therefore, we tend to default to a dispositionist perspective.

One study on the actor-observer bias investigated reasons male participants gave for why they liked their girlfriend (Nisbett et al., 1973). When asked why participants liked their own girlfriend, participants focused on internal, dispositional qualities of their girlfriends (for example, her pleasant personality). The participants' explanations rarely included causes internal to themselves, such as dispositional traits (for example, "I need companionship."). In contrast, when

speculating why a male friend likes his girlfriend, participants were equally likely to give dispositional and external explanations. This supports the idea that actors tend to provide few internal explanations but many situational explanations for their own behaviour. In contrast, observers tend to provide more dispositional explanations for a friend's behaviour (Figure SP.4).

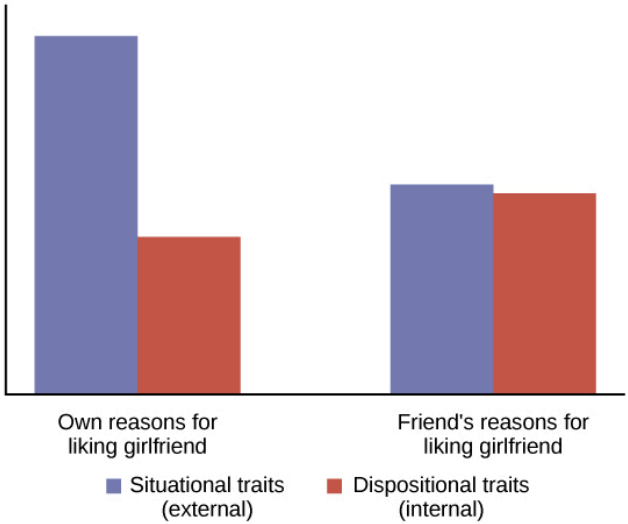

Figure SP.4 Actor-observer bias is evident when subjects explain their own reasons for liking a girlfriend versus their impressions of others' reasons for liking a girlfriend.

Self-Serving Bias

We can understand self-serving bias by digging more deeply into **attribution**, a belief about the cause of a result. One model of attribution proposes three main dimensions: locus

of control (internal versus external), stability (stable versus unstable), and controllability (controllable versus uncontrollable). In this context, stability refers the extent to which the circumstances that result in a given outcome are changeable. The circumstances are considered stable if they are unlikely to change. Controllability refers to the extent to which the circumstances that are associated with a given outcome can be controlled. Obviously, those things that we have the power to control would be labeled controllable (Weiner, 1979).

Following an outcome, self-serving biases are those attributions that enable us to see ourselves in a favourable light (for example, making internal attributions for success and external attributions for failures). When you do well at a task, for example acing an exam, it is in your best interest to make a dispositional attribution for your behaviour ("I'm smart,") instead of a situational one ("The exam was easy,"). The tendency of an individual to take credit by making dispositional or internal attributions for positive outcomes (Miller & Ross, 1975). **Self-serving bias** is the tendency to explain our successes as due to dispositional (internal) characteristics, but to explain our failures as due to situational (external) factors. Again, this is culture dependent. This bias serves to protect self-esteem. You can imagine that if people always made situational attributions for their behaviour, they would never be able to take credit and feel good about their accomplishments.

Consider the example of how we explain our favourite sports team's wins. Research shows that we make internal, stable, and controllable attributions for our team's victory (Figure SP.5) (Grove, Hanrahan, & McInman, 1991). For example, we might tell ourselves that our team is talented (internal), consistently works hard (stable), and uses effective strategies (controllable). In contrast, we are more likely to make external, unstable, and uncontrollable attributions when our favourite team loses. For example, we might tell ourselves that the other team has more experienced players or that the referees were unfair (external), the other team played at home (unstable), and the cold weather affected our team's performance (uncontrollable).

Figure SP.5 We tend to believe that our team wins because it's better, but loses for reasons it cannot control. (credit: Wikimedia Commons, user: Tom Szczerbowski)

Just-World Hypothesis

One consequence of westerners' tendency to provide dispositional explanations for behaviour is victim blame (Jost & Major, 2001). When people experience bad fortune, others tend to assume that they somehow are responsible for their own fate. A common ideology, or worldview, in the United States is the just-world hypothesis. The **just-world hypothesis** is the belief that people get the outcomes they deserve (Lerner & Miller, 1978). In order to maintain the belief that the world is a fair place, people tend to think that good people experience positive outcomes, and bad people

experience negative outcomes (Jost, Banaji, & Nosek, 2004; Jost & Major, 2001). The ability to think of the world as a fair place, where people get what they deserve, allows us to feel that the world is predictable and that we have some control over our life outcomes (Jost et al., 2004; Jost & Major, 2001). For example, if you want to experience positive outcomes, you just need to work hard to get ahead in life.

Can you think of a negative consequence of the just-world hypothesis? One negative consequence is people's tendency to blame poor individuals for their plight. What common explanations are given for why people live in poverty? Have you heard statements such as, "The poor are lazy and just don't want to work" or "Poor people just want to live off the government"? What types of explanations are these, dispositional or situational? These dispositional explanations are clear examples of the fundamental attribution error. Blaming poor people for their poverty ignores situational factors that impact them, such as high unemployment rates, recession, poor educational opportunities, and the familial cycle of poverty (Figure SP.6). Other research shows that people who hold just-world beliefs have negative attitudes toward people who are unemployed and people living with AIDS (Sutton & Douglas, 2005). In the United States and other countries, victims of sexual assault may find themselves blamed for their abuse. Victim advocacy groups, such as Domestic Violence Ended (DOVE), attend court in support of

victims to ensure that blame is directed at the perpetrators of sexual violence, not the victims.

Figure SP.6 People who hold just-world beliefs tend to blame the people in poverty for their circumstances, ignoring situational and cultural causes of poverty. (credit: Adrian Miles)

110.

SELF-PRESENTATION

Learning Objectives

By the end of this section, you will be able to:

- Describe social roles and how they influence behaviour
- Explain what social norms are and how they influence behaviour
- Define the concept of a "script" in the context of social psychology

As you've learned, social psychology is the study of how people affect one another's thoughts, feelings, and behaviours. We have discussed situational perspectives and social psychology's emphasis on the ways in which a person's environment,

including culture and other social influences, affect behaviour. In this section, we examine situational forces that have a strong influence on human behaviour including social roles, social norms, and scripts. We discuss how humans use the social environment as a source of information, or cues, on how to behave. Situational influences on our behaviour have important consequences, such as whether we will help a stranger in an emergency or how we would behave in an unfamiliar environment.

Social Roles

One major social determinant of human behaviour is our social roles. A **social role** is a pattern of behaviour that is expected of a person in a given setting or group (Hare, 2003). Each one of us has several social roles. You may be, at the same time, a student, a parent, an aspiring teacher, a son or daughter, a spouse, and a lifeguard. How do these social roles influence your behaviour? Social roles are defined by culturally shared knowledge. That is, nearly everyone in a given culture knows what behaviour is expected of a person in a given role. For example, what is the social role for a student? If you look around a college classroom you will likely see students engaging in studious behaviour, taking notes, listening to the professor, reading the textbook, and sitting quietly at their desks (Figure SP.7). Of course you may see students deviating from the expected studious behaviour such as texting on their

phones or using Facebook on their laptops, but in all cases, the students that you observe are attending class—a part of the social role of students.

Figure SP.7 Being a student is just one of the many social roles you have. (credit: modification of work by "Rural Institute"/Flickr)

Social roles, and our related behaviour, can vary across different settings. How do you behave when you are engaging in the role of a child attending a family function? Now imagine how you behave when you are engaged in the role of employee at your workplace. It is very likely that your behaviour will be different. Perhaps you are more relaxed and outgoing with your family, making jokes and doing silly things. But at your workplace you might speak more professionally, and although you may be friendly, you are also serious and focused on getting the work completed. These are examples of how our social roles influence and often dictate our behaviour to the extent that identity and personality can vary with

context (that is, in different social groups) (Malloy, Albright, Kenny, Agatstein & Winquist, 1997).

Social Norms

As discussed previously, social roles are defined by a culture's shared knowledge of what is expected behaviour of an individual in a specific role. This shared knowledge comes from social norms. A **social norm** is a group's expectation of what is appropriate and acceptable behaviour for its members—how they are supposed to behave and think (Deutsch & Gerard, 1955; Berkowitz, 2004). How are we expected to act? What are we expected to talk about? What are we expected to wear? In our discussion of social roles we noted that colleges have social norms for students' behaviour in the role of student and workplaces have social norms for employees' behaviours in the role of employee. Social norms are everywhere including in families, gangs, and on social media outlets. What are some social norms on Facebook?

Everyday Connection

Tweens, Teens, and Social Norms

My 11-year-old, Shiloh, recently told me they needed shorts and shirts for the summer, and that they wanted me to take them to a store at the mall that is popular with preteens and teens to buy them. I have noticed that many kids have clothes from that store, so I tried teasing Shiloh. I said, "All the shirts say 'Aero' on the front. If you are wearing a shirt like that and you have a substitute teacher, and the other kids are all wearing that type of shirt, won't the substitute teacher think you are all named 'Aero'?"

Shiloh replied, in typical 11-year-old fashion, "You are not funny. Can we please go shopping?"

I tried a different tactic. I asked Shiloh if having clothing from that particular store will make them popular. They replied, "No, it will not make me popular. It is what the popular kids wear. It will

make me feel happier." How can a label or name brand make someone feel happier? Think back to what you've learned about lifespan development. What is it about pre-teens and young teens that make them want to fit in (Figure SP.8)? Does this change over time? Think back to your high school experience, or look around your college campus. What is the main name brand clothing you see? What messages do we get from the media about how to fit in?

Figure SP.8 Young people struggle to become independent at the same time they are desperately trying to fit in with their peers. (credit: Monica Arellano-Ongpin)

Scripts

Because of social roles, people tend to know what behaviour is expected of them in specific, familiar settings. A **script** is a person's knowledge about the sequence of events expected in a specific setting (Schank & Abelson, 1977). How do you act on the first day of school, when you walk into an elevator, or are at a restaurant? For example, at a restaurant in the United States, if we want the server's attention, we try to make eye contact. In Brazil, you would make the sound "psst" to get the server's attention. You can see the cultural differences in scripts. To an American, saying "psst" to a server might seem rude, yet to a Brazilian, trying to make eye contact might not seem an effective strategy. Scripts are important sources of information to guide behaviour in given situations. Can you imagine being in an unfamiliar situation and not having a script for how to behave? This could be uncomfortable and confusing. How could you find out about social norms in an unfamiliar culture?

111.

ATTITUDES AND PERSUASION

Learning Objectives

By the end of this section, you will be able to:

- Define attitude
- Describe how people's attitudes are internally changed through cognitive dissonance
- Explain how people's attitudes are externally changed through persuasion
- Describe the peripheral and central routes to persuasion

Social psychologists have documented how the power of the

situation can influence our behaviours. Now we turn to how the power of the situation can influence our attitudes and beliefs. **Attitude** is our evaluation of a person, an idea, or an object. We have attitudes for many things ranging from products that we might pick up in the supermarket to people around the world to political policies. Typically, attitudes are favourable or unfavourable: positive or negative (Eagly & Chaiken, 1993). And, they have three components: an affective component (feelings), a behavioural component (the effect of the attitude on behaviour), and a cognitive component (belief and knowledge) (Rosenberg & Hovland, 1960).

For example, you may hold a positive attitude toward recycling. This attitude should result in positive feelings toward recycling (such as "It makes me feel good to recycle" or "I enjoy knowing that I make a small difference in reducing the amount of waste that ends up in landfills"). Certainly, this attitude should be reflected in our behaviour: You actually recycle as often as you can. Finally, this attitude will be reflected in favourable thoughts (for example, "Recycling is good for the environment" or "Recycling is the responsible thing to do").

Our attitudes and beliefs are not only influenced by external forces, but also by internal influences that we control. Like our behaviour, our attitudes and thoughts are not always changed by situational pressures, but they can be consciously changed by our own free will. In this section we discuss the conditions

under which we would want to change our own attitudes and beliefs.

What is Cognitive Dissonance?

Social psychologists have documented that feeling good about ourselves and maintaining positive self-esteem is a powerful motivator of human behaviour (Tavris & Aronson, 2008). In the United States, members of the predominant culture typically think very highly of themselves and view themselves as good people who are above average on many desirable traits (Ehrlinger, Gilovich, & Ross, 2005). Often, our behaviour, attitudes, and beliefs are affected when we experience a threat to our self-esteem or positive self-image. Psychologist Leon Festinger (1957) defined **cognitive dissonance** as psychological discomfort arising from holding two or more inconsistent attitudes, behaviours, or cognitions (thoughts, beliefs, or opinions). Festinger's theory of cognitive dissonance states that when we experience a conflict in our behaviours, attitudes, or beliefs that runs counter to our positive self-perceptions, we experience psychological discomfort (dissonance). For example, if you believe smoking is bad for your health but you continue to smoke, you experience conflict between your belief and behaviour (Figure SP.9).

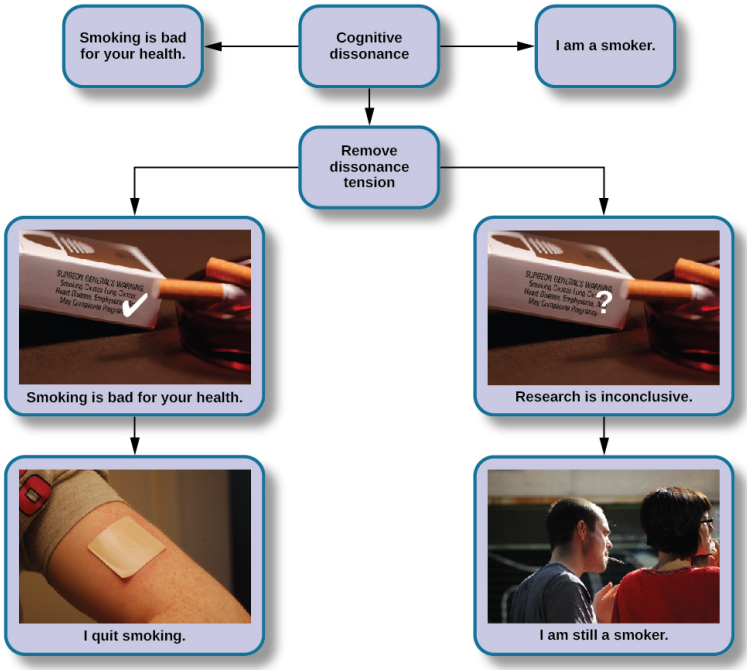

Figure SP.9 Cognitive dissonance is aroused by inconsistent beliefs and behaviours. Believing cigarettes are bad for your health, but smoking cigarettes anyway, can cause cognitive dissonance. To reduce cognitive dissonance, individuals can change their behaviour, as in quitting smoking, or change their belief, such as discounting the evidence that smoking is harmful. (credit "cigarettes": modification of work by CDC/Debora Cartagena; "patch": modification of "RegBarc"/Wikimedia Commons; "smoking": modification of work by Tim Parkinson)

Later research documented that only conflicting cognitions that threaten individuals' positive self-image cause dissonance (Greenwald & Ronis, 1978). Additional research found that dissonance is not only psychologically uncomfortable but also

can cause physiological arousal (Croyle & Cooper, 1983) and activate regions of the brain important in emotions and cognitive functioning (van Veen, Krug, Schooler, & Carter, 2009). When we experience cognitive dissonance, we are motivated to decrease it because it is psychologically, physically, and mentally uncomfortable. We can reduce cognitive dissonance by bringing our cognitions, attitudes, and behaviours in line—that is, making them harmonious. This can be done in different ways, such as:

- changing our discrepant behaviour (e.g., stop smoking),
- changing our cognitions through rationalization or denial (e.g., telling ourselves that health risks can be reduced by smoking filtered cigarettes),
- adding a new cognition (e.g., "Smoking suppresses my appetite so I don't become overweight, which is good for my health.").

A classic example of cognitive dissonance is Elian, a 20-year-old who enlists in the military. During boot camp is awakened at 5:00 a.m., is chronically sleep deprived, yelled at, covered in sand flea bites, physically bruised and battered, and mentally exhausted (Figure SP.10). It gets worse. Recruits that make it to week 11 of boot camp have to do 54 hours of continuous training.

Figure SP.10 A person who has chosen a difficult path must deal with cognitive dissonance in addition to many other discomforts. (credit: Tyler J. Bolken)

Not surprisingly, Elian is miserable. No one likes to be miserable. In this type of situation, people can change their beliefs, their attitudes, or their behaviours. The last option, a change of behaviours, is not available to Elian. He has signed on to the military for four years, and cannot legally leave.

If Elian keeps thinking about how miserable they are, it is going to be a very long four years. Elian will be in a constant state of cognitive dissonance. As an alternative to this misery, Elian can change their beliefs or attitudes. Elian can tell themselves, "I am becoming stronger, healthier, and sharper. I am learning discipline and how to defend myself and my country. What I am doing is really important." If this is their

belief, Elian will realize that they are becoming stronger through their challenges. Then they will feel better and not experience cognitive dissonance, which is an uncomfortable state.

TRICKY TOPIC: COGNITIVE DISSONANCE

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The Effect of Initiation

The military example demonstrates the observation that a difficult initiation into a group influences us to like the group more. Another social psychology concept, **justification of effort**, suggests that we value goals and achievements that we put a lot of effort into. According to this theory, if something

is difficult for us to achieve, we believe it is more worthwhile. For example, if you move to an apartment and spend hours assembling a dresser you bought from Ikea, you will value that more than a fancier dresser your parents bought you. We do not want to have wasted time and effort to join a group that we eventually leave. A classic experiment by Aronson and Mills (1959) demonstrated this justification of effort effect. College students volunteered to join a campus group that would meet regularly to discuss the psychology of sex. Participants were randomly assigned to one of three conditions: no initiation, an easy initiation, and a difficult initiation into the group. After participating in the first discussion, which was deliberately made very boring, participants rated how much they liked the group. Participants who underwent a difficult initiation process to join the group rated the group more favourably than did participants with an easy initiation or no initiation (Figure SP.11).

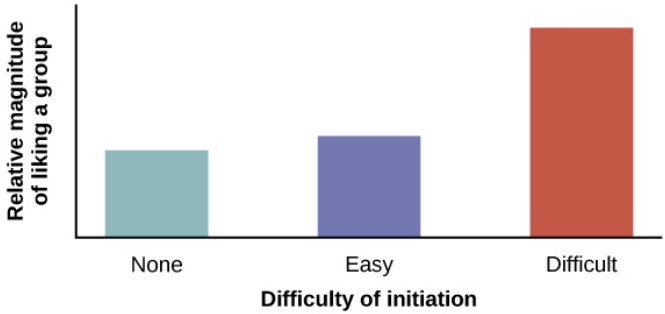

Figure SP.11 Justification of effort has a distinct effect on a person liking a group. Students in the difficult initiation condition liked the group more than students in other conditions due to the justification of effort.

Similar effects can be seen in a more recent study of how student effort affects course evaluations. Heckert, Latier, Ringwald-Burton, and Drazen (2006) surveyed 463 undergraduates enrolled in courses at a midwestern university about the amount of effort that their courses required of them. In addition, the students were also asked to evaluate various aspects of the course. Given what you've just read, it will come as no surprise that those courses that were associated with the highest level of effort were evaluated as being more valuable than those that did not. Furthermore, students indicated that they learned more in courses that required more effort, regardless of the grades that they received in those courses (Heckert et al., 2006).

Besides the classic military example and group initiation, can you think of other examples of cognitive dissonance? Here is

one: Addison and Adrian live in Fairfield County, Connecticut, which is one of the wealthiest areas in the United States and has a very high cost of living. Addison telecommutes from home and Adrian does not work outside of the home. They rent a very small house for more than $3000 a month. Adrian shops at consignment stores for clothes and economizes when possible. They complain that they never have any money and that they cannot buy anything new. When asked why they do not move to a less expensive location, since Addison telecommutes, they respond that Fairfield County is beautiful, they love the beaches, and they feel comfortable there. How does the theory of cognitive dissonance apply to Addison and Adrian's choices?

Persuasion

In the previous section we discussed that the motivation to reduce cognitive dissonance leads us to change our attitudes, behaviours, and/or cognitions to make them consonant. **Persuasion** is the process of changing our attitude toward something based on some kind of communication. Much of the persuasion we experience comes from outside forces. How do people convince others to change their attitudes, beliefs, and behaviours (Figure SP.12)? What communications do you receive that attempt to persuade you to change your attitudes, beliefs, and behaviours?

Figure SP.12 We encounter attempts at persuasion attempts everywhere. Persuasion is not limited to formal advertising; we are confronted with it throughout our everyday world. (credit: Robert Couse-Baker)

A subfield of social psychology studies persuasion and social influence, providing us with a plethora of information on how humans can be persuaded by others.

Yale Attitude Change Approach

The topic of persuasion has been one of the most extensively researched areas in social psychology (Fiske et al., 2010). During the Second World War, Carl Hovland extensively researched persuasion for the U.S. Army. After the war, Hovland continued his exploration of persuasion at Yale

University. Out of this work came a model called the Yale attitude change approach, which describes the conditions under which people tend to change their attitudes. Hovland demonstrated that certain features of the source of a persuasive message, the content of the message, and the characteristics of the audience will influence the persuasiveness of a message (Hovland, Janis, & Kelley, 1953).

Features of the source of the persuasive message include the credibility of the speaker (Hovland & Weiss, 1951) and the physical attractiveness of the speaker (Eagly & Chaiken, 1975; Petty, Wegener, & Fabrigar, 1997). Thus, speakers who are credible, or have expertise on the topic, and who are deemed as trustworthy are more persuasive than less credible speakers. Similarly, more attractive speakers are more persuasive than less attractive speakers. The use of famous actors and athletes to advertise products on television and in print relies on this principle. The immediate and long term impact of the persuasion also depends, however, on the credibility of the messenger (Kumkale & Albarracín, 2004).

Features of the message itself that affect persuasion include subtlety (the quality of being important, but not obvious) (Petty & Cacioppo, 1986; Walster & Festinger, 1962); sidedness (that is, having more than one side) (Crowley & Hoyer, 1994; Igou & Bless, 2003; Lumsdaine & Janis, 1953); timing (Haugtvedt & Wegener, 1994; Miller & Campbell, 1959), and whether both sides are presented. Messages that are more subtle are more persuasive than direct messages.

Arguments that occur first, such as in a debate, are more influential if messages are given back-to-back. However, if there is a delay after the first message, and before the audience needs to make a decision, the last message presented will tend to be more persuasive (Miller & Campbell, 1959).

Features of the audience that affect persuasion are attention (Albarracín & Wyer, 2001; Festinger & Maccoby, 1964), intelligence, self-esteem (Rhodes & Wood, 1992), and age (Krosnick & Alwin, 1989). In order to be persuaded, audience members must be paying attention. People with lower intelligence are more easily persuaded than people with higher intelligence; whereas people with moderate self-esteem are more easily persuaded than people with higher or lower self-esteem (Rhodes & Wood, 1992). Finally, younger adults aged 18–25 are more persuadable than older adults.

Elaboration Likelihood Model

An especially popular model that describes the dynamics of persuasion is the elaboration likelihood model of persuasion (Petty & Cacioppo, 1986). The elaboration likelihood model considers the variables of the attitude change approach—that is, features of the source of the persuasive message, contents of the message, and characteristics of the audience are used to determine when attitude change will occur. According to the elaboration likelihood model of persuasion, there are two main routes that play a role in

delivering a persuasive message: central and peripheral (Figure SP.13).

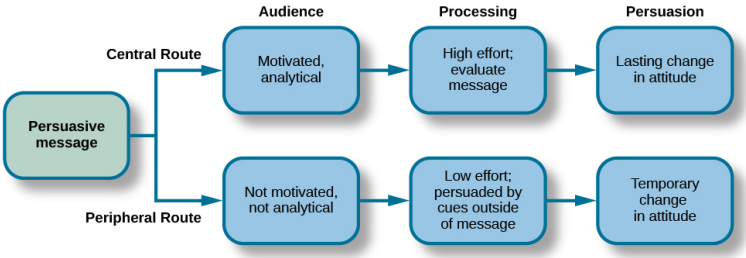

Figure SP.13 Persuasion can take one of two paths, and the durability of the end result depends on the path.

The **central route** is logic driven and uses data and facts to convince people of an argument's worthiness. For example, a car company seeking to persuade you to purchase their model will emphasize the car's safety features and fuel economy. This is a direct route to persuasion that focuses on the quality of the information. In order for the central route of persuasion to be effective in changing attitudes, thoughts, and behaviours, the argument must be strong and, if successful, will result in lasting attitude change.

The central route to persuasion works best when the target of persuasion, or the audience, is analytical and willing to engage in processing of the information. From an advertiser's perspective, what products would be best sold using the central route to persuasion? What audience would most likely be influenced to buy the product? One example is buying a computer. It is likely, for example, that small business owners

might be especially influenced by the focus on the computer's quality and features such as processing speed and memory capacity.

The **peripheral route** is an indirect route that uses peripheral cues to associate positivity with the message (Petty & Cacioppo, 1986). Instead of focusing on the facts and a product's quality, the peripheral route relies on association with positive characteristics such as positive emotions and celebrity endorsement. For example, having a popular athlete advertise athletic shoes is a common method used to encourage young adults to purchase the shoes. This route to attitude change does not require much effort or information processing. This method of persuasion may promote positivity toward the message or product, but it typically results in less permanent attitude or behaviour change. The audience does not need to be analytical or motivated to process the message. In fact, a peripheral route to persuasion may not even be noticed by the audience, for example in the strategy of product placement. Product placement refers to putting a product with a clear brand name or brand identity in a TV show or movie to promote the product (Gupta & Lord, 1998). For example, one season of the reality series *American Idol* prominently showed the panel of judges drinking out of cups that displayed the Coca-Cola logo. What other products would be best sold using the peripheral route to persuasion? Another example is clothing: A retailer may focus on celebrities that are wearing the same style of clothing.

Foot-in-the-door Technique

Researchers have tested many persuasion strategies that are effective in selling products and changing people's attitude, ideas, and behaviours. One effective strategy is the **foot-in-the-door technique** (Cialdini, 2001; Pliner, Hart, Kohl, & Saari, 1974). Using the foot-in-the-door technique, the persuader gets a person to agree to bestow a small favour or to buy a small item, only to later request a larger favour or purchase of a bigger item. The foot-in-the-door technique was demonstrated in a study by Freedman and Fraser (1966) in which participants who agreed to post small sign in their yard or sign a petition were more likely to agree to put a large sign in their yard than people who declined the first request (Figure SP.14). Research on this technique also illustrates the principle of consistency (Cialdini, 2001): Our past behaviour often directs our future behaviour, and we have a desire to maintain consistency once we have a committed to a behaviour.

(a)

(b)

Figure SP.14 With the foot-in-the-door technique, getting someone to agree to a small request such as (a) wearing a campaign button can make them more likely to agree to a larger request, such as (b) putting campaigns signs in your yard. (credit a: modification of work by Joe Crawford; credit b: modification of work by "shutterblog"/Flickr)

A common application of foot-in-the-door is when teens ask their parents for a small permission (for example, extending curfew by a half hour) and then asking them for something larger. Having granted the smaller request increases the likelihood that parents will acquiesce with the later, larger request.

How would a store owner use the foot-in-the-door technique to sell you an expensive product? For example, say that you are buying the latest model smartphone, and the salesperson suggests you purchase the best data plan. You agree to this. The salesperson then suggests a bigger purchase—the three-year extended warranty. After agreeing to the smaller request, you are more likely to also agree to the larger request. You may have encountered this if you have bought a car. When

salespeople realize that a buyer intends to purchase a certain model, they might try to get the customer to pay for many or most available options on the car. Another example of the foot-in-the-door technique would be applied to an individual in the market for a used car who decides to buy a fully loaded new car. Why? Because the salesperson convinced the buyer that they need a car that has all of the safety features that were not available in the used car.

112.

CONFORMITY, COMPLIANCE, AND OBEDIENCE

Learning Objectives

By the end of this section, you will be able to:

- Explain the Asch effect
- Define conformity and types of social influence
- Describe Stanley Milgram's experiment and its implications
- Define groupthink, social loafing, and social facilitation

In this section, we discuss additional ways in which people influence others. The topics of conformity, social influence, obedience, and group processes demonstrate the power of the social situation to change our thoughts, feelings, and behaviours. We begin this section with a discussion of a famous social psychology experiment that demonstrated how susceptible humans are to outside social pressures.

Conformity

Solomon Asch conducted several experiments in the 1950s to determine how people are affected by the thoughts and behaviours of other people. In one study, a group of participants was shown a series of printed line segments of different lengths: a, b, and c (Figure SP.15). Participants were then shown a fourth line segment: x. They were asked to identify which line segment from the first group (a, b, or c) most closely resembled the fourth line segment in length.

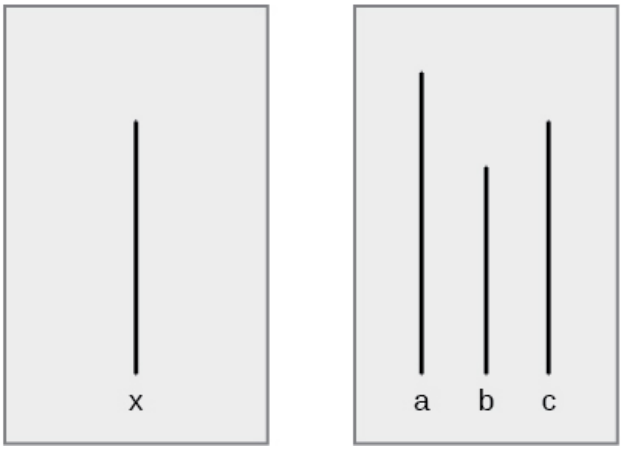

Figure SP.15 These line segments illustrate the judgment task in Asch's conformity study. Which line on the right—a, b, or c—is the same length as line x on the left?

Each group of participants had only one true, naïve subject. The remaining members of the group were confederates of the researcher. A **confederate** is a person who is aware of the experiment and works for the researcher. Confederates are used to manipulate social situations as part of the research design, and the true, naïve participants believe that confederates are, like them, uninformed participants in the experiment. In Asch's study, the confederates identified a line segment that was obviously shorter than the target line—a wrong answer. The naïve participant then had to identify aloud the line segment that best matched the target line segment.

How often do you think the true participant aligned with the

confederates' response? That is, how often do you think the group influenced the participant, and the participant gave the wrong answer? Asch (1955) found that 76% of participants conformed to group pressure at least once by indicating the incorrect line. **Conformity** is the change in a person's behaviour to go along with the group, even if they do not agree with the group. Why would people give the wrong answer? What factors would increase or decrease someone giving in or conforming to group pressure?

The **Asch effect** is the influence of the group majority on an individual's judgment.

What factors make a person more likely to yield to group pressure? Research shows that the size of the majority, the presence of another dissenter, and the public or relatively private nature of responses are key influences on conformity.

- The size of the majority: The greater the number of people in the majority, the more likely an individual will conform. There is, however, an upper limit: a point where adding more members does not increase conformity. In Asch's study, conformity increased with the number of people in the majority—up to seven individuals. At numbers beyond seven, conformity levelled off and decreased slightly (Asch, 1955).
- The presence of another dissenter: If there is at least one dissenter, conformity rates drop to near zero (Asch, 1955).

- The public or private nature of the responses: When responses are made publicly (in front of others), conformity is more likely; however, when responses are made privately (e.g., writing down the response), conformity is less likely (Deutsch & Gerard, 1955).

The finding that conformity is more likely to occur when responses are public than when they are private is the reason government elections require voting in secret, so we are not coerced by others (Figure SP.16). The Asch effect can be easily seen in children when they have to publicly vote for something. For example, if the teacher asks whether the children would rather have extra recess, no homework, or candy, once a few children vote, the rest will comply and go with the majority. In a different classroom, the majority might vote differently, and most of the children would comply with that majority. When someone's vote changes if it is made in public versus private, this is known as compliance. Compliance can be a form of conformity. Compliance is going along with a request or demand, even if you do not agree with the request. In Asch's studies, the participants complied by giving the wrong answers, but privately did not accept that the obvious wrong answers were correct.

Figure SP.16 Voting for government officials in most countries is private to reduce the pressure of conformity. (credit: Nicole Klauss)

Now that you have learned about the Asch line experiments, why do you think the participants conformed? The correct answer to the line segment question was obvious, and it was an easy task. Researchers have categorized the motivation to conform into two types: normative social influence and informational social influence (Deutsch & Gerard, 1955).

In **normative social influence**, people conform to the group norm to fit in, to feel good, and to be accepted by the group. However, with **informational social influence**, people conform because they believe the group is competent and has the correct information, particularly when the task or situation is ambiguous. What type of social influence was operating in

the Asch conformity studies? Since the line judgment task was unambiguous, participants did not need to rely on the group for information. Instead, participants complied to fit in and avoid ridicule, an instance of normative social influence.

An example of informational social influence may be what to do in an emergency situation. Imagine that you are in a movie theatre watching a film and what seems to be smoke comes in the theatre from under the emergency exit door. You are not certain that it is smoke—it might be a special effect for the movie, such as a fog machine. When you are uncertain you will tend to look at the behaviour of others in the theatre. If other people show concern and get up to leave, you are likely to do the same. However, if others seem unconcerned, you are likely to stay put and continue watching the movie (Figure SP.18).

(a) (b)

Figure SP.17 People in crowds tend to take cues from others and act accordingly. (a) An audience is listening to a lecture and people are relatively quiet, still, and attentive to the speaker on the stage. (b) An audience is at a rock concert where people are dancing, singing, and possibly engaging in activities like crowd surfing. (credit a: modification of work by Matt Brown; credit b: modification of work by Christian Holmér)

How would you have behaved if you were a participant in Asch's study? Many students say they would not conform, that the study is outdated, and that people nowadays are more independent. To some extent this may be true. Research suggests that overall rates of conformity may have reduced since the time of Asch's research. Furthermore, efforts to replicate Asch's study have made it clear that many factors determine how likely it is that someone will demonstrate conformity to the group. These factors include the participant's age, gender, and socio-cultural background (Bond & Smith, 1996; Larsen, 1990; Walker & Andrade, 1996).

TRICKY TOPIC: INFORMATIONAL AND NORMATIVE INFLUENCES

One or more interactive elements has been excluded from this version of the text. You can view them online here: https://caul-cbua.pressbooks.pub/intropsychneuro/?p=523#oembed-1

If the video above does not load, click here: https://youtu.be/b9UGiP8DGYQ
For a full transcript of this video, click here

Stanley Milgram's Experiment

Conformity is one effect of the influence of others on our thoughts, feelings, and behaviours. Another form of social influence is obedience to authority. **Obedience** is the change of an individual's behaviour to comply with a demand by an authority figure. People often comply with the request because they are concerned about a consequence if they do not comply. To demonstrate this phenomenon, we review another classic social psychology experiment.

Stanley Milgram was a social psychology professor at Yale who was influenced by the trial of Adolf Eichmann, a Nazi war

criminal. Eichmann's defence for the atrocities he committed was that he was "just following orders." Milgram (1963) wanted to test the validity of this defence, so he designed an experiment and initially recruited 40 men for his experiment. The volunteer participants were led to believe that they were participating in a study to improve learning and memory. The participants were told that they were to teach other students (learners) correct answers to a series of test items. The participants were shown how to use a device that they were told delivered electric shocks of different intensities to the learners. The participants were told to shock the learners if they gave a wrong answer to a test item—that the shock would help them to learn. The participants believed they gave the learners shocks, which increased in 15-volt increments, all the way up to 450 volts. The participants did not know that the learners were confederates and that the confederates did not actually receive shocks.

In response to a string of incorrect answers from the learners, the participants obediently and repeatedly shocked them. The confederate learners cried out for help, begged the participant teachers to stop, and even complained of heart trouble. Yet, when the researcher told the participant-teachers to continue the shock, 65% of the participants continued the shock to the maximum voltage and to the point that the learner became unresponsive (Figure SP.18). What makes someone obey authority to the point of potentially causing serious harm to another person?

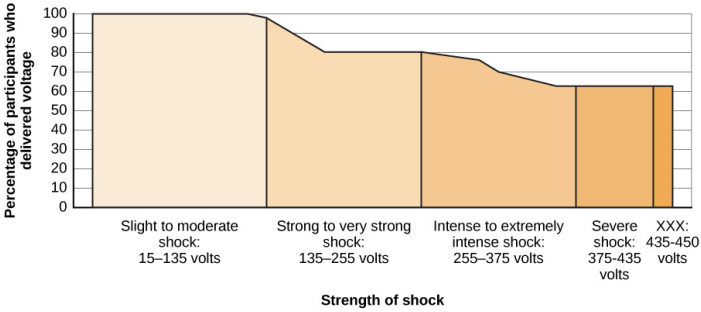

Figure SP.18 The Milgram experiment showed the surprising degree to which people obey authority. Two out of three (65%) participants continued to administer shocks to an unresponsive learner.

Several variations of the original Milgram experiment were conducted to test the boundaries of obedience. When certain features of the situation were changed, participants were less likely to continue to deliver shocks (Milgram, 1965). For example, when the setting of the experiment was moved to an off-campus office building, the percentage of participants who delivered the highest shock dropped to 48%. When the learner was in the same room as the teacher, the highest shock rate dropped to 40%. When the teachers' and learners' hands were touching, the highest shock rate dropped to 30%. When the researcher gave the orders by phone, the rate dropped to 23%. These variations show that when the humanity of the person being shocked was increased, obedience decreased. Similarly, when the authority of the experimenter decreased, so did obedience.

This case is still very applicable today. What does a person

do if an authority figure orders something done? What if the person believes it is incorrect, or worse, unethical? In a study by Martin and Bull (2008), midwives privately filled out a questionnaire regarding best practices and expectations in delivering a baby. Then, a more senior midwife and supervisor asked the junior midwives to do something they had previously stated they were opposed to. Most of the junior midwives were obedient to authority, going against their own beliefs. Burger (2009) partially replicated this study. He found among a multicultural sample of women and men that their levels of obedience matched Milgram's research. Doliński et al. (2017) performed a replication of Burger's work in Poland and controlled for the gender of both participants and learners, and once again, results that were consistent with Milgram's original work were observed.

Link to Learning

Watch this Crash Course on Social Influence, in which Hank Green outlines the Milgram experiment and related concepts, to learn more.

Groupthink

When in group settings, we are often influenced by the thoughts, feelings, and behaviours of people around us. Whether it is due to normative or informational social influence, groups have power to influence individuals. Another phenomenon of group conformity is groupthink. **Groupthink** is the modification of the opinions of members of a group to align with what they believe is the group consensus (Janis, 1972). In group situations, the group often takes action that individuals would not perform outside the group setting because groups make more extreme decisions than individuals do. Moreover, groupthink can hinder opposing trains of thought. This elimination of diverse opinions contributes to faulty decision by the group.

Why does groupthink occur? There are several causes of groupthink, which makes it preventable. When the group is highly cohesive, or has a strong sense of connection, maintaining group harmony may become more important to the group than making sound decisions. If the group leader is directive and makes his opinions known, this may discourage group members from disagreeing with the leader. If the group is isolated from hearing alternative or new viewpoints, groupthink may be more likely. How do you know when groupthink is occurring?

There are several symptoms of groupthink including the following:

- perceiving the group as invulnerable or invincible—believing it can do no wrong
- believing the group is morally correct
- self-censorship by group members, such as withholding information to avoid disrupting the group consensus
- the quashing of dissenting group members' opinions
- the shielding of the group leader from dissenting views
- perceiving an illusion of unanimity among group members
- holding stereotypes or negative attitudes toward the out-group or others' with differing viewpoints (Janis, 1972)

Given the causes and symptoms of groupthink, how can it be avoided? There are several strategies that can improve group decision making including seeking outside opinions, voting in private, having the leader withhold position statements until all group members have voiced their views, conducting research on all viewpoints, weighing the costs and benefits of all options, and developing a contingency plan (Janis, 1972; Mitchell & Eckstein, 2009).

Group Polarization

Another phenomenon that occurs within group settings is group polarization. **Group polarization** (Teger & Pruitt, 1967) is the strengthening of an original group attitude after the discussion of views within a group. That is, if a group

initially favours a viewpoint, after discussion the group consensus is likely a stronger endorsement of the viewpoint. Conversely, if the group was initially opposed to a viewpoint, group discussion would likely lead to stronger opposition. Group polarization explains many actions taken by groups that would not be undertaken by individuals. Group polarization can be observed at political conventions, when platforms of the party are supported by individuals who, when not in a group, would decline to support them. Recently, some theorists have argued that group polarization may be partly responsible for the extreme political partisanship that seems ubiquitous in modern society. Given that people can self-select media outlets that are most consistent with their own political views, they are less likely to encounter opposing viewpoints. Over time, this leads to a strengthening of their own perspective and of hostile attitudes and behaviours towards those with different political ideals. Remarkably, political polarization leads to open levels of discrimination that are on par with, or perhaps exceed, racial discrimination (Iyengar & Westwood, 2015). A more everyday example is a group's discussion of how attractive someone is. Does your opinion change if you find someone attractive, but your friends do not agree? If your friends vociferously agree, might you then find this person even more attractive?

Social traps refer to situations that arise when individuals or groups of individuals behave in ways that are not in their best interest and that may have negative, long-term consequences.

However, once established, a social trap is very difficult to escape. For example, following World War II, the United States and the former Soviet Union engaged in a nuclear arms race. While the presence of nuclear weapons is not in either party's best interest, once the arms race began, each country felt the need to continue producing nuclear weapons to protect itself from the other.

Social Loafing

Imagine you were just assigned a group project with other students whom you barely know. Everyone in your group will get the same grade. Are you the type who will do most of the work, even though the final grade will be shared? Or are you more likely to do less work because you know others will pick up the slack? **Social loafing** involves a reduction in individual output on tasks where contributions are pooled. Because each individual's efforts are not evaluated, individuals can become less motivated to perform well. Karau and Williams (1993) and Simms and Nichols (2014) reviewed the research on social loafing and discerned when it was least likely to happen. The researchers noted that social loafing could be alleviated if, among other situations, individuals knew their work would be assessed by a manager (in a workplace setting) or instructor (in a classroom setting), or if a manager or instructor required group members to complete self-evaluations.

The likelihood of social loafing in student work groups increases as the size of the group increases (Shepperd & Taylor,

1999). According to Kamau and Williams (1993), college students were the population most likely to engage in social loafing. Their study also found that women and participants from collectivistic cultures were less likely to engage in social loafing, explaining that their group orientation may account for this.

College students could work around social loafing or "free-riding" by suggesting to their professors use of a flocking method to form groups. Harding (2018) compared groups of students who had self-selected into groups for class to those who had been formed by flocking, which involves assigning students to groups who have similar schedules and motivations. Not only did she find that students reported less "free riding," but that they also did better in the group assignments compared to those whose groups were self-selected.

Interestingly, the opposite of social loafing occurs when the task is complex and difficult (Bond & Titus, 1983; Geen, 1989). In a group setting, such as the student work group, if your individual performance cannot be evaluated, there is less pressure for you to do well, and thus less anxiety or physiological arousal (Latané, Williams, & Harkens, 1979). This puts you in a relaxed state in which you can perform your best, if you choose (Zajonc, 1965). If the task is a difficult one, many people feel motivated and believe that their group needs their input to do well on a challenging project (Jackson & Williams, 1985).

Social Facilitation

Not all intergroup interactions lead to social loafing. Sometimes being in a group situation can improve performance. **Social facilitation** occurs when an individual performs better when an audience is watching than when the individual performs the behaviour alone. This typically occurs when people are performing a task for which they are skilled. Can you think of an example in which having an audience could improve performance? One common example is sports. Skilled basketball players will be more likely to make a free throw basket when surrounded by a cheering audience than when playing alone in the gym. However, there are instances when even skilled athletes can have difficulty under pressure. For example, if an athlete is less skilled or nervous about making a free throw, having an audience may actually hinder rather than help. In sum, social facilitation is likely to occur for easy tasks, or tasks at which we are skilled, but worse performance may occur when performing in front of others, depending on the task.

Deindividuation

Another way that being part of a group can affect behaviour is exhibited in instances in which deindividuation occurs. Deindividuation refers to situations in which a person may feel a sense of anonymity and therefore a reduction in accountability and sense of self when among others.

Deindividuation is often pointed to in cases in which mob or riot-like behaviours occur (Zimbardo, 1969), but research on the subject and the role that deindividuation plays in such behaviours has resulted in inconsistent results (as discussed in Granström, Guvå, Hylander, & Rosander, 2009).

Table SP.2 summarizes the types of social influence you have learned about in this chapter.

Table SP.2 Types of Social Influence

Type of Social Influence	Description
Conformity	Changing your behaviour to go along with the group even if you do not agree with the group
Compliance	Going along with a request or demand
Normative social influence	Conformity to a group norm to fit in, feel good, and be accepted by the group
Informational social influence	Conformity to a group norm prompted by the belief that the group is competent and has the correct information
Obedience	Changing your behaviour to please an authority figure or to avoid aversive consequences
Groupthink	Tendency to prioritize group cohesion over critical thinking that might lead to poor decision making; more likely to occur when there is perceived unanimity among the group
Group polarization	Strengthening of the original group attitude after discussing views within a group
Social facilitation	Improved performance when an audience is watching versus when the individual performs the behaviour alone
Social loafing	Exertion of less effort by a person working in a group because individual performance cannot be evaluated separately from the group, thus causing performance decline on easy tasks
Deindividuation	Group situation in which a person may feel a sense of anonymity and a resulting reduction in accountability and sense of self

113.

PREJUDICE AND OPPRESSION

Learning Objectives

By the end of this section, you will be able to:

- Define and distinguish among prejudice, stereotypes, and discrimination
- Provide examples of prejudice, stereotypes, and discrimination
- Explain why prejudice and discrimination exist

Human conflict can result in crime, war, and mass murder, such as genocide. Prejudice and discrimination often are root causes of human conflict, which explains how strangers come to hate one another to the extreme of causing others harm.

Prejudice and discrimination affect everyone. In this section we will examine the definitions of prejudice and discrimination, examples of these concepts, and causes of these biases.

(a) (b) (c)

Figure SP.19 Prejudice and discrimination occur across the globe. (a) A 1939 sign in German-occupied Poland warns "No Entrance for Poles!" (b) An African-American male drinks from a designated "colored" water fountain in Oklahoma in 1939 during the era of racial segregation as a practice of discrimination. (c) Members of the Westboro Baptist Church, widely identified as a hate group, engage in discrimination based on religion and sexual orientation. (credit b: modification of work by United States Farm Security Administration; credit c: modification of work by "JCWilmore"/Wikimedia Commons)

Understanding Prejudice and Discrimination

As we discussed in the opening story of Trayvon Martin, humans are very diverse and although we share many similarities, we also have many differences. The social groups we belong to help form our identities (Tajfel, 1974). These differences may be difficult for some people to reconcile, which may lead to prejudice toward people who are different. **Prejudice** is a negative attitude and feeling toward

an individual based solely on one's membership in a particular social group (Allport, 1954; Brown, 2010). Prejudice is common against people who are members of an unfamiliar cultural group. Thus, certain types of education, contact, interactions, and building relationships with members of different cultural groups can reduce the tendency toward prejudice. In fact, simply imagining interacting with members of different cultural groups might affect prejudice. Indeed, when experimental participants were asked to imagine themselves positively interacting with someone from a different group, this led to an increased positive attitude toward the other group and an increase in positive traits associated with the other group. Furthermore, imagined social interaction can reduce anxiety associated with inter-group interactions (Crisp & Turner, 2009). What are some examples of social groups that you belong to that contribute to your identity? Social groups can include gender, race, ethnicity, nationality, social class, religion, sexual orientation, profession, and many more. And, as is true for social roles, you can simultaneously be a member of more than one social group. An example of prejudice is having a negative attitude toward people who are not born in the United States. Although people holding this prejudiced attitude do not know all people who were not born in the United States, they dislike them due to their status as foreigners.

Can you think of a prejudiced attitude you have held toward a group of people? How did your prejudice develop? Prejudice

often begins in the form of a **stereotype**—that is, a specific belief or assumption about individuals based solely on their membership in a group, regardless of their individual characteristics. Stereotypes become overgeneralized and applied to all members of a group. For example, someone holding prejudiced attitudes toward older adults, may believe that older adults are slow and incompetent (Cuddy, Norton, & Fiske, 2005; Nelson, 2004). We cannot possibly know each individual person of advanced age to know that all older adults are slow and incompetent. Therefore, this negative belief is overgeneralized to all members of the group, even though many of the individual group members may in fact be spry and intelligent.

Another example of a well-known stereotype involves beliefs about racial differences among athletes. As Hodge, Burden, Robinson, and Bennett (2008) point out, Black male athletes are often believed to be more athletic, yet less intelligent, than their White male counterparts. These beliefs persist despite a number of high profile examples to the contrary. Sadly, such beliefs often influence how these athletes are treated by others and how they view themselves and their own capabilities. Whether or not you agree with a stereotype, stereotypes are generally well-known within in a given culture (Devine, 1989).

Sometimes people will act on their prejudiced attitudes toward a group of people, and this behaviour is known as discrimination. **Discrimination** is negative action toward an

individual as a result of one's membership in a particular group (Allport, 1954; Dovidio & Gaertner, 2004). As a result of holding negative beliefs (stereotypes) and negative attitudes (prejudice) about a particular group, people often treat the target of prejudice poorly, such as excluding older adults from their circle of friends. An example of a psychologist experiencing gender discrimination is found in the life and studies of Mary Whiton Calkins. Calkins was given special permission to attend graduate seminars at Harvard (at that time in the late 1880s, Harvard did not accept women) and at one point was the sole student of the famous psychologist William James. She passed all the requirements needed for a PhD and was described by psychologist Hugo Münsterberg as "one of the strongest professors of psychology in this country." However, Harvard refused to grant Calkins a PhD because she was a woman (Harvard University, 2019). Table SP.3 summarizes the characteristics of stereotypes, prejudice, and discrimination. Have you ever been the target of discrimination? If so, how did this negative treatment make you feel?

Table SP.3 Connecting Stereotypes, Prejudice, and Discrimination

Item	Function	Connection	Example
Stereotype	Cognitive; thoughts about people	Overgeneralized beliefs about people may lead to prejudice.	"Toronto Maple Leafs fans are arrogant and obnoxious."
Prejudice	Affective; feelings about people, both positive and negative	Feelings may influence treatment of others, leading to discrimination.	"I hate Leafs fans; they make me angry."
Discrimination	Behaviour; positive or negative treatment of others	Holding stereotypes and harbouring prejudice may lead to excluding, avoiding, and biased treatment of group members.	"I would never hire nor become friends with a person if I knew he or she were a Leafs fan."

So far, we've discussed stereotypes, prejudice, and discrimination as negative thoughts, feelings, and behaviours because these are typically the most problematic. However, it is important to also point out that people can hold positive thoughts, feelings, and behaviours toward individuals based on group membership; for example, they would show

preferential treatment for people who are like themselves—that is, who share the same gender, race, or favourite sports team.

Link to Learning

Watch this clip from the show "What Would You Do?", that demonstrates the concepts of prejudice, stereotypes, and discrimination. In the video, three different people try to "steal" a bike – how might their race or gender influence the reaction of those passing by? How would you react?

Types of Prejudice and Discrimination

When we meet strangers we automatically process three pieces of information about them: their race, gender, and age (Ito & Urland, 2003). Why are these aspects of an unfamiliar person so important? Why don't we instead notice whether their eyes are friendly, whether they are smiling, their height, the type of clothes they are wearing? Although these secondary

characteristics are important in forming a first impression of a stranger, the social categories of race, gender, and age provide a wealth of information about an individual. This information, however, often is based on stereotypes. We may have different expectations of strangers depending on their race, gender, and age. What stereotypes and prejudices do you hold about people who are from a race, gender, and age group different from your own?

Racism

Racism is prejudice and discrimination against an individual based solely on one's membership in a specific racial group (such as toward African Americans, Asian Americans, Latinos, Native Americans, European Americans). What are some stereotypes of various racial or ethnic groups? Research suggests cultural stereotypes for Asian Americans include cold, sly, and intelligent; for Latinos, cold and unintelligent; for European Americans, cold and intelligent; and for African Americans, aggressive, athletic, and more likely to be law breakers (Devine & Elliot, 1995; Fiske, Cuddy, Glick, & Xu, 2002; Sommers & Ellsworth, 2000; Dixon & Linz, 2000).

Racism exists for many racial and ethnic groups. For example, Blacks are significantly more likely to have their vehicles searched during traffic stops than Whites, particularly when Blacks are driving in predominately White neighborhoods, a phenomenon often termed "DWB" or "driving while Black" (Rojek, Rosenfeld, & Decker, 2012).

Mexican Americans and other Latino groups also are targets of racism from the police and other members of the community. For example, when purchasing items with a personal check, Latino shoppers are more likely than White shoppers to be asked to show formal identification (Dovidio et al., 2010).

In one case of alleged harassment by the police, several East Haven, Connecticut, police officers were arrested on federal charges due to reportedly continued harassment and brutalization of Latinos. When the accusations came out, the mayor of East Haven was asked, "What are you doing for the Latino community today?" The Mayor responded, "I might have tacos when I go home, I'm not quite sure yet" ("East Haven Mayor," 2012). This statement undermines the important issue of racial profiling and police harassment of Latinos, while belittling Latino culture by emphasizing an interest in a food product stereotypically associated with Latinos.

Racism is prevalent toward many other groups in the United States including Native Americans, Arab Americans, Jewish Americans, and Asian Americans. Have you experienced or witnessed racism toward any of these racial or ethnic groups? Are you aware of racism in your community?

One reason modern forms of racism, and prejudice in general, are hard to detect is related to the dual attitudes model (Wilson, Lindsey, & Schooler, 2000). Humans have two forms of attitudes: explicit attitudes, which are conscious and

controllable, and implicit attitudes, which are unconscious and uncontrollable (Devine, 1989; Olson & Fazio, 2003). Because holding egalitarian views is socially desirable (Plant & Devine, 1998), most people do not show extreme racial bias or other prejudices on measures of their explicit attitudes. However, measures of implicit attitudes often show evidence of mild to strong racial bias or other prejudices (Greenwald, McGee, & Schwartz, 1998; Olson & Fazio, 2003).

Sexism

Sexism is prejudice and discrimination toward individuals based on their sex. Typically, sexism takes the form of men holding biases against women, but either sex can show sexism toward their own or their opposite sex. Like racism, sexism may be subtle and difficult to detect. Common forms of sexism in modern society include gender role expectations, such as expecting women to be the caretakers of the household. Sexism also includes people's expectations for how members of a gender group should behave. For example, women are expected to be friendly, passive, and nurturing, and when women behave in an unfriendly, assertive, or neglectful manner they often are disliked for violating their gender role (Rudman, 1998). Research by Laurie Rudman (1998) finds that when female job applicants self-promote, they are likely to be viewed as competent, but they may be disliked and are less likely to be hired because they violated gender expectations for modesty. Sexism can exist on a societal level such as in hiring,

employment opportunities, and education. Women are less likely to be hired or promoted in male-dominated professions such as engineering, aviation, and construction (Figure SP.20) (Blau, Ferber, & Winkler, 2010; Ceci & Williams, 2011). Have you ever experienced or witnessed sexism? Think about your family members' jobs or careers. Why do you think there are differences in the jobs women and men have, such as more women nurses but more male surgeons (Betz, 2008)?

Figure SP.20 Women now have many jobs previously closed to them, though they still face challenges in male-dominated occupations. (credit: "The National Guard"/Flickr)

Ageism

People often form judgments and hold expectations about people based on their age. These judgments and expectations can lead to **ageism**, or prejudice and discrimination toward

individuals based solely on their age. Think of expectations you hold for older adults. How could someone's expectations influence the feelings they hold toward individuals from older age groups? Ageism is widespread in U.S. culture (Nosek, 2005), and a common ageist attitude toward older adults is that they are incompetent, physically weak, and slow (Greenberg, Schimel, & Martens, 2002) and some people consider older adults less attractive. Chang, Kannoth, Levy, Wang, Lee, and Levy (2020) reported on relationships between ageism and health outcomes over a 40-year-plus period from countries around the world. Across 11 health domains, people over 50 were likely to experience ageism most often in the form of being denied access to health services and work opportunities. Some cultures, however, including some Asian, Latino, and African American cultures, both outside and within the United States afford older adults respect and honour.

Typically, ageism occurs against older adults, but ageism also can occur toward younger adults. What expectations do you hold toward younger people? Does society expect younger adults to be immature and irresponsible? Raymer, Reed, Spiegel, and Purvanova (2017) examined ageism against younger workers. They found that older workers endorsed negative stereotypes of younger workers, believing that they had more work deficit characteristics (including perceptions of incompetence). How might these forms of ageism affect

a younger and older adult who are applying for a sales clerk position?

Homophobia

Another form of prejudice is **homophobia:** prejudice and discrimination of individuals based solely on their sexual orientation. Like ageism, homophobia is a widespread prejudice in U.S. society that is tolerated by many people (Herek & McLemore, 2013; Nosek, 2005). Negative feelings often result in discrimination, such as the exclusion of lesbian, gay, bisexual, transgender, and queer (LBGTQ+) people from social groups and the avoidance of LGBTQ+ neighbours and co-workers. This discrimination also extends to employers deliberately declining to hire qualified LGBTQ+ job applicants. Have you experienced or witnessed homophobia? If so, what stereotypes, prejudiced attitudes, and discrimination were evident?

Why Do Prejudice and Discrimination Exist?

Prejudice and discrimination persist in society due to social learning and conformity to social norms. Children learn prejudiced attitudes and beliefs from society: their parents, teachers, friends, the media, and other sources of socialization, such as Facebook (O'Keeffe & Clarke-Pearson, 2011). If

certain types of prejudice and discrimination are acceptable in a society, there may be normative pressures to conform and share those prejudiced beliefs, attitudes, and behaviours. For example, public and private schools are still somewhat segregated by social class. Historically, only children from wealthy families could afford to attend private schools, whereas children from middle- and low-income families typically attended public schools. If a child from a low-income family received a merit scholarship to attend a private school, how might the child be treated by classmates? Can you recall a time when you held prejudiced attitudes or beliefs or acted in a discriminatory manner because your group of friends expected you to?

Stereotypes and Self-Fulfilling Prophecy

When we hold a stereotype about a person, we have expectations that he or she will fulfill that stereotype. A **self-fulfilling prophecy** is an expectation held by a person that alters his or her behaviour in a way that tends to make it true. When we hold stereotypes about a person, we tend to treat the person according to our expectations. This treatment can influence the person to act according to our stereotypic expectations, thus confirming our stereotypic beliefs. Research by Rosenthal and Jacobson (1968) found that disadvantaged students whose teachers expected them to perform well had

higher grades than disadvantaged students whose teachers expected them to do poorly.

Consider this example of cause and effect in a self-fulfilling prophecy: If an employer expects an openly gay male job applicant to be incompetent, the potential employer might treat the applicant negatively during the interview by engaging in less conversation, making little eye contact, and generally behaving coldly toward the applicant (Hebl, Foster, Mannix, & Dovidio, 2002). In turn, the job applicant will perceive that the potential employer dislikes him, and he will respond by giving shorter responses to interview questions, making less eye contact, and generally disengaging from the interview. After the interview, the employer will reflect on the applicant's behaviour, which seemed cold and distant, and the employer will conclude, based on the applicant's poor performance during the interview, that the applicant was in fact incompetent. Thus, the employer's stereotype—gay men are incompetent and do not make good employees—is reinforced. Do you think this job applicant is likely to be hired? Treating individuals according to stereotypic beliefs can lead to prejudice and discrimination.

Another dynamic that can reinforce stereotypes is confirmation bias. When interacting with the target of our prejudice, we tend to pay attention to information that is consistent with our stereotypic expectations and ignore information that is inconsistent with our expectations. In this process, known as **confirmation bias**, we seek out

information that supports our stereotypes and ignore information that is inconsistent with our stereotypes (Wason & Johnson-Laird, 1972). In the job interview example, the employer may not have noticed that the job applicant was friendly and engaging, and that he provided competent responses to the interview questions in the beginning of the interview. Instead, the employer focused on the job applicant's performance in the later part of the interview, after the applicant changed his demeanour and behaviour to match the interviewer's negative treatment. Have you ever fallen prey to the self-fulfilling prophecy or confirmation bias, either as the source or target of such bias? How might we stop the cycle of the self-fulfilling prophecy?

In-Groups and Out-Groups

As discussed previously in this section, we all belong to a gender, race, age, and social economic group. These groups provide a powerful source of our identity and self-esteem (Tajfel & Turner, 1979). These groups serve as our in-groups. An **in-group** is a group that we identify with or see ourselves as belonging to. A group that we don't belong to, or an **out-group,** is a group that we view as fundamentally different from us. For example, if you are female, your gender in-group includes all females, and your gender out-group includes all males (Figure SP.21). People often view gender groups as being fundamentally different from each other in personality traits,

characteristics, social roles, and interests. Because we often feel a strong sense of belonging and emotional connection to our in-groups, we develop in-group bias: a preference for our own group over other groups. This **in-group bias** can result in prejudice and discrimination because the out-group is perceived as different and is less preferred than our in-group.

Figure SP.21 These children are very young, but they are already aware of their gender in-group and out-group. (credit: modification of work by "Reiner Kraft"/Flickr)

Despite the group dynamics that seem only to push groups toward conflict, there are forces that promote reconciliation between groups: the expression of empathy, of acknowledgment of past suffering on both sides, and the halt of destructive behaviours.

One function of prejudice is to help us feel good about ourselves and maintain a positive self-concept. This need to feel good about ourselves extends to our in-groups: We want to feel good and protect our in-groups. We seek to resolve threats individually and at the in-group level. This often happens by blaming an out-group for the problem. **Scapegoating** is the act of blaming an out-group when the in-group experiences frustration or is blocked from obtaining a goal (Allport, 1954).

Link to Learning

Watch this video, "The sibling rivalry that divided a town", that explores the work of Henri Tajfel a social psychologist and examines what it takes to create divide and turn people against each other.

114.

AGGRESSION

Learning Objectives

By the end of this section, you will be able to:

- Define aggression
- Define cyberbullying
- Describe the bystander effect

Throughout this chapter we have discussed how people interact and influence one another's thoughts, feelings, and behaviours in both positive and negative ways. People can work together to achieve great things, such as helping each other in emergencies: recall the heroism displayed during the 9/11 terrorist attacks. People also can do great harm to one

another, such as conforming to group norms that are immoral and obeying authority to the point of murder: consider the mass conformity of Nazis during WWII. In this section we will discuss a negative side of human behaviour—aggression.

A number of researchers have explored ways to reduce prejudice. One of the earliest was a study by Sherif et al. (1961) known as the Robbers Cave experiment. They found that when two opposing groups at a camp worked together toward a common goal, prejudicial attitudes between the groups decreased (Gaertner, Dovidio, Banker, Houlette, Johnson, & McGlynn, 2000). Focusing on superordinate goals was the key to attitude change in the research. Another study examined the jigsaw classroom, a technique designed by Aronson and Bridgeman in an effort to increase success in desegregated classrooms. In this technique, students work on an assignment in groups inclusive of various races and abilities. They are assigned tasks within their group, then collaborate with peers from other groups who were assigned the same task, and then report back to their original group. Walker and Crogan (1998) noted that the jigsaw classroom reduced potential for prejudice in Australia, as diverse students worked together on projects needing all of the pieces to succeed. This research suggests that anything that can allow individuals to work together toward common goals can decrease prejudicial attitudes. Obviously, the application of such strategies in real-world settings would enhance opportunities for conflict resolution.

Aggression

Humans engage in **aggression** when they seek to cause harm or pain to another person. Aggression takes two forms depending on one's motives: hostile or instrumental. **Hostile aggression** is motivated by feelings of anger with intent to cause pain; a fight in a bar with a stranger is an example of hostile aggression. In contrast, **instrumental aggression** is motivated by achieving a goal and does not necessarily involve intent to cause pain (Berkowitz, 1993); a contract killer who murders for hire displays instrumental aggression.

There are many different theories as to why aggression exists. Some researchers argue that aggression serves an evolutionary function (Buss, 2004). Men are more likely than women to show aggression (Wilson & Daly, 1985). From the perspective of evolutionary psychology, human male aggression, like that in nonhuman primates, likely serves to display dominance over other males, both to protect a mate and to perpetuate the male's genes (Figure SP.22). Sexual jealousy is part of male aggression; males endeavour to make sure their mates are not copulating with other males, thus ensuring their own paternity of the female's offspring. Although aggression provides an obvious evolutionary advantage for men, women also engage in aggression. Women typically display more indirect forms of aggression, with their aggression serving as a means to an end (Dodge & Schwartz, 1997). For example, women may express their aggression

covertly by communication that impairs the social standing of another person. Another theory that explains one of the functions of human aggression is frustration aggression theory (Dollard, Doob, Miller, Mowrer, & Sears, 1939). This theory states that when humans are prevented from achieving an important goal, they become frustrated and aggressive.

Figure SP.22 Human males and nonhuman male primates endeavour to gain and display dominance over other males, as demonstrated in the behaviour of these monkeys. (credit: "Arcadiuš"/Flickr)

Bullying

Another form of aggression is bullying. As you learn in your study of child development, socializing and playing with other children is beneficial for children's psychological development. However, as you may have experienced as a child, not all play

behaviour has positive outcomes. Some children are aggressive and want to play roughly. Other children are selfish and do not want to share toys. One form of negative social interactions among children that has become a national concern is bullying. **Bullying** is repeated negative treatment of another person, often an adolescent, over time (Olweus, 1993). A one-time incident in which one child hits another child on the playground would not be considered bullying: Bullying is repeated behaviour. The negative treatment typical in bullying is the attempt to inflict harm, injury, or humiliation, and bullying can include physical or verbal attacks. However, bullying doesn't have to be physical or verbal, it can be psychological. Research finds gender differences in how girls and boys bully others (American Psychological Association, 2010; Olweus, 1993). Boys tend to engage in direct, physical aggression such as physically harming others. Girls tend to engage in indirect, social forms of aggression such as spreading rumours, ignoring, or socially isolating others. Based on what you have learned about child development and social roles, why do you think boys and girls display different types of bullying behaviour?

Bullying involves three parties: the bully, the victim, and witnesses or bystanders. The act of bullying involves an imbalance of power with the bully holding more power—physically, emotionally, and/or socially over the victim. The experience of bullying can be positive for the bully, who may enjoy a boost to self-esteem. However, there are

several negative consequences of bullying for the victim, and also for the bystanders. How do you think bullying negatively impacts adolescents? Being the victim of bullying is associated with decreased mental health, including experiencing anxiety and depression (APA, 2010). Victims of bullying may underperform in schoolwork (Bowen, 2011). Bullying also can result in the victim committing suicide (APA, 2010). How might bullying negatively affect witnesses?

Although there is not one single personality profile for who becomes a bully and who becomes a victim of bullying (APA, 2010), researchers have identified some patterns in children who are at a greater risk of being bullied (Olweus, 1993):

- Children who are emotionally reactive are at a greater risk for being bullied. Bullies may be attracted to children who get upset easily because the bully can quickly get an emotional reaction from them.
- Children who are different from others are likely to be targeted for bullying. Children who are overweight, cognitively impaired, or racially or ethnically different from their peer group may be at higher risk.
- Gay, lesbian, bisexual, and transgender teens are at very high risk of being bullied and hurt due to their sexual orientation.

Cyberbullying

With the rapid growth of technology, and widely available

mobile technology and social networking media, a new form of bullying has emerged: cyberbullying (Hoff & Mitchell, 2009). **Cyberbullying**, like bullying, is repeated behaviour that is intended to cause psychological or emotional harm to another person. What is unique about cyberbullying is that it is typically covert, concealed, done in private, and the bully can remain anonymous. This anonymity gives the bully power, and the victim may feel helpless, unable to escape the harassment, and unable to retaliate (Spears, Slee, Owens, & Johnson, 2009).

Cyberbullying can take many forms, including harassing a victim by spreading rumours, creating a website defaming the victim, and ignoring, insulting, laughing at, or teasing the victim (Spears et al., 2009). In cyberbullying, it is more common for girls to be the bullies and victims because cyberbullying is nonphysical and is a less direct form of bullying (Figure SP.23) (Hoff & Mitchell, 2009). Interestingly, girls who become cyberbullies often have been the victims of cyberbullying at one time (Vandebosch & Van Cleemput, 2009). The effects of cyberbullying are just as harmful as traditional bullying and include the victim feeling frustration, anger, sadness, helplessness, powerlessness, and fear. Victims will also experience lower self-esteem (Hoff & Mitchell, 2009; Spears et al., 2009). Furthermore, recent research suggests that both cyberbullying victims and perpetrators are more likely to experience suicidal ideation, and they are more likely to attempt suicide than individuals who have no experience with

cyberbullying (Hinduja & Patchin, 2010). What features of technology make cyberbullying easier and perhaps more accessible to young adults? What can parents, teachers, and social networking websites, like Facebook, do to prevent cyberbullying?

Figure SP.23 Research suggests that cyberbullies and their victims are most often female; however, there is much evidence that gay men are frequently victims of cyberbullying as well (Hinduja & Patchin, 2011). (credit: Steven Depolo)

The Bystander Effect

The discussion of bullying highlights the problem of witnesses not intervening to help a victim. Researchers Latané and Darley (1968) described a phenomenon called the bystander effect. **The bystander effect** is a phenomenon in which a

witness or bystander does not volunteer to help a victim or person in distress. Instead, they just watch what is happening. Social psychologists hold that we make these decisions based on the social situation, not our own personality variables. The impetus behind the bystander effect was the murder of a young woman named Kitty Genovese in 1964. The story of her tragic death took on a life of its own when it was reported that none of her neighbours helped her or called the police when she was being attacked. However, Kassin (2017) noted that her killer was apprehended due to neighbours who called the police when they saw him committing a burglary days later. Not only did bystanders indeed intervene in her murder (one man who shouted at the killer, a woman who said she called the police, and a friend who comforted her in her last moments), but other bystanders intervened in the capture of the murderer. Social psychologists claim that diffusion of responsibility is the likely explanation. **Diffusion of responsibility** is the tendency for no one in a group to help because the responsibility to help is spread throughout the group (Bandura, 1999). Because there were many witnesses to the attack on Genovese, as evidenced by the number of lit apartment windows in the building, individuals assumed someone else must have already called the police. The responsibility to call the police was diffused across the number of witnesses to the crime. Have you ever passed an accident on the freeway and assumed that a victim or certainly another motorist has already reported the accident? In general, the

greater the number of bystanders, the less likely any one person will help.

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PROSOCIAL BEHAVIOUR

Learning Objectives

By the end of this section, you will be able to:

- Describe altruism
- Describe conditions that influence the formation of relationships
- Identify what attracts people to each other
- Describe the triangular theory of love
- Explain social exchange theory in relationships

You've learned about many of the negative behaviours of social psychology, but the field also studies many positive social interactions and behaviours. What makes people like each other? With whom are we friends? Whom do we date?

Researchers have documented several features of the situation that influence whether we form relationships with others. There are also universal traits that humans find attractive in others. In this section we discuss conditions that make forming relationships more likely, what we look for in friendships and romantic relationships, the different types of love, and a theory explaining how our relationships are formed, maintained, and terminated.

Prosocial Behaviour and Altruism

Do you voluntarily help others? Voluntary behaviour with the intent to help other people is called prosocial behaviour. Why do people help other people? Is personal benefit such as feeling good about oneself the only reason people help one another? Research suggests there are many other reasons. Altruism is people's desire to help others even if the costs outweigh the benefits of helping. In fact, people acting in altruistic ways may disregard the personal costs associated with helping (Figure SP.24). For example, news accounts of the 9/11 terrorist attacks on the World Trade Center in New York reported an employee in the first tower helped his co-workers make it to the exit stairwell. After helping a co-worker to safety he went back in the burning building to help additional co-workers. In this case the costs of helping were great, and the hero lost his life in the destruction (Stewart, 2002).

Figure SP.24 The events of 9/11 unleashed an enormous show of altruism and heroism on the parts of first responders and many ordinary people. (credit: Don Halasy)

Some researchers suggest that altruism operates on empathy. Empathy is the capacity to understand another person's perspective, to feel what he or she feels. An empathetic person makes an emotional connection with others and feels compelled to help (Batson, 1991). Other researchers argue that altruism is a form of selfless helping that is not motivated by benefits or feeling good about oneself. Certainly, after helping, people feel good about themselves, but some researchers argue that this is a consequence of

altruism, not a cause. Other researchers argue that helping is always self-serving because our egos are involved, and we receive benefits from helping (Cialdini, Brown, Lewis, Luce, & Neuberg 1997). It is challenging to determine experimentally the true motivation for helping, whether is it largely self-serving (egoism) or selfless (altruism). Thus, a debate on whether pure altruism exists continues.

TRICKY TOPIC: ALTRUISM

One or more interactive elements has been excluded from this version of the text. You can view them online here: https://caul-cbua.pressbooks.pub/intropsychneuro/?p=526#oembed-1

If the video above does not load, click here: https://youtu.be/guwwO8s6gh4
For a full transcript of this video, click here

Forming Relationships

What do you think is the single most influential factor in determining with whom you become friends and whom you form romantic relationships? You might be surprised to learn

that the answer is simple: the people with whom you have the most contact. This most important factor is **proximity**. You are more likely to be friends with people you have regular contact with. For example, there are decades of research that shows that you are more likely to become friends with people who live in your dorm, your apartment building, or your immediate neighbourhood than with people who live farther away (Festinger, Schachler, & Back, 1950). It is simply easier to form relationships with people you see often because you have the opportunity to get to know them.

Similarity is another factor that influences who we form relationships with. We are more likely to become friends or lovers with someone who is similar to us in background, attitudes, and lifestyle. In fact, there is no evidence that opposites attract. Rather, we are attracted to people who are most like us (Figure SP.26) (McPherson, Smith-Lovin, & Cook, 2001). Why do you think we are attracted to people who are similar to us? Sharing things in common will certainly make it easy to get along with others and form connections. When you and another person share similar music taste, hobbies, food preferences, and so on, deciding what to do with your time together might be easy. **Homophily** is the tendency for people to form social networks, including friendships, marriage, business relationships, and many other types of relationships, with others who are similar (McPherson et al., 2001).

Figure SP.25 People tend to be attracted to similar people. Many couples share a cultural background. This can be quite obvious in a ceremony such as a wedding, and more subtle (but no less significant) in the day-to-day workings of a relationship. (credit: modification of work by Shiraz Chanawala)

But, homophily limits our exposure to diversity (McPherson et al., 2001). By forming relationships only with people who are similar to us, we will have homogenous groups and will not be exposed to different points of view. In other words, because we are likely to spend time with those who are most like ourselves, we will have limited exposure to those who are different than ourselves, including people of different races, ethnicities, social-economic status, and life situations.

Once we form relationships with people, we desire reciprocity. Reciprocity is the give and take in relationships. We contribute to relationships, but we expect to receive

benefits as well. That is, we want our relationships to be a two way street. We are more likely to like and engage with people who like us back. Self-disclosure is part of the two way street. Self-disclosure is the sharing of personal information (Laurenceau, Barrett, & Pietromonaco, 1998). We form more intimate connections with people with whom we disclose important information about ourselves. Indeed, self-disclosure is a characteristic of healthy intimate relationships, as long as the information disclosed is consistent with our own views (Cozby, 1973).

Attraction

We have discussed how proximity and similarity lead to the formation of relationships, and that reciprocity and self-disclosure are important for relationship maintenance. But, what features of a person do we find attractive? We don't form relationships with everyone that lives or works near us, so how is it that we decide which specific individuals we will select as friends and lovers?

Researchers have documented several characteristics that humans find attractive. First we look for friends and lovers who are physically attractive. People differ in what they consider attractive, and attractiveness is culturally influenced. Research, however, suggests that some universally attractive features in women include large eyes, high cheekbones, a narrow jaw line, a slender build (Buss, 1989), and a lower

waist-to-hip ratio (Singh, 1993). For men, attractive traits include being tall, having broad shoulders, and a narrow waist (Buss, 1989). Both men and women with high levels of facial and body symmetry are generally considered more attractive than asymmetric individuals (Fink, Neave, Manning, & Grammer, 2006; Penton-Voak et al., 2001; Rikowski & Grammer, 1999). Social traits that people find attractive in potential female mates include warmth, affection, and social skills; in males, the attractive traits include achievement, leadership qualities, and job skills (Regan & Berscheid, 1997). Although humans want mates who are physically attractive, this does not mean that we look for the most attractive person possible. In fact, this observation has led some to propose what is known as the matching hypothesis which asserts that people tend to pick someone they view as their equal in physical attractiveness and social desirability (Taylor, Fiore, Mendelsohn, & Cheshire, 2011). For example, you and most people you know likely would say that a very attractive movie star is out of your league. So, even if you had proximity to that person, you likely would not ask them out on a date because you believe you likely would be rejected. People weigh a potential partner's attractiveness against the likelihood of success with that person. If you think you are particularly unattractive (even if you are not), you likely will seek partners that are fairly unattractive (that is, unattractive in physical appearance or in behaviour).

Sternberg's Triangular Theory of Love

We typically love the people with whom we form relationships, but the type of love we have for our family, friends, and lovers differs. Robert Sternberg (1986) proposed that there are three components of love: intimacy, passion, and commitment. These three components form a triangle that defines multiple types of love: this is known as Sternberg's triangular theory of love (Figure SP.26). Intimacy is the sharing of details and intimate thoughts and emotions. Passion is the physical attraction—the flame in the fire. Commitment is standing by the person—the "in sickness and health" part of the relationship.

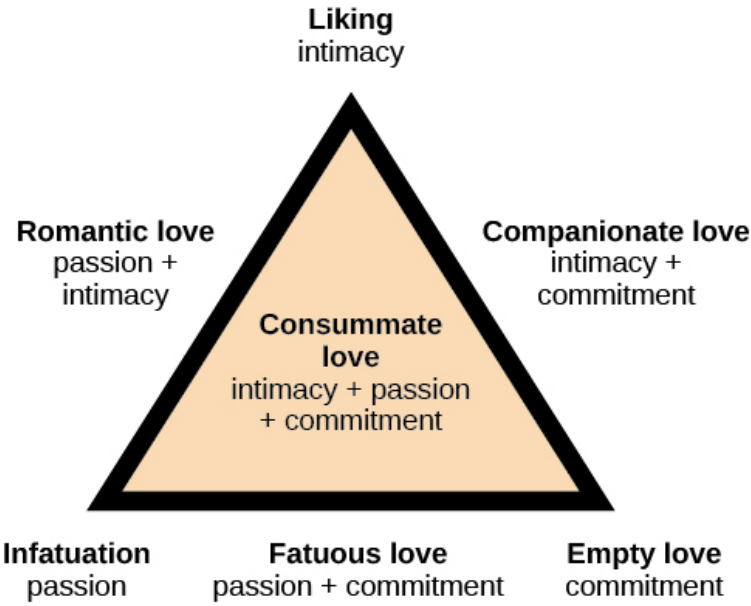

Figure SP.26 According to Sternberg's triangular theory of love, seven types of love can be described from combinations of three components: intimacy, passion, and commitment. (credit: modification of work by "Lnesa"/Wikimedia Commons)

Sternberg (1986) states that a healthy relationship will have all three components of love—intimacy, passion, and commitment—which is described as consummate love (Figure SP.27). However, different aspects of love might be more prevalent at different life stages. Other forms of love include liking, which is defined as having intimacy but no passion or commitment. Infatuation is the presence of passion without intimacy or commitment. Empty love is having commitment without intimacy or passion. Companionate love, which is

characteristic of close friendships and family relationships, consists of intimacy and commitment but no passion. Romantic love is defined by having passion and intimacy, but no commitment. Finally, fatuous love is defined by having passion and commitment, but no intimacy, such as a long term sexual love affair. Can you describe other examples of relationships that fit these different types of love?

Figure SP.27 According to Sternberg, consummate love describes a healthy relationship containing intimacy, passion, and commitment. (credit: Carloxito/Wikimedia)

Social Exchange Theory

We have discussed why we form relationships, what attracts us to others, and different types of love. But what determines whether we are satisfied with and stay in a relationship? One theory that provides an explanation is social exchange theory. According to social exchange theory, we act as naïve economists in keeping a tally of the ratio of costs and benefits of forming and maintaining a relationship with others (Figure SP.28) (Rusbult & Van Lange, 2003).

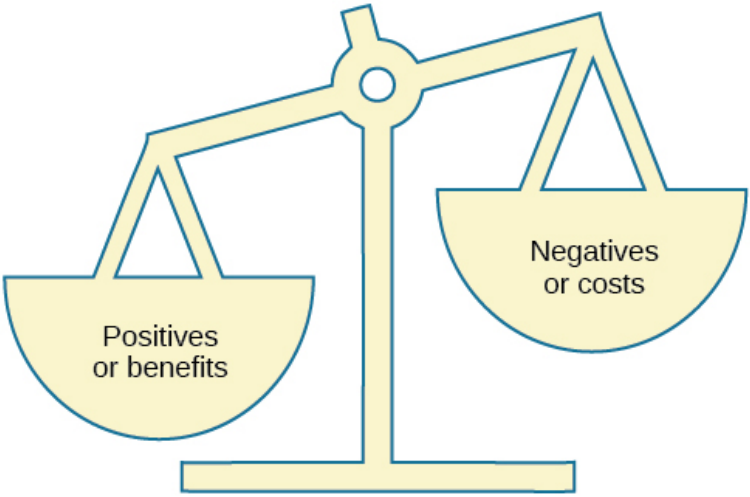

Figure SP.28 Acting like naïve economists, people may keep track of the costs and benefits of maintaining a relationship. Typically, only those relationships in which the benefits outweigh the costs will be maintained.

People are motivated to maximize the benefits of social

exchanges, or relationships, and minimize the costs. People prefer to have more benefits than costs, or to have nearly equal costs and benefits, but most people are dissatisfied if their social exchanges create more costs than benefits. Let's discuss an example. If you have ever decided to commit to a romantic relationship, you probably considered the advantages and disadvantages of your decision. What are the benefits of being in a committed romantic relationship? You may have considered having companionship, intimacy, and passion, but also being comfortable with a person you know well. What are the costs of being in a committed romantic relationship? You may think that over time boredom from being with only one person may set in; moreover, it may be expensive to share activities such as attending movies and going to dinner. However, the benefits of dating your romantic partner presumably outweigh the costs, or you wouldn't continue the relationship.

116.

KEY TERMS FOR SOCIAL PSYCHOLOGY

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actor-observer bias
: phenomenon of explaining other people's behaviours are due to internal factors and our own behaviours are due to situational forces

ageism
: prejudice and discrimination toward individuals based solely on their age

aggression
: seeking to cause harm or pain to another person

altruism
: humans' desire to help others even if the costs outweigh the benefits of helping

Asch effect
: group majority influences an individual's judgment, even when that judgment is inaccurate

attitude
: evaluations of or feelings toward a person, idea, or object that are typically positive or negative

attribution

explanation for the behaviour of other people

bullying

a person, often an adolescent, being treated negatively repeatedly and over time

bystander effect

situation in which a witness or bystander does not volunteer to help a victim or person in distress

central route persuasion

logic-driven arguments using data and facts to convince people of an argument's worthiness

cognitive dissonance

psychological discomfort that arises from a conflict in a person's behaviours, attitudes, or beliefs that runs counter to one's positive self-perception

collectivist culture

culture that focuses on communal relationships with others such as family, friends, and community

companionate love

type of love consisting of intimacy and commitment, but not passion; associated with close friendships and family relationships

confederate

person who works for a researcher and is aware of the experiment, but who acts as a participant; used to manipulate social situations as part of the research design

confirmation bias

seeking out information that supports our stereotypes while ignoring information that is inconsistent with our stereotypes

conformity

when individuals change their behaviour to go along with the group even if they do not agree with the group

consummate love

type of love occurring when intimacy, passion, and commitment are all present

cyberbullying

repeated behaviour that is intended to cause psychological or emotional harm to another person and that takes place online

diffusion of responsibility

tendency for no one in a group to help because the responsibility to help is spread throughout the group

discrimination

negative actions toward individuals as a result of their membership in a particular group

dispositionism

describes a perspective common to personality psychologists, which asserts that our behaviour is determined by internal factors, such as personality traits and temperament

empathy

capacity to understand another person's perspective—to

feel what he or she feels

foot-in-the-door technique

persuasion of one person by another person, encouraging a person to agree to a small favour, or to buy a small item, only to later request a larger favour or purchase of a larger item

fundamental attribution error

tendency to overemphasize internal factors as attributions for behaviour and underestimate the power of the situation

group polarization

strengthening of the original group attitude after discussing views within the group

groupthink

group members modify their opinions to match what they believe is the group consensus

homophily

tendency for people to form social networks, including friendships, marriage, business relationships, and many other types of relationships, with others who are similar

homophobia

prejudice and discrimination against individuals based solely on their sexual orientation

hostile aggression

aggression motivated by feelings of anger with intent to cause pain

in-group
group that we identify with or see ourselves as belonging to

in-group bias
preference for our own group over other groups

individualistic culture
culture that focuses on individual achievement and autonomy

informational social influence
conformity to a group norm prompted by the belief that the group is competent and has the correct information

instrumental aggression
aggression motivated by achieving a goal and does not necessarily involve intent to cause pain

internal factor
internal attribute of a person, such as personality traits or temperament

just-world hypothesis
ideology common in the United States that people get the outcomes they deserve

justification of effort
theory that people value goals and achievements more when they have put more effort into them

normative social influence
conformity to a group norm to fit in, feel good, and be accepted by the group

obedience

change of behaviour to please an authority figure or to avoid aversive consequences

out-group

group that we don't belong to—one that we view as fundamentally different from us

peripheral route persuasion

one person persuades another person; an indirect route that relies on association of peripheral cues (such as positive emotions and celebrity endorsement) to associate positivity with a message

persuasion

process of changing our attitude toward something based on some form of communication

prejudice

negative attitudes and feelings toward individuals based solely on their membership in a particular group

prosocial behaviour

voluntary behaviour with the intent to help other people

racism

prejudice and discrimination toward individuals based solely on their race

reciprocity

give and take in relationships

romantic love

type of love consisting of intimacy and passion, but no commitment

scapegoating

act of blaming an out-group when the in-group experiences frustration or is blocked from obtaining a goal

script

person's knowledge about the sequence of events in a specific setting

self-disclosure

sharing personal information in relationships

self-fulfilling prophecy

treating stereotyped group members according to our biased expectations only to have this treatment influence the individual to act according to our stereotypic expectations, thus confirming our stereotypic beliefs

self-serving bias

tendency for individuals to take credit by making dispositional or internal attributions for positive outcomes and situational or external attributions for negative outcomes

sexism

prejudice and discrimination toward individuals based on their sex

situationism

describes a perspective that behaviour and actions are determined by the immediate environment and surroundings; a view promoted by social psychologists

social exchange theory

humans act as naïve economists in keeping a tally of the ratio of costs and benefits of forming and maintain a relationship, with the goal to maximize benefits and minimize costs

social facilitation

improved performance when an audience is watching versus when the individual performs the behaviour alone

social loafing

exertion of less effort by a person working in a group because individual performance cannot be evaluated separately from the group, thus causing performance decline on easy tasks

social norm

group's expectations regarding what is appropriate and acceptable for the thoughts and behaviour of its members

social psychology

field of psychology that examines how people impact or affect each other, with particular focus on the power of the situation

social role

socially defined pattern of behaviour that is expected of a person in a given setting or group

stanford prison experiment

Stanford University conducted an experiment in a mock prison that demonstrated the power of social roles, social

norms, and scripts

stereotype

specific beliefs or assumptions about individuals based solely on their membership in a group, regardless of their individual characteristics

triangular theory of love

model of love based on three components: intimacy, passion, and commitment; several types of love exist, depending on the presence or absence of each of these components

117.

SUMMARY FOR SOCIAL PSYCHOLOGY

SP.1 What Is Social Psychology?

Social psychology is the subfield of psychology that studies the power of the situation to influence individuals' thoughts, feelings, and behaviours. Psychologists categorize the causes of human behaviour as those due to internal factors, such as personality, or those due to external factors, such as cultural and other social influences. Behaviour is better explained, however, by using both approaches. Lay people tend to over-rely on dispositional explanations for behaviour and ignore the power of situational influences, a perspective called the fundamental attribution error. People from individualistic cultures are more likely to display this bias versus people from collectivistic cultures. Our explanations for our own and others behaviours can be biased due to not having enough information about others' motivations for behaviours and by providing explanations that bolster our self-esteem.

SP.2 Self-presentation

Human behaviour is largely influenced by our social roles, norms, and scripts. In order to know how to act in a given situation, we have shared cultural knowledge of how to behave depending on our role in society. Social norms dictate the behaviour that is appropriate or inappropriate for each role. Each social role has scripts that help humans learn the sequence of appropriate behaviours in a given setting. The famous Stanford prison experiment is an example of how the power of the situation can dictate the social roles, norms, and scripts we follow in a given situation, even if this behaviour is contrary to our typical behaviour.

SP.3 Attitudes and Persuasion

Attitudes are our evaluations or feelings toward a person, idea, or object and typically are positive or negative. Our attitudes and beliefs are influenced not only by external forces, but also by internal influences that we control. An internal form of attitude change is cognitive dissonance or the tension we experience when our thoughts, feelings, and behaviours are in conflict. In order to reduce dissonance, individuals can change their behaviour, attitudes, or cognitions, or add a new cognition. External forces of persuasion include advertising; the features of advertising that influence our behaviours include the source, message, and audience. There are two

primary routes to persuasion. The central route to persuasion uses facts and information to persuade potential consumers. The peripheral route uses positive association with cues such as beauty, fame, and positive emotions.

SP.4 Conformity, Compliance, and Obedience

The power of the situation can lead people to conform, or go along with the group, even in the face of inaccurate information. Conformity to group norms is driven by two motivations, the desire to fit in and be liked and the desire to be accurate and gain information from the group. Authority figures also have influence over our behaviours, and many people become obedient and follow orders even if the orders are contrary to their personal values. Conformity to group pressures can also result in groupthink, or the faulty decision-making process that results from cohesive group members trying to maintain group harmony. Group situations can improve human behaviour through facilitating performance on easy tasks, but inhibiting performance on difficult tasks. The presence of others can also lead to social loafing when individual efforts cannot be evaluated.

SP.5 Prejudice and Discrimination

As diverse individuals, humans can experience conflict when

interacting with people who are different from each other. Prejudice, or negative feelings and evaluations, is common when people are from a different social group (i.e., out-group). Negative attitudes toward out-groups can lead to discrimination. Prejudice and discrimination against others can be based on gender, race, ethnicity, social class, sexual orientation, or a variety of other social identities. In-group's who feel threatened may blame the out-groups for their plight, thus using the out-group as a scapegoat for their frustration.

SP.6 Aggression

Aggression is seeking to cause another person harm or pain. Hostile aggression is motivated by feelings of anger with intent to cause pain, and instrumental aggression is motivated by achieving a goal and does not necessarily involve intent to cause pain Bullying is an international public health concern that largely affects the adolescent population. Bullying is repeated behaviours that are intended to inflict harm on the victim and can take the form of physical, psychological, emotional, or social abuse. Bullying has negative mental health consequences for youth including suicide. Cyberbullying is a newer form of bullying that takes place in an online environment where bullies can remain anonymous and victims are helpless to address the harassment. Despite the social norm of helping others in need, when there are many bystanders witnessing

an emergency, diffusion of responsibility will lead to a lower likelihood of any one person helping.

SP.7 Prosocial Behaviour

Altruism is a pure form of helping others out of empathy, which can be contrasted with egoistic motivations for helping. Forming relationships with others is a necessity for social beings. We typically form relationships with people who are close to us in proximity and people with whom we share similarities. We expect reciprocity and self-disclosure in our relationships. We also want to form relationships with people who are physically attractive, though standards for attractiveness vary. There are many types of love that are determined by various combinations of intimacy, passion, and commitment; consummate love, which is the ideal form of love, contains all three components. When determining satisfaction and whether to maintain a relationship, individuals often use a social exchange approach and weigh the costs and benefits of forming and maintaining a relationship.

118.

REVIEW QUESTIONS FOR SOCIAL PSYCHOLOGY

Click here for Answer Key

Multiple Choice Questions

1. As a field, social psychology focuses on _____ in predicting human behaviour.

a. personality traits
b. genetic predispositions
c. biological forces
d. situational factors

2. Making internal attributions for your successes and making external attributions for your failures is an example of _____.

a. actor-observer bias
b. fundamental attribution error
c. self-serving bias

d. just-world hypothesis

3. Collectivistic cultures are to _____ as individualistic cultures are to _____.

a. dispositional; situational
b. situational; dispositional
c. autonomy; group harmony
d. just-world hypothesis; self-serving bias

4. According to the actor-observer bias, we have more information about _____.

a. situational influences on behaviour
b. influences on our own behaviour
c. influences on others' behaviour
d. dispositional influences on behaviour

5. A(n) _____ is a set of group expectations for appropriate thoughts and behaviours of its members.

a. social role
b. social norm
c. script
d. attribution

6. On his first day of soccer practice, Jose suits up in a t-shirt,

shorts, and cleats and runs out to the field to join his teammates. Jose's behaviour is reflective of _____.

a. a script
b. social influence
c. good athletic behaviour
d. normative behaviour

7. When it comes to buying clothes, teenagers often follow social norms; this is likely motivated by _____.

a. following parents' rules
b. saving money
c. fitting in
d. looking good

8. In the Stanford prison experiment, even the lead researcher succumbed to his role as a prison supervisor. This is an example of the power of _____ influencing behaviour.

a. scripts
b. social norms
c. conformity
d. social roles

9. Attitudes describe our _____ of people, objects, and ideas.

a. treatment
b. evaluations
c. cognitions
d. knowledge

10. Cognitive dissonance causes discomfort because it disrupts our sense of _____.

a. dependency
b. unpredictability
c. consistency
d. power

11. In order for the central route to persuasion to be effective, the audience must be _____ and _____.

a. analytical; motivated
b. attentive; happy
c. intelligent; unemotional
d. gullible; distracted

12. Examples of cues used in peripheral route persuasion include all of the following *except* _____.

a. celebrity endorsement
b. positive emotions
c. attractive models

d. factual information

13. In the Asch experiment, participants conformed due to _____ social influence.

a. informational
b. normative
c. inspirational
d. persuasive

14. Under what conditions will informational social influence be more likely?

a. when individuals want to fit in
b. when the answer is unclear
c. when the group has expertise
d. both b and c

15. Social loafing occurs when _____.

a. individual performance cannot be evaluated
b. the task is easy
c. both a and b
d. none of the above

16. If group members modify their opinions to align with a perceived group consensus, then _____ has occurred.

a. group cohesion
b. social facilitation
c. groupthink
d. social loafing

17. Prejudice is to _____ as discrimination is to _____.

a. feelings; behaviour
b. thoughts; feelings
c. feelings; thoughts
d. behaviour; feelings

18. Which of the following is *not* a type of prejudice?

a. homophobia
b. racism
c. sexism
d. individualism

19. _____ occurs when the out-group is blamed for the in-group's frustration.

a. stereotyping
b. in-group bias
c. scapegoating
d. ageism

20. When we seek out information that supports our stereotypes we are engaged in _____.

a. scapegoating
b. confirmation bias
c. self-fulfilling prophecy
d. in-group bias

21. Typically, bullying from boys is to _____ as bullying from girls is to _____.

a. emotional harm; physical harm
b. physical harm; emotional harm
c. psychological harm; physical harm
d. social exclusion; verbal taunting

22. Which of the following adolescents is least likely to be targeted for bullying?

a. a child with a physical disability
b. a transgender adolescent
c. an emotionally sensitive boy
d. the captain of the football team

23. The bystander effect likely occurs due to _____.

a. desensitization to violence
b. people not noticing the emergency

c. diffusion of responsibility
d. emotional insensitivity

24. Altruism is a form of prosocial behaviour that is motivated by _____.

a. feeling good about oneself
b. selfless helping of others
c. earning a reward
d. showing bravery to bystanders

25. After moving to a new apartment building, research suggests that Sam will be most likely to become friends with _____.

a. his next door neighbour
b. someone who lives three floors up in the apartment building
c. someone from across the street
d. his new postal delivery person

26. What trait do both men and women tend to look for in a romantic partner?

a. sense of humour
b. social skills
c. leadership potential

d. physical attractiveness

27. According to the triangular theory of love, what type of love is defined by passion and intimacy but no commitment?

a. consummate love
b. empty love
c. romantic love
d. liking

28. According to social exchange theory, humans want to maximize the _____ and minimize the _____ in relationships.

a. intimacy; commitment
b. benefits; costs
c. costs; benefits
d. passion; intimacy

Critical Thinking Questions

29. Compare and contrast situational influences and dispositional influences and give an example of each. Explain how situational influences and dispositional influences might explain inappropriate behaviour.

30. Provide an example of how people from individualistic and collectivistic cultures would differ in explaining why they won an important sporting event.

31. Why didn't the "good" guards in the Stanford prison experiment object to other guards' abusive behaviour? Were the student prisoners simply weak people? Why didn't they object to being abused?

32. Describe how social roles, social norms, and scripts were evident in the Stanford prison experiment. How can this experiment be applied to everyday life? Are there any more recent examples where people started fulfilling a role and became abusive?

33. Give an example (one *not* used in class or your text) of cognitive dissonance and how an individual might resolve this.

34. Imagine that you work for an advertising agency, and you've been tasked with developing an advertising campaign to increase sales of Bliss Soda. How would you develop an advertisement for this product that uses a central route of persuasion? How would you develop an ad using a peripheral route of persuasion?

35. Describe how seeking outside opinions can prevent groupthink.

36. Compare and contrast social loafing and social facilitation.

37. Some people seem more willing to openly display prejudice regarding sexual orientation than prejudice regarding race and gender. Speculate on why this might be.

38. When people blame a scapegoat, how do you think they choose evidence to support the blame?

39. Compare and contrast hostile and instrumental aggression.

40. What evidence discussed in the previous section suggests that cyberbullying is difficult to detect and prevent?

41. Describe what influences whether relationships will be formed.

42. The evolutionary theory argues that humans are motivated to perpetuate their genes and reproduce. Using an evolutionary perspective, describe traits in men and women that humans find attractive.

Personal Application Questions

43. Provide a personal example of an experience in which your behaviour was influenced by the power of the situation.

44. Think of an example in the media of a sports figure—player or coach—who gives a self-serving attribution for winning or losing. Examples might include accusing the referee of incorrect calls, in the case of losing, or citing their own hard work and talent, in the case of winning.

45. Try attending a religious service very different from your own and see how you feel and behave without knowing the

appropriate script. Or, try attending an important, personal event that you have never attended before, such as a bar mitzvah (a coming-of-age ritual in Jewish culture), a quinceañera (in some Latin American cultures a party is given to a girl who is turning 15 years old), a wedding, a funeral, or a sporting event new to you, such as horse racing or bull riding. Observe and record your feelings and behaviours in this unfamiliar setting for which you lack the appropriate script. Do you silently observe the action, or do you ask another person for help interpreting the behaviours of people at the event? Describe in what ways your behaviour would change if you were to attend a similar event in the future?

46. Name and describe at least three social roles you have adopted for yourself. Why did you adopt these roles? What are some roles that are expected of you, but that you try to resist?

47. Cognitive dissonance often arises after making an important decision, called post-decision dissonance (or in popular terms, buyer's remorse). Describe a recent decision you made that caused dissonance and describe how you resolved it.

48. Describe a time when you or someone you know used the foot-in-the-door technique to gain someone's compliance.

49. Conduct a conformity study the next time you are in an elevator. After you enter the elevator, stand with your back

toward the door. See if others conform to your behaviour. Watch this video for a candid camera demonstration of this phenomenon. Did your results turn out as expected?

50. Most students adamantly state that they would never have turned up the voltage in the Milligram experiment. Do you think you would have refused to shock the learner? Looking at your own past behaviour, what evidence suggests that you would go along with the order to increase the voltage?

51. Give an example when you felt that someone was prejudiced against you. What do you think caused this attitude? Did this person display any discrimination behaviours and, if so, how?

52. Give an example when you felt prejudiced against someone else. How did you discriminate against them? Why do you think you did this?

53. Have you ever experienced or witnessed bullying or cyberbullying? How did it make you feel? What did you do about it? After reading this section would you have done anything differently?

54. The next time you see someone needing help, observe your surroundings. Look to see if the bystander effect is in action and take measures to make sure the person gets help. If you aren't able to help, notify an adult or authority figure that can.

55. Think about your recent friendships and romantic relationship(s). What factors do you think influenced the development of these relationships? What attracted you to becoming friends or romantic partners?

56. Have you ever used a social exchange theory approach to determine how satisfied you were in a relationship, either a friendship or romantic relationship? Have you ever had the costs outweigh the benefits of a relationship? If so, how did you address this imbalance?

119.

ACKNOWLEDGEMENTS & ATTRIBUTIONS

CHAPTER XIII
STRESS & HEALTH

120.

INTRODUCTION TO STRESS & HEALTH

Chapter Outline

- What Is Stress?
- Stressors
- Stress and Illness
- Regulation of Stress
- The Pursuit of Happiness

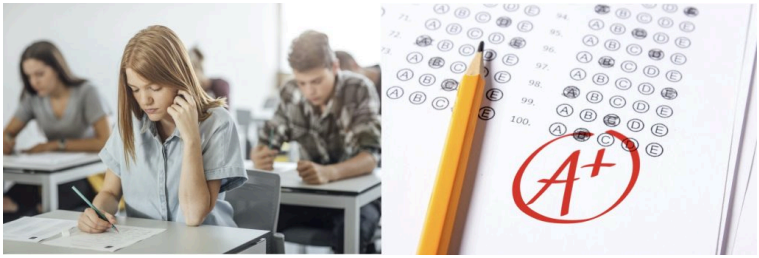


Figure SH.1 Exams are a stressful, but unavoidable, element of college life. (credit modified from Shutterstock)

Few would deny that today's college students are under a lot of pressure. In addition to many usual stresses and strains incidental to the college experience (e.g., exams and term papers), students today are faced with increased college tuitions, burdensome debt, and difficulty finding employment after graduation. A significant population of college students may face additional stressors, such as raising children or holding down a full-time job while working toward a degree.

Of course, life is filled with many additional challenges beyond those incurred in college or the workplace. We might have concerns with financial security, difficulties with friends or neighbours, family responsibilities, and we may not have enough time to do the things we want to do. Even minor hassles—losing things, traffic jams, and loss of internet service—all involve pressure and demands that can make life seem like a struggle and that can compromise our sense of well-being. That is, all can be stressful in some way.

Scientific interest in stress, including how we adapt and

cope, has been longstanding in psychology; indeed, after nearly a century of research on the topic, much has been learned and many insights have been developed. This chapter examines stress and highlights our current understanding of the phenomenon, including its psychological and physiological natures, its causes and consequences, and the steps we can take to master stress rather than become its victim.

121.

WHAT IS STRESS?

Learning Objectives

By the end of this section, you will be able to:

- Differentiate between stimulus-based and response-based definitions of stress
- Define stress as a process
- Differentiate between good stress and bad stress
- Describe the early contributions of Walter Cannon and Hans Selye to the stress research field
- Understand the physiological basis of stress and describe the general adaptation syndrome

The term stress as it relates to the human condition first emerged in scientific literature in the 1930s, but it did not enter the popular vernacular until the 1970s (Lyon, 2012). Today, we often use the term loosely in describing a variety of unpleasant feeling states; for example, we often say we are stressed out when we feel frustrated, angry, conflicted, overwhelmed, or fatigued. Despite the widespread use of the term, stress is a fairly vague concept that is difficult to define with precision.

Researchers have had a difficult time agreeing on an acceptable definition of stress. Some have conceptualized stress as a demanding or threatening event or situation (e.g., a high-stress job, overcrowding, and long commutes to work). Such conceptualizations are known as stimulus-based definitions because they characterize stress as a stimulus that causes certain reactions. Stimulus-based definitions of stress are problematic, however, because they fail to recognize that people differ in how they view and react to challenging life events and situations. For example, a conscientious student who has studied diligently all semester would likely experience less stress during final exams week than would a less responsible, unprepared student.

Others have conceptualized stress in ways that emphasize the physiological responses that occur when faced with demanding or threatening situations (e.g., increased arousal). These conceptualizations are referred to as response-based definitions because they describe stress as a response to

environmental conditions. For example, the endocrinologist Hans Selye, a famous stress researcher, once defined stress as the "response of the body to any demand, whether it is caused by, or results in, pleasant or unpleasant conditions" (Selye, 1976, p. 74). Selye's definition of stress is response-based in that it conceptualizes stress chiefly in terms of the body's physiological reaction to any demand that is placed on it. Neither stimulus-based nor response-based definitions provide a complete definition of stress. Many of the physiological reactions that occur when faced with demanding situations (e.g., accelerated heart rate) can also occur in response to things that most people would not consider to be genuinely stressful, such as receiving unanticipated good news: an unexpected promotion or raise.

A useful way to conceptualize **stress** is to view it as a process whereby an individual perceives and responds to events that he appraises as overwhelming or threatening to his well-being (Lazarus & Folkman, 1984). A critical element of this definition is that it emphasizes the importance of how we appraise—that is, judge—demanding or threatening events (often referred to as **stressors**); these appraisals, in turn, influence our reactions to such events. Two kinds of appraisals of a stressor are especially important in this regard: primary and secondary appraisals. A **primary appraisal** involves judgment about the degree of potential harm or threat to well-being that a stressor might entail. A stressor would likely be appraised as a threat if one anticipates that it could lead to

some kind of harm, loss, or other negative consequence; conversely, a stressor would likely be appraised as a challenge if one believes that it carries the potential for gain or personal growth. For example, an employee who is promoted to a leadership position would likely perceive the promotion as a much greater threat if she believed the promotion would lead to excessive work demands than if she viewed it as an opportunity to gain new skills and grow professionally. Similarly, a college student on the cusp of graduation may face the change as a threat or a challenge (Figure SH.2).

Figure SH.2 Graduating from college and entering the workforce can be viewed as either a threat (loss of financial support) or a challenge (opportunity for independence and growth). (credit: Pexels user RODNAE)

The perception of a threat triggers a **secondary appraisal**: judgment of the options available to cope with a stressor, as well as perceptions of how effective such options will be (Lyon, 2012) (Figure SH.3). As you may recall from what you learned about self-efficacy, an individual's belief in his ability to complete a task is important (Bandura, 1994). A threat tends to be viewed as less catastrophic if one believes something can be done about it (Lazarus & Folkman, 1984). Imagine that two middle-aged people Syd and Madhuri, perform breast self-examinations one morning and each notices a lump on the lower region of their left breast. Although both view the breast lump as a potential threat (primary appraisal), their secondary appraisals differ considerably. In considering the breast lump, some of the thoughts racing through Syd's mind are, "Oh my God, I could have breast cancer! What if the cancer has spread to the rest of my body and I cannot recover? What if I have to go through chemotherapy? I've heard that experience is awful! What if I have to quit my job? My partner and I won't have enough money to pay the mortgage. Oh, this is just horrible…I can't deal with it!" On the other hand, Madhuri thinks, "Hmm, this may not be good. Although most times these things turn out to be benign, I need to have it checked out. If it turns out to be breast cancer, there are doctors who can take care of it because the medical technology today is quite advanced. I'll have a lot of different options, and I'll be just fine." Clearly, Syd and Madhuri have different outlooks

on what might turn out to be a very serious situation: Syd seems to think that little could be done about it, whereas Madhuri believes that, worst case scenario, a number of options that are likely to be effective would be available. As such, Syd would clearly experience greater stress than would Madhuri.

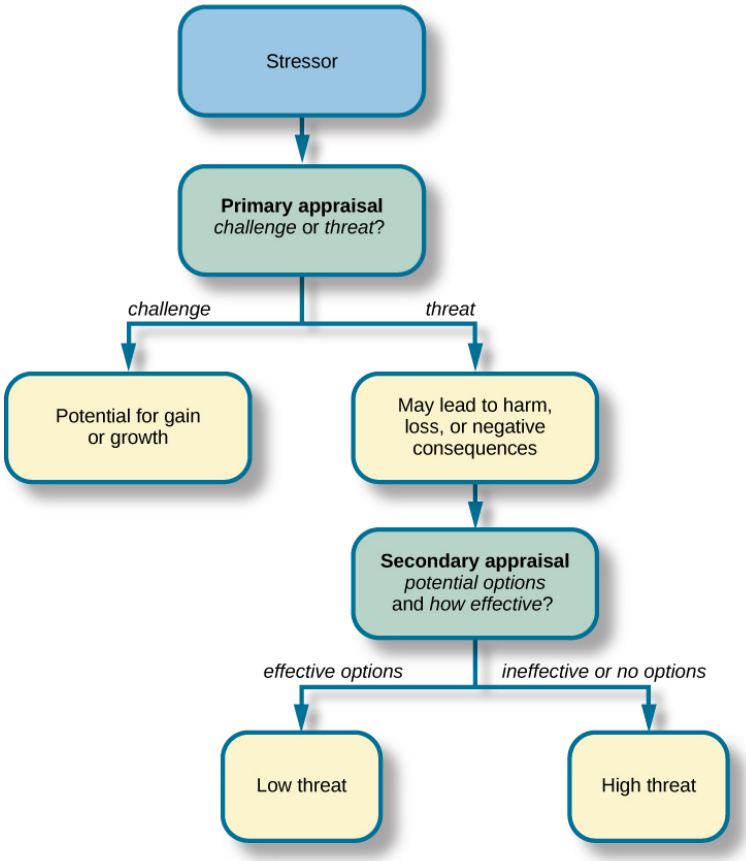


Figure SH.3 When encountering a stressor, a person judges its potential threat (primary appraisal) and then determines if effective options are available to manage the situation. Stress is likely to result if a stressor is perceived as extremely threatening or threatening with few or no effective coping options available.

To be sure, some stressors are inherently more stressful than others in that they are more threatening and leave less

potential for variation in cognitive appraisals (e.g., objective threats to one's health or safety). Nevertheless, appraisal will still play a role in augmenting or diminishing our reactions to such events (Everly & Lating, 2002).

If a person appraises an event as harmful and believes that the demands imposed by the event exceed the available resources to manage or adapt to it, the person will subjectively experience a state of stress. In contrast, if one does not appraise the same event as harmful or threatening, she is unlikely to experience stress. According to this definition, environmental events trigger stress reactions by the way they are interpreted and the meanings they are assigned. In short, stress is largely in the eye of the beholder: it's not so much what happens to you as it is how you respond (Selye, 1976).

Good Stress?

Although stress carries a negative connotation, at times it may be of some benefit. Stress can motivate us to do things in our best interests, such as study for exams, visit the doctor regularly, exercise, and perform to the best of our ability at work. Indeed, Selye (1974) pointed out that not all stress is harmful. He argued that stress can sometimes be a positive, motivating force that can improve the quality of our lives. This kind of stress, which Selye called **eustress** (from the Greek *eu* = "good"), is a good kind of stress associated with

positive feelings, optimal health, and performance. A moderate amount of stress can be beneficial in challenging situations. For example, athletes may be motivated and energized by pregame stress, and students may experience similar beneficial stress before a major exam. Indeed, research shows that moderate stress can enhance both immediate and delayed recall of educational material. Male participants in one study who memorized a scientific text passage showed improved memory of the passage immediately after exposure to a mild stressor as well as one day following exposure to the stressor (Hupbach & Fieman, 2012).

Increasing one's level of stress will cause performance to change in a predictable way. As shown in Figure SH.4, as stress increases, so do performance and general well-being (eustress); when stress levels reach an optimal level (the highest point of the curve), performance reaches its peak. A person at this stress level is colloquially at the top of their game, meaning they feel fully energized, focused, and can work with minimal effort and maximum efficiency. But when stress exceeds this optimal level, it is no longer a positive force—it becomes excessive and debilitating, or what Selye termed **distress** (from the Latin *dis* = "bad"). People who reach this level of stress feel burned out; they are fatigued, exhausted, and their performance begins to decline. If the stress remains excessive, health may begin to erode as well (Everly & Lating, 2002). A good example of distress is severe test anxiety. When students are feeling very stressed about a test, negative emotions

combined with physical symptoms may make concentration difficult, thereby negatively affecting test scores.

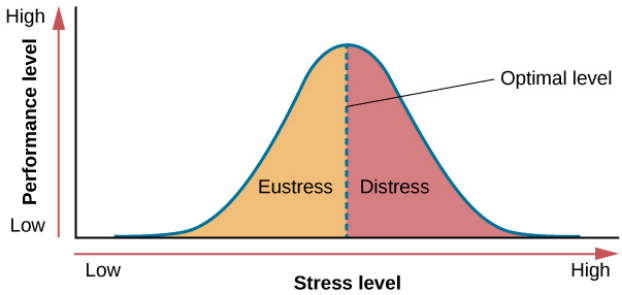


Figure SH.4 As the stress level increases from low to moderate, so does performance (eustress). At the optimal level (the peak of the curve), performance has reached its peak. If stress exceeds the optimal level, it will reach the distress region, where it will become excessive and debilitating, and performance will decline (Everly & Lating, 2002).

The Prevalence of Stress

Stress is everywhere. Each of us is acquainted with stress—some are more familiar than others. In many ways, stress feels like a load you just can't carry—a feeling you experience when, for example, you have to drive somewhere in a blizzard, when you wake up late the morning of an important job interview, when you run out of money before the next pay period, and before taking an important exam for which you realize you are not fully prepared.

Stress is an experience that evokes a variety of responses,

including those that are physiological (e.g., accelerated heart rate, headaches, or gastrointestinal problems), cognitive (e.g., difficulty concentrating or making decisions), and behavioural (e.g., drinking alcohol, smoking, or taking actions directed at eliminating the cause of the stress). Although stress can be positive at times, it can have deleterious health implications, contributing to the onset and progression of a variety of physical illnesses and diseases (Cohen & Herbert, 1996).

The scientific study of how stress and other psychological factors impact health falls within the realm of **health psychology**, a subfield of psychology devoted to understanding the importance of psychological influences on health, illness, and how people respond when they become ill (Taylor, 1999). Health psychology emerged as a discipline in the 1970s, a time during which there was increasing awareness of the role behavioural and lifestyle factors play in the development of illnesses and diseases (Straub, 2007). In addition to studying the connection between stress and illness, health psychologists investigate issues such as why people make certain lifestyle choices (e.g., smoking or eating unhealthy food despite knowing the potential adverse health implications of such behaviours). Health psychologists also design and investigate the effectiveness of interventions aimed at changing unhealthy behaviours. Perhaps one of the more fundamental tasks of health psychologists is to identify which groups of people are especially at risk for negative health outcomes, based on psychological or behavioural factors. For example,

measuring differences in stress levels among demographic groups and how these levels change over time can help identify populations who may have an increased risk for illness or disease.

Figure SH.5 depicts the results of three national surveys in which several thousand individuals from different demographic groups completed a brief stress questionnaire; the surveys were administered in 1983, 2006, and 2009 (Cohen & Janicki-Deverts, 2012). All three surveys demonstrated higher stress in women than in men. Unemployed individuals reported high levels of stress in all three surveys, as did those with less education and income; retired persons reported the lowest stress levels. However, from 2006 to 2009 the greatest increase in stress levels occurred among men, Hispanics people aged 45–64, college graduates, and those with full-time employment. One interpretation of these findings is that concerns surrounding the 2008–2009 economic downturn (e.g., threat of or actual job loss and substantial loss of retirement savings) may have been especially stressful to college-educated employed men with limited time remaining in their working careers.

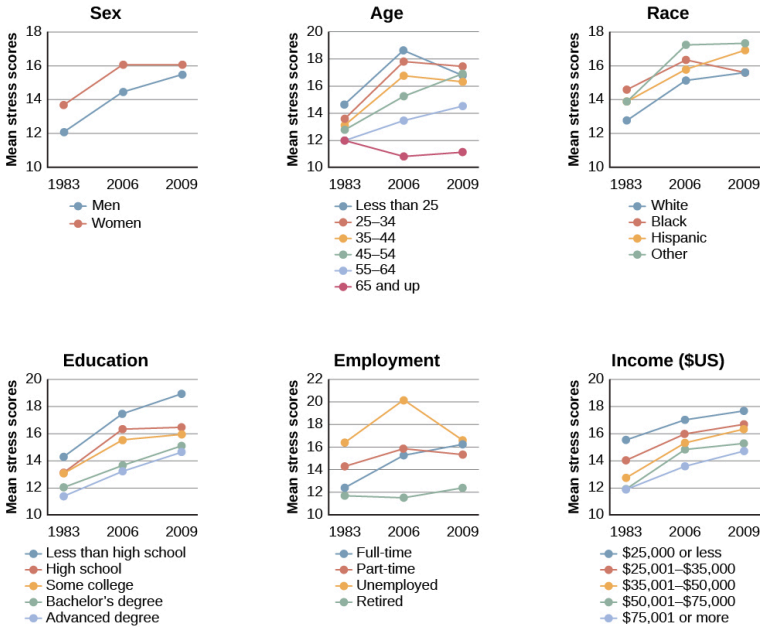


Figure SH.5 The charts above, adapted from Cohen & Janicki-Deverts (2012), depict the mean stress level scores among different demographic groups during the years 1983, 2006, and 2009. Across categories of sex, age, race, education level, employment status, and income, stress levels generally show a marked increase over this quarter-century time span.

Link to Learning

Check out the interactive tables from Statistics Canada to explore the trends in reported stress across age groups, reported sex, and geographic locations, to learn more.

TRICKY TOPIC: THE STRESS RESPONSE

One or more interactive elements has been excluded from this version of the text. You can view them online here: https://caul-cbua.pressbooks.pub/intropsychneuro/?p=533#oembed-1

If the video above does not load, click here: https://youtu.be/JH6J8_uKOu0

For a full transcript of this video, click here

Early Contributions to the Study of Stress

As previously stated, scientific interest in stress goes back nearly a century. One of the early pioneers in the study of stress was Walter Cannon, an eminent American physiologist at Harvard Medical School (Figure SH.6). In the early part of the 20th century, Cannon was the first to identify the body's physiological reactions to stress.

Figure SH.6 Harvard physiologist Walter Cannon first articulated and named the fight-or-flight response, the nervous system's sympathetic response to a significant stressor.

Cannon and the Fight-or-Flight Response

Imagine that you are hiking in the beautiful mountains of Colorado on a warm and sunny spring day. At one point during your hike, a large, frightening-looking black bear appears from behind a stand of trees and sits about 50 yards from you. The bear notices you, sits up, and begins to lumber in your direction. In addition to thinking, "This is definitely not good," a constellation of physiological reactions begins to

take place inside you. Prompted by a deluge of epinephrine (adrenaline) and norepinephrine (noradrenaline) from your adrenal glands, your pupils begin to dilate. Your heart starts to pound and speeds up, you begin to breathe heavily and perspire, you get butterflies in your stomach, and your muscles become tense, preparing you to take some kind of direct action. Cannon proposed that this reaction, which he called the **fight-or-flight response**, occurs when a person experiences very strong emotions—especially those associated with a perceived threat (Cannon, 1932). During the fight-or-flight response, the body is rapidly aroused by activation of both the sympathetic nervous system and the endocrine system (Figure SH.7). This arousal helps prepare the person to either fight or flee from a perceived threat.

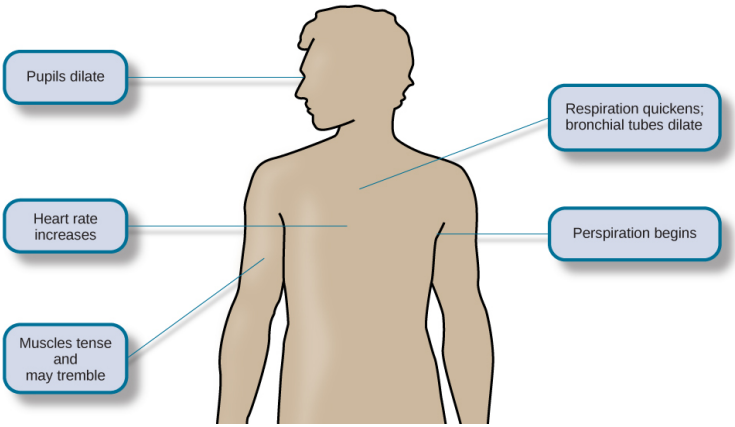


Figure SH.7 Fight or flight is a physiological response to a stressor.

According to Cannon, the fight-or-flight response is a built-in mechanism that assists in maintaining homeostasis—an internal environment in which physiological variables such as blood pressure, respiration, digestion, and temperature are stabilized at levels optimal for survival. Thus, Cannon viewed the fight-or-flight response as adaptive because it enables people to adjust internally and externally to threats in their environment, allowing them to continue to be alive and overcome the threat.

Selye and the General Adaptation Syndrome

Another important early contributor to the stress field was Hans Selye, mentioned earlier. He would eventually become one of the world's foremost experts in the study of stress (Figure SH.8). As a young assistant in the biochemistry department at McGill University in the 1930s, Selye was engaged in research involving sex hormones in rats. Although he was unable to find an answer for what he was initially researching, he incidentally discovered that when exposed to prolonged negative stimulation (stressors)—such as extreme cold, surgical injury, excessive muscular exercise, and shock—the rats showed signs of adrenal enlargement, thymus and lymph node shrinkage, and stomach ulceration. Selye realized that these responses were triggered by a coordinated series of physiological reactions that unfold over time during continued exposure to a stressor. These physiological reactions

were nonspecific, which means that regardless of the type of stressor, the same pattern of reactions would occur. What Selye discovered was the **general adaptation syndrome**, the body's nonspecific physiological response to stress.

Figure SH.8 Hans Selye specialized in research about stress. In 2009, his native Hungary honoured his work with this stamp, released in conjunction with the 2nd annual World Conference on Stress.

The general adaptation syndrome, shown in Figure SH.9, consists of three stages: (1) alarm reaction, (2) stage of resistance, and (3) stage of exhaustion (Selye, 1936; 1976). **Alarm reaction** describes the body's immediate reaction upon facing a threatening situation or emergency, and it is roughly analogous to the fight-or-flight response described by Cannon. During an alarm reaction, you are alerted to a stressor, and your body alarms you with a cascade of physiological reactions that provide you with the energy to

manage the situation. A person who wakes up in the middle of the night to discover her house is on fire, for example, is experiencing an alarm reaction.

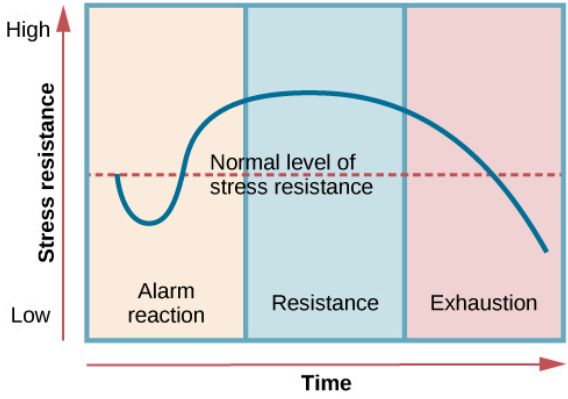


Figure SH.9 The three stages of Selye's general adaptation syndrome are shown in this graph. Prolonged stress ultimately results in exhaustion.

If exposure to a stressor is prolonged, the organism will enter the **stage of resistance**. During this stage, the initial shock of alarm reaction has worn off and the body has adapted to the stressor. Nevertheless, the body also remains on alert and is prepared to respond as it did during the alarm reaction, although with less intensity. For example, suppose a child who went missing is still missing 72 hours later. Although the parents would obviously remain extremely disturbed, the magnitude of physiological reactions would likely have diminished over the 72 intervening hours due to some adaptation to this event.

If exposure to a stressor continues over a longer period of time, the **stage of exhaustion** ensues. At this stage, the person is no longer able to adapt to the stressor: the body's ability to resist becomes depleted as physical wear takes its toll on the body's tissues and organs. As a result, illness, disease, and other permanent damage to the body—even death—may occur. If a missing child still remained missing after three months, the long-term stress associated with this situation may cause a parent to literally faint with exhaustion at some point or even to develop a serious and irreversible illness.

In short, Selye's general adaptation syndrome suggests that stressors tax the body via a three-phase process—an initial jolt, subsequent readjustment, and a later depletion of all physical resources—that ultimately lays the groundwork for serious health problems and even death. It should be pointed out, however, that this model is a response-based conceptualization of stress, focusing exclusively on the body's physical responses while largely ignoring psychological factors such as appraisal and interpretation of threats. Nevertheless, Selye's model has had an enormous impact on the field of stress because it offers a general explanation for how stress can lead to physical damage and, thus, disease. As we shall discuss later, prolonged or repeated stress has been implicated in development of a number of disorders such as hypertension and coronary artery disease.

The Physiological Basis of Stress

What goes on inside our bodies when we experience stress? The physiological mechanisms of stress are extremely complex, but they generally involve the work of two systems—the sympathetic nervous system and the **hypothalamic-pituitary-adrenal (HPA) axis**. When a person first perceives something as stressful (Selye's alarm reaction), the sympathetic nervous system triggers arousal via the release of adrenaline from the adrenal glands. Release of these hormones activates the fight-or-flight responses to stress, such as accelerated heart rate and respiration. At the same time, the HPA axis, which is primarily endocrine in nature, becomes especially active, although it works much more slowly than the sympathetic nervous system. In response to stress, the hypothalamus (one of the limbic structures in the brain) releases corticotrophin-releasing factor, a hormone that causes the pituitary gland to release adrenocorticotropic hormone (ACTH) (Figure SH.10). The ACTH then activates the adrenal glands to secrete a number of hormones into the bloodstream; an important one is cortisol, which can affect virtually every organ within the body. Cortisol is commonly known as a stress hormone and helps provide that boost of energy when we first encounter a stressor, preparing us to run away or fight. However, sustained elevated levels of cortisol weaken the immune system.

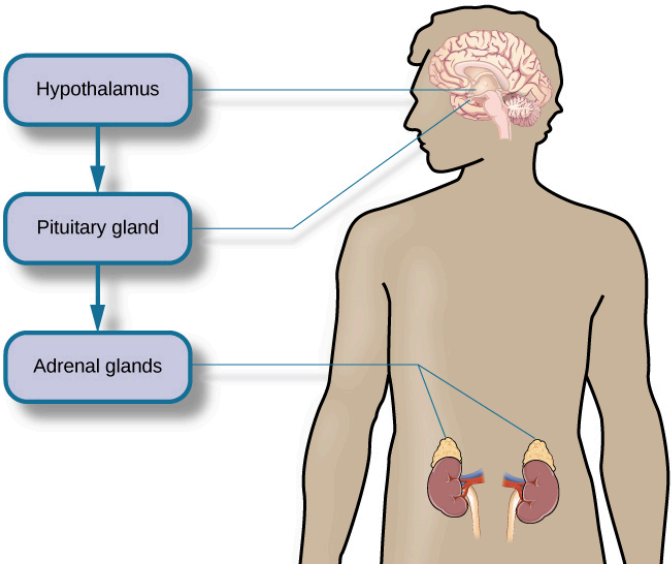


Figure SH.10 This diagram shows the functioning of the hypothalamic-pituitary-adrenal (HPA) axis. The hypothalamus activates the pituitary gland, which in turn activates the adrenal glands, increasing their secretion of cortisol.

In short bursts, this process can have some favourable effects, such as providing extra energy, improving immune system functioning temporarily, and decreasing pain sensitivity. However, extended release of cortisol—as would happen with prolonged or chronic stress—often comes at a high price. High levels of cortisol have been shown to produce a number of harmful effects. For example, increases in cortisol can significantly weaken our immune system (Glaser & Kiecolt-Glaser, 2005), and high levels are frequently observed among depressed individuals (Geoffroy, Hertzman, Li, &

Power, 2013). In summary, a stressful event causes a variety of physiological reactions that activate the adrenal glands, which in turn release epinephrine, norepinephrine, and cortisol. These hormones affect a number of bodily processes in ways that prepare the stressed person to take direct action, but also in ways that may heighten the potential for illness.

When stress is extreme or chronic, it can have profoundly negative consequences. For example, stress often contributes to the development of certain psychological disorders, including post-traumatic stress disorder, major depressive disorder, and other serious psychiatric conditions. Additionally, we noted earlier that stress is linked to the development and progression of a variety of physical illnesses and diseases. For example, researchers in one study found that people injured during the September 11, 2001, World Trade Center disaster or who developed post-traumatic stress symptoms afterward later suffered significantly elevated rates of heart disease (Jordan, Miller-Archie, Cone, Morabia, & Stellman, 2011). Another investigation yielded that self-reported stress symptoms among aging and retired Finnish food industry workers were associated with morbidity 11 years later. This study also predicted the onset of musculoskeletal, nervous system, and endocrine and metabolic disorders (Salonen, Arola, Nygård, & Huhtala, 2008). Another study reported that male South Korean manufacturing employees who reported high levels of work-related stress were more

likely to catch the common cold over the next several months than were those employees who reported lower work-related stress levels (Park et al., 2011). Later, you will explore the mechanisms through which stress can produce physical illness and disease.

122.

STRESSORS

Learning Objectives

By the end of this section, you will be able to:

- Describe different types of possible stressors
- Explain the importance of life changes as potential stressors
- Describe the Social Readjustment Rating Scale
- Understand the concepts of job strain and job burnout

For an individual to experience stress, he must first encounter a potential stressor. In general, stressors can be placed into one of two broad categories: chronic and acute. Chronic stressors include events that persist over an extended period of time,

such as caring for a parent with dementia, long-term unemployment, or imprisonment. Acute stressors involve brief focal events that sometimes continue to be experienced as overwhelming well after the event has ended, such as falling on an icy sidewalk and breaking your leg (Cohen, Janicki-Deverts, & Miller, 2007). Whether chronic or acute, potential stressors come in many shapes and sizes. They can include major traumatic events, significant life changes, daily hassles, as well as other situations in which a person is regularly exposed to threat, challenge, or danger.

Traumatic Events

Some stressors involve traumatic events or situations in which a person is exposed to actual or threatened death or serious injury. Stressors in this category include exposure to military combat, threatened or actual physical assaults (e.g., physical attacks, robbery, abuse), terrorist attacks, natural disasters (e.g., earthquakes, floods, hurricanes), and automobile accidents. Men, non-Whites, and individuals in lower socioeconomic status (SES) groups report experiencing a greater number of traumatic events than do women, Whites, and individuals in higher SES groups (Hatch & Dohrenwend, 2007). Some individuals who are exposed to stressors of extreme magnitude develop post-traumatic stress disorder (PTSD): a chronic stress reaction characterized by experiences and behaviours that may include intrusive and painful

memories of the stressor event, jumpiness, persistent negative emotional states, detachment from others, angry outbursts, and avoidance of reminders of the event (American Psychiatric Association [APA], 2013).

Life Changes

Most stressors that we encounter are not nearly as intense as the ones described above. Many potential stressors we face involve events or situations that require us to make changes in our ongoing lives and require time as we adjust to those changes. Examples include death of a close family member, marriage, divorce, and moving (Figure SH.11).

Figure SH.11 Some fairly typical life events, such as moving, can be significant stressors. Even when the move is intentional and positive, the amount of resulting change in daily life can cause stress. (credit: "Jellaluna"/Flickr)

In the 1960s, psychiatrists Thomas Holmes and Richard Rahe wanted to examine the link between life stressors and physical illness, based on the hypothesis that life events requiring significant changes in a person's normal life routines are stressful, whether these events are desirable or undesirable. They developed the **Social Readjustment Rating Scale (SRRS)**, consisting of 43 life events that require varying degrees of personal readjustment (Holmes & Rahe, 1967). Many life events that most people would consider pleasant (e.g., holidays, retirement, marriage) are among those

listed on the SRRS; these are examples of eustress. Holmes and Rahe also proposed that life events can add up over time, and that experiencing a cluster of stressful events increases one's risk of developing physical illnesses.

In developing their scale, Holmes and Rahe asked 394 participants to provide a numerical estimate for each of the 43 items; each estimate corresponded to how much readjustment participants felt each event would require. These estimates resulted in mean value scores for each event—often called life change units (LCUs) (Rahe, McKeen, & Arthur, 1967). The numerical scores ranged from 11 to 100, representing the perceived magnitude of life change each event entails. Death of a spouse ranked highest on the scale with 100 LCUs, and divorce ranked second highest with 73 LCUs. In addition, personal injury or illness, marriage, and job termination also ranked highly on the scale with 53, 50, and 47 LCUs, respectively. Conversely, change in residence (20 LCUs), change in eating habits (15 LCUs), and vacation (13 LCUs) ranked low on the scale (Table SH.1). Minor violations of the law ranked the lowest with 11 LCUs. To complete the scale, participants checked yes for events experienced within the last 12 months. LCUs for each checked item are totalled for a score quantifying the amount of life change. Agreement on the amount of adjustment required by the various life events on the SRRS is highly consistent, even cross-culturally (Holmes & Masuda, 1974).

Table SH.1 Some Stressors on the Social Readjustment Rating Scale (Holmes & Rahe, 1967)

Life event	Life change units
Death of a close family member	63
Personal injury or illness	53
Dismissal from work	47
Change in financial state	38
Change to different line of work	36
Outstanding personal achievement	28
Beginning or ending school	26
Change in living conditions	25
Change in working hours or conditions	20
Change in residence	20
Change in schools	20
Change in social activities	18
Change in sleeping habits	16
Change in eating habits	15
Minor violation of the law	11

Extensive research has demonstrated that accumulating a high number of life change units within a brief period of time (one or two years) is related to a wide range of physical illnesses (even accidents and athletic injuries) and mental health problems (Monat & Lazarus, 1991; Scully, Tosi, & Banning,

2000). In an early demonstration, researchers obtained LCU scores for U.S. and Norwegian Navy personnel who were about to embark on a six-month voyage. A later examination of medical records revealed positive (but small) correlations between LCU scores prior to the voyage and subsequent illness symptoms during the ensuing six-month journey (Rahe, 1974). In addition, people tend to experience more physical symptoms, such as backache, upset stomach, diarrhea, and acne, on specific days in which self-reported LCU values are considerably higher than normal, such as the day of a family member's wedding (Holmes & Holmes, 1970).

The Social Readjustment Rating Scale (SRRS) provides researchers a simple, easy-to-administer way of assessing the amount of stress in people's lives, and it has been used in hundreds of studies (Thoits, 2010). Despite its widespread use, the scale has been subject to criticism. First, many of the items on the SRRS are vague; for example, death of a close friend could involve the death of a long-absent childhood friend that requires little social readjustment (Dohrenwend, 2006). In addition, some have challenged its assumption that undesirable life events are no more stressful than desirable ones (Derogatis & Coons, 1993). However, most of the available evidence suggests that, at least as far as mental health is concerned, undesirable or negative events are more strongly associated with poor outcomes (such as depression) than are desirable, positive events (Hatch & Dohrenwend, 2007). Perhaps the most serious criticism is that the scale does not

take into consideration respondents' appraisals of the life events it contains. As you recall, appraisal of a stressor is a key element in the conceptualization and overall experience of stress. Being fired from work may be devastating to some but a welcome opportunity to obtain a better job for others. The SRRS remains one of the most well-known instruments in the study of stress, and it is a useful tool for identifying potential stress-related health outcomes (Scully et al., 2000).

Link to Learning

Go to this site and complete the SRRS scale to determine the total number of LCUs you have experienced over the last year.

What do you think?

Correlational Research

The Holmes and Rahe Social Readjustment Rating Scale (SRRS) uses the correlational research method to identify the connection between stress and health. That is, respondents' LCU scores are correlated with the number or frequency of self-reported symptoms indicating health problems. These correlations are typically positive—as LCU scores increase, the number of symptoms increase. Consider all the thousands of studies that have used this scale to correlate stress and illness symptoms: If you were to assign an average correlation coefficient to this body of research, what would be your best guess? How strong do you think the correlation coefficient would be? *Why can't the SRRS show a causal relationship between stress and illness?* If it were possible to show causation, do you think stress causes illness or illness causes stress?

Hassles

Potential stressors do not always involve major life events. **Daily hassles**—the minor irritations and annoyances that are part of our everyday lives (e.g., rush hour traffic, lost keys, obnoxious coworkers, inclement weather, arguments with friends or family)—can build on one another and leave us just as stressed as life change events (Figure SH.12) (Kanner, Coyne, Schaefer, & Lazarus, 1981).

(a) (b)

Figure SH.12 Daily commutes, whether (a) on the road or (b) via public transportation, can be hassles that contribute to our feelings of everyday stress. (credit a: modification of work by Jeff Turner; credit b: modification of work by "epSos.de"/Flickr)

Researchers have demonstrated that the frequency of daily hassles is actually a better predictor of both physical and psychological health than are life change units. In a well-known study of San Francisco residents, the frequency of daily hassles was found to be more strongly associated with physical health problems than were life change events (DeLongis, Coyne, Dakof, Folkman, & Lazarus, 1982). In

addition, daily minor hassles, especially interpersonal conflicts, often lead to negative and distressed mood states (Bolger, DeLongis, Kessler, & Schilling, 1989). Cyber hassles that occur on social media may represent a modern and evolving source of stress. In one investigation, social media stress was tied to loss of sleep in adolescents, presumably because ruminating about social media caused a physiological stress response that increased arousal (van der Schuur, Baumgartner, & Sumter, 2018). Clearly, daily hassles can add up and take a toll on us both emotionally and physically.

OCCUPATION-RELATED Stressors

Stressors can include situations in which one is frequently exposed to challenging and unpleasant events, such as difficult, demanding, or unsafe working conditions. Although most jobs and occupations can at times be demanding, some are clearly more stressful than others (Figure SH.13). For example, most people would likely agree that a firefighter's work is inherently more stressful than that of a florist. Equally likely, most would agree that jobs containing various unpleasant elements, such as those requiring exposure to loud noise (heavy equipment operator), constant harassment and threats of physical violence (prison guard), perpetual frustration (bus driver in a major city), or those mandating that an employee work alternating day and night shifts (hotel desk clerk), are much more demanding—and thus, more stressful—than

those that do not contain such elements. Table SH.2 lists several occupations and some of the specific stressors associated with those occupations (Sulsky & Smith, 2005).

(a)

(b)

Figure SH.13 (a) Police officers and (b) firefighters hold high stress occupations. (credit a: modification of work by Australian Civil-Military Centre; credit b: modification of work by Andrew Magill)

Table SH.2 Occupations and Their Related Stressors

Occupation	Stressors Specific to Occupation
Police officer	physical dangers, excessive paperwork, dealing with court system, tense interactions, life-and-death decision making
Firefighter	uncertainty over whether a serious fire or hazard awaits after an alarm, potential for extreme physical danger
Social worker	little positive feedback from jobs or from the public, unsafe work environments, frustration in dealing with bureaucracy, excessive paperwork, sense of personal responsibility for clients, work overload
Teacher	Excessive paperwork, lack of adequate supplies or facilities, work overload, lack of positive feedback, threat of physical violence, lack of support from parents and administrators
Nurse	Work overload, heavy physical work, patient concerns (dealing with death and medical concerns), interpersonal problems with other medical staff (especially physicians)
Emergency medical worker	Unpredictable and extreme nature of the job, inexperience
Clerical and secretarial work	Few opportunities for advancement, unsupportive supervisors, work overload, lack of perceived control
Managerial work	Work overload, conflict and ambiguity in defining the managerial role, difficult work relationships

Although the specific stressors for these occupations are diverse, they seem to share some common denominators such

as heavy workload and uncertainty about and lack of control over certain aspects of a job. Chronic occupational stress contributes to **job strain**, a work situation that combines excessive job demands and workload with little discretion in decision making or job control (Karasek & Theorell, 1990). Clearly, many occupations other than the ones listed in Table SH.2 involve at least a moderate amount of job strain in that they often involve heavy workloads and little job control (e.g., inability to decide when to take breaks). Such jobs are often low-status and include those of factory workers, postal clerks, supermarket cashiers, taxi drivers, and short-order cooks. Job strain can have adverse consequences on both physical and mental health; it has been shown to be associated with increased risk of hypertension (Schnall & Landsbergis, 1994), heart attacks (Theorell et al., 1998), recurrence of heart disease after a first heart attack (Aboa-Éboulé et al., 2007), significant weight loss or gain (Kivimäki et al., 2006), and major depressive disorder (Stansfeld, Shipley, Head, & Fuhrer, 2012). A longitudinal study of over 10,000 British civil servants reported that workers under 50 years old who earlier had reported high job strain were 68% more likely to later develop heart disease than were those workers under 50 years old who reported little job strain (Chandola et al., 2008).

Some people who are exposed to chronically stressful work conditions can experience **job burnout**, which is a general sense of emotional exhaustion and cynicism in relation to

one's job (Maslach & Jackson, 1981). Job burnout occurs frequently among those in human service jobs (e.g., social workers, teachers, therapists, cashiers, and fast-food employees). Job burnout consists of three dimensions. The first dimension is exhaustion—a sense that one's emotional resources are drained or that one is at the end of their rope and has nothing more to give at a psychological level. Second, job burnout is characterized by depersonalization: a sense of emotional detachment between the worker and the recipients of his services, often resulting in callous, cynical, or indifferent attitudes toward these individuals. Third, job burnout is characterized by diminished personal accomplishment, which is the tendency to evaluate one's work negatively by, for example, experiencing dissatisfaction with one's job-related accomplishments or feeling as though one has categorically failed to influence others' lives through one's work.

Job strain appears to be one of the greatest risk factors leading to job burnout, which is most commonly observed in workers who are older (ages 55–64), unmarried, and whose jobs involve manual labor. Heavy alcohol consumption, physical inactivity, being overweight, and having a physical or lifetime mental disorder are also associated with job burnout (Ahola, et al., 2006). In addition, depression often co-occurs with job burnout. One large-scale study of over 3,000 Finnish employees reported that half of the participants with severe job burnout had some form of depressive disorder (Ahola et al., 2005). Job burnout is often precipitated by feelings of having

invested considerable energy, effort, and time into one's work while receiving little in return (e.g., little respect or support from others or low pay) (Tatris, Peeters, Le Blanc, Schreurs, & Schaufeli, 2001).

As an illustration, consider Tyre, a nursing assistant who worked in a nursing home. Tyre worked long hours for little pay in a difficult facility. Tyre's supervisor was domineering, unpleasant, and unsupportive, as well as disrespectful of Tyre's personal time, frequently informing them at the last minute they must work several additional hours after their shift ended or report to work on weekends. Tyre had very little autonomy at work. They had little input in day-to-day duties and how to perform them, and was not permitted to take breaks unless explicitly told by their supervisor. Tyre did not feel as though their hard work was appreciated, either by supervisory staff or by the residents of the home. Tyre was very unhappy over the low pay, and felt that many of the residents treated them disrespectfully.

After several years, Tyre began to hate their job. Tyre dreaded going to work in the morning, and gradually developed a callous, hostile attitude toward many of the residents. Eventually, they began to feel they could no longer help the nursing home residents. Tyre's absenteeism from work increased, and one day they decided that they had had enough and quit. Tyre now has a job in sales, vowing never to work in nursing again.

Link to Learning

Watch this clip from the 1999 comedy *Office Space* for a humorous illustration of lack of supervisory support in which a sympathetic character's insufferable boss makes a last-minute demand that he "go ahead and come in" to the office on both Saturday and Sunday.

Finally, our close relationships with friends and family—particularly the negative aspects of these relationships—can be a potent source of stress. Negative aspects of close relationships can include conflicts such as disagreements or arguments, lack of emotional support or confiding, and lack of reciprocity. All of these can be overwhelming, threatening to the relationship, and thus stressful. Such stressors can take a toll both emotionally and physically. A longitudinal investigation of over 9,000 British civil servants found that those who at one point had reported the highest levels of negative interactions in their closest relationship were 34% more likely to experience serious heart problems (fatal or nonfatal heart attacks) over a 13–15 year

period, compared to those who experienced the lowest levels of negative interaction (De Vogli, Chandola & Marmot, 2007).

123.

STRESS AND ILLNESS

Learning Objectives

By the end of this section, you will be able to:

- Explain the nature of psychophysiological disorders
- Describe the immune system and how stress impacts its functioning
- Describe how stress and emotional factors can lead to the development and exacerbation of cardiovascular disorders, asthma, and tension headaches

In this section, we will discuss stress and illness. As stress researcher Robert Sapolsky (1998) describes,

> "...stress-related disease emerges, predominantly, out of the fact that we so often activate a physiological system that has evolved for responding to acute physical emergencies, but we turn it on for months on end, worrying about mortgages, relationships, and promotions." (p. 6)

The stress response, as noted earlier, consists of a coordinated but complex system of physiological reactions that are called upon as needed. These reactions are beneficial at times because they prepare us to deal with potentially dangerous or threatening situations (for example, recall our old friend, the fearsome bear on the trail). However, health is affected when physiological reactions are sustained, as can happen in response to ongoing stress.

Psychophysiological Disorders

If the reactions that compose the stress response are chronic or if they frequently exceed normal ranges, they can lead to cumulative wear and tear on the body, in much the same way that running your air conditioner on full blast all summer will eventually cause wear and tear on it. For example, the high blood pressure that a person under considerable job strain experiences might eventually take a toll on his heart and set the stage for a heart attack or heart failure. Also, someone exposed to high levels of the stress hormone cortisol might become vulnerable to infection or disease because of weakened immune system functioning (McEwen, 1998).

Link to Learning

Neuroscientists Robert Sapolsky and Carol Shively have conducted extensive research on stress in non-human primates for over 30 years. Both have shown that position in the social hierarchy predicts stress, mental health status, and disease. Their research sheds light on how stress may lead to negative health outcomes for stigmatized or ostracized people. Here are two videos featuring Dr. Sapolsky: one is brief and discusses killer stress and the other is an excellent full-length (1 hour) in-depth documentary from *National Geographic*.

Physical disorders or diseases whose symptoms are brought about or worsened by stress and emotional factors are called psychophysiological disorders. The physical symptoms of psychophysiological disorders are real and they can be produced or exacerbated by psychological factors (hence the *psycho* and *physiological* in psychophysiological). A list of frequently encountered psychophysiological disorders is provided in Table SH.3.

SH. 3Types of Psychophysiological Disorders (adapted from Everly & Lating, 2002)

Type of Psychophysiological Disorder	Examples
Cardiovascular	hypertension, coronary heart disease
Gastrointestinal	irritable bowel syndrome
Respiratory	asthma, allergy
Musculoskeletal	low back pain, tension headaches
Skin	acne, eczema, psoriasis

Friedman and Booth-Kewley (1987) statistically reviewed 101 studies to examine the link between personality and illness. They proposed the existence of disease-prone personality characteristics, including depression, anger/hostility, and anxiety. Indeed, a study of over 61,000 Norwegians identified depression as a risk factor for all major disease-related causes of death (Mykletun et al., 2007). In addition, neuroticism—a personality trait that reflects how anxious, moody, and sad one is—has been identified as a risk factor for chronic health problems and mortality (Ploubidis & Grundy, 2009).

Below, we discuss two kinds of psychophysiological disorders about which a great deal is known: cardiovascular disorders and asthma. First, however, it is necessary to turn our attention to a discussion of the immune system—one of the major

pathways through which stress and emotional factors can lead to illness and disease.

Stress and the Immune System

In a sense, the **immune system** is the body's surveillance system. It consists of a variety of structures, cells, and mechanisms that serve to protect the body from invading microorganisms that can harm or damage the body's tissues and organs. When the immune system is working as it should, it keeps us healthy and disease free by eliminating harmful bacteria, viruses, and other foreign substances that have entered the body (Everly & Lating, 2002).

TRICKY TOPIC: STRESS AND THE IMMUNE RESPONSE

One or more interactive elements has been excluded from this version of the text. You can view them online here: https://caul-cbua.pressbooks.pub/intropsychneuro/?p=535#oembed-1

If the video above does not load, click here: https://youtu.be/

1mJ7WhYDuU8

For a full transcript of this video, click here

Immune System Errors

Sometimes, the immune system will function erroneously. For example, sometimes it can go awry by mistaking your body's own healthy cells for invaders and repeatedly attacking them. When this happens, the person is said to have an autoimmune disease, which can affect almost any part of the body. How an autoimmune disease affects a person depends on what part of the body is targeted. For instance, rheumatoid arthritis, an autoimmune disease that affects the joints, results in joint pain, stiffness, and loss of function. Systemic lupus erythematosus, an autoimmune disease that affects the skin, can result in rashes and swelling of the skin. Grave's disease, an autoimmune disease that affects the thyroid gland, can result in fatigue, weight gain, and muscle aches (National Institute of Arthritis and Musculoskeletal and Skin Diseases [NIAMS], 2012).

In addition, the immune system may sometimes break down and be unable to do its job. This situation is referred to as **immunosuppression**, the decreased effectiveness of the immune system. When people experience immunosuppression, they become susceptible to any number of infections, illness, and diseases. For example, acquired immune deficiency syndrome (AIDS) is a serious and lethal disease that is caused by human immunodeficiency virus

(HIV), which greatly weakens the immune system by infecting and destroying antibody-producing cells, thus rendering an untreated person vulnerable to any of a number of opportunistic infections (Powell, 1996).

Stressors and Immune Function

The question of whether stress and negative emotional states can influence immune function has captivated researchers for over three decades, and discoveries made over that time have dramatically changed the face of health psychology (Kiecolt-Glaser, 2009). **Psychoneuroimmunology** is the field that studies how psychological factors such as stress influence the immune system and immune functioning. The term psychoneuroimmunology was first coined in 1981, when it appeared as the title of a book that reviewed available evidence for associations between the brain, endocrine system, and immune system (Zacharie, 2009). To a large extent, this field evolved from the discovery that there is a connection between the central nervous system and the immune system.

Some of the most compelling evidence for a connection between the brain and the immune system comes from studies in which researchers demonstrated that immune responses in animals could be classically conditioned (Everly & Lating, 2002). For example, Ader and Cohen (1975) paired flavoured water (the conditioned stimulus) with the presentation of an immunosuppressive drug (the unconditioned stimulus), causing sickness (an unconditioned response). Not

surprisingly, rats exposed to this pairing developed a conditioned aversion to the flavoured water. However, the taste of the water itself later produced immunosuppression (a conditioned response), indicating that the immune system itself had been conditioned. Many subsequent studies over the years have further demonstrated that immune responses can be classically conditioned in both animals and humans (Ader & Cohen, 2001). Thus, if classical conditioning can alter immunity, other psychological factors should be capable of altering it as well.

Hundreds of studies involving tens of thousands of participants have tested many kinds of brief and chronic stressors and their effects on the immune system (e.g., public speaking, medical school examinations, unemployment, marital discord, divorce, death of spouse, burnout and job strain, caring for a relative with Alzheimer's disease, and exposure to the harsh climate of Antarctica). It has been repeatedly demonstrated that many kinds of stressors are associated with poor or weakened immune functioning (Glaser & Kiecolt-Glaser, 2005; Kiecolt-Glaser, McGuire, Robles, & Glaser, 2002; Segerstrom & Miller, 2004).

When evaluating these findings, it is important to remember that there is a tangible physiological connection between the brain and the immune system. For example, the sympathetic nervous system innervates immune organs such as the thymus, bone marrow, spleen, and even lymph nodes (Maier, Watkins, & Fleshner, 1994). Also, we noted earlier

that stress hormones released during hypothalamic-pituitary-adrenal (HPA) axis activation can adversely impact immune function. One way they do this is by inhibiting the production of **lymphocytes**, white blood cells that circulate in the body's fluids that are important in the immune response (Everly & Lating, 2002).

Some of the more dramatic examples demonstrating the link between stress and impaired immune function involve studies in which volunteers were exposed to viruses. The rationale behind this research is that because stress weakens the immune system, people with high stress levels should be more likely to develop an illness compared to those under little stress. In one memorable experiment using this method, researchers interviewed 276 healthy volunteers about recent stressful experiences (Cohen et al., 1998). Following the interview, these participants were given nasal drops containing the cold virus (in case you are wondering why anybody would ever want to participate in a study in which they are subjected to such treatment, the participants were paid $800 for their trouble). When examined later, participants who reported experiencing chronic stressors for more than one month—especially enduring difficulties involving work or relationships—were considerably more likely to have developed colds than were participants who reported no chronic stressors (Figure SH.14).

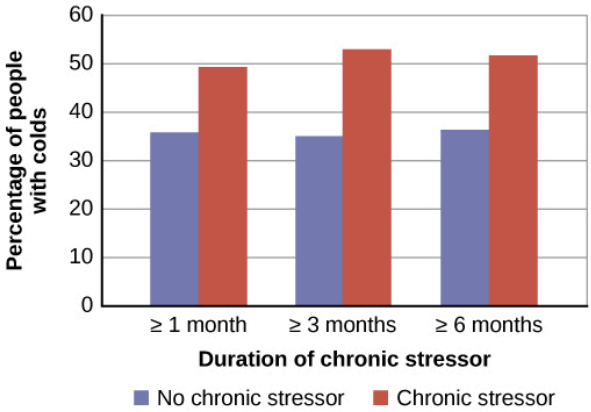


Figure SH.14 This graph shows the percentages of participants who developed colds (after receiving the cold virus) after reporting having experienced chronic stressors lasting at least one month, three months, and six months (adapted from Cohen et al., 1998).

In another study, older volunteers were given an influenza virus vaccination. Compared to controls, those who were caring for a spouse with Alzheimer's disease (and thus were under chronic stress) showed poorer antibody response following the vaccination (Kiecolt-Glaser, Glaser, Gravenstein, Malarkey, & Sheridan, 1996).

Other studies have demonstrated that stress slows down wound healing by impairing immune responses important to wound repair (Glaser & Kiecolt-Glaser, 2005). In one study, for example, skin blisters were induced on the forearm. Subjects who reported higher levels of stress produced lower levels of immune proteins necessary for wound healing (Glaser et al., 1999). Stress, then, is not so much the sword that kills

the knight, so to speak; rather, it's the sword that breaks the knight's shield, and your immune system is that shield.

Cardiovascular Disorders

The cardiovascular system is composed of the heart and blood circulation system. For many years, disorders that involve the cardiovascular system—known as **cardiovascular disorders**—have been a major focal point in the study of psychophysiological disorders because of the cardiovascular system's centrality in the stress response (Everly & Lating, 2002). **Heart disease** is one such condition. Each year, heart disease causes approximately one in three deaths in the United States, and it is the leading cause of death in the developed world (Centers for Disease Control and Prevention [CDC], 2011; Shapiro, 2005).

The symptoms of heart disease vary somewhat depending on the specific kind of heart disease one has, but they generally involve angina—chest pains or discomfort that occur when the heart does not receive enough blood (Office on Women's Health, 2009). The pain often feels like the chest is being pressed or squeezed; burning sensations in the chest and shortness of breath are also commonly reported. Such pain and discomfort can spread to the arms, neck, jaws, stomach (as nausea), and back (American Heart Association [AHA], 2012a) (Figure SH.15).

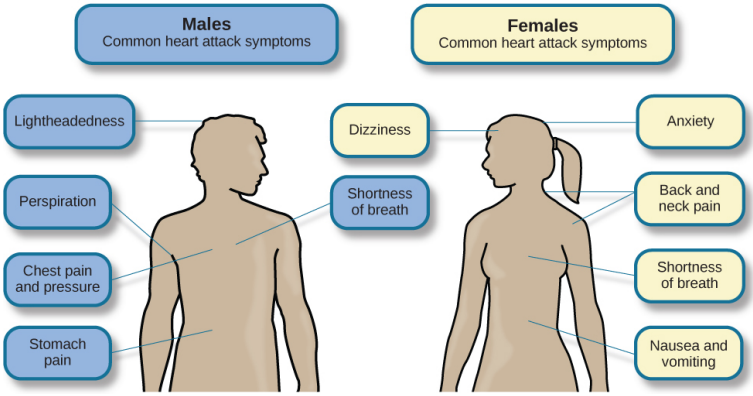


Figure SH.15 Males and females often experience different symptoms of a heart attack.

A major risk factor for heart disease is **hypertension**, which is high blood pressure. Hypertension forces a person's heart to pump harder, thus putting more physical strain on the heart. If left unchecked, hypertension can lead to a heart attack, stroke, or heart failure; it can also lead to kidney failure and blindness. Hypertension is a serious cardiovascular disorder, and it is sometimes called the silent killer because it has no symptoms—one who has high blood pressure may not even be aware of it (AHA, 2012b).

Many risk factors contributing to cardiovascular disorders have been identified. These risk factors include social determinants such as aging, income, education, and employment status, as well as behavioural risk factors that include unhealthy diet, tobacco use, physical inactivity, and excessive alcohol consumption; obesity and diabetes are

additional risk factors (World Health Organization [WHO], 2013).

Over the past few decades, there has been much greater recognition and awareness of the importance of stress and other psychological factors in cardiovascular health (Nusair, Al-dadah, & Kumar, 2012). Indeed, exposure to stressors of many kinds has also been linked to cardiovascular problems; in the case of hypertension, some of these stressors include job strain (Trudel, Brisson, & Milot, 2010), natural disasters (Saito, Kim, Maekawa, Ikeda, & Yokoyama, 1997), marital conflict (Nealey-Moore, Smith, Uchino, Hawkins, & Olson-Cerny, 2007), and exposure to high traffic noise levels at one's home (de Kluizenaar, Gansevoort, Miedema, & de Jong, 2007). Perceived discrimination appears to be associated with hypertension among African Americans (Sims et al., 2012). In addition, laboratory-based stress tasks, such as performing mental arithmetic under time pressure, immersing one's hand into ice water (known as the cold pressor test), mirror tracing, and public speaking have all been shown to elevate blood pressure (Phillips, 2011).

Are You Type A or Type B?

Sometimes research ideas and theories emerge from seemingly trivial observations. In the 1950s, cardiologist Meyer Friedman was looking over his waiting room furniture, which consisted of upholstered chairs with armrests. Friedman decided to have

these chairs reupholstered. When the person doing the reupholstering came to the office to do the work, they commented on how the chairs were worn in a unique manner—the front edges of the cushions were worn down, as were the front tips of the arm rests. It seemed like the cardiology patients were tapping or squeezing the front of the armrests, as well as literally sitting on the edge of their seats (Friedman & Rosenman, 1974). Were cardiology patients somehow different than other types of patients? If so, how?

After researching this matter, Friedman and his colleague, Ray Rosenman, came to understand that people who are prone to heart disease tend to think, feel, and act differently than those who are not. These individuals tend to be intensively driven workaholics who are preoccupied with deadlines and always seem to be in a rush. According to Friedman and Rosenman, these individuals exhibit **Type A** behaviour pattern; those who are more relaxed and laid-back were characterized as **Type B** (Figure SH.16). In a sample of Type As and Type Bs, Friedman and Rosenman were startled to discover that heart disease was over seven times more frequent among the Type As than the Type Bs (Friedman & Rosenman, 1959).

(a)

(b)

Figure SH.17 (a) Type A individuals are characterized as intensely driven, (b) while Type B people are characterized as laid-back and relaxed. (credit a: modification of work by Greg Hernandez; credit b: modification of work by Elvert Barnes)

The major components of the Type A pattern include an aggressive and chronic struggle to achieve more and more in less and less time (Friedman & Rosenman, 1974). Specific characteristics of the Type A pattern include an excessive competitive drive, chronic sense of time urgency, impatience, and hostility toward others (particularly those who get in the person's way).

An example of a person who exhibits Type A behaviour pattern is Terry. Even as a child, Terry was intense and driven. They excelled at school, was captain of the swim team, and graduated with honours from an Ivy League college. Terry never seems able to relax; they are always working on something, even on the weekends. However, Terry always seems to feel as though there are not enough hours in the day to accomplish all they feel they should. Terry volunteers to take on extra tasks at work and often brings their work home with

them; they often go to bed frustrated late at night because they feel that they have not done enough. Terry is quick tempered with their coworkers; often becoming noticeably agitated when dealing with coworkers Terry thinks work too slowly or whose work does not meet Terry's standards. Terry typically reacts with hostility when interrupted at work. Terry has experienced problems in their relationship over their lack of time spent with family. When caught in traffic during their commute to and from work, Terry incessantly pounds on his horn and swears loudly at other drivers. When Jeffrey was 52, they suffered their first heart attack.

By the 1970s, a majority of practicing cardiologists believed that Type A behaviour pattern was a significant risk factor for heart disease (Friedman, 1977). Indeed, a number of early longitudinal investigations demonstrated a link between Type A behaviour pattern and later development of heart disease (Rosenman et al., 1975; Haynes, Feinleib, & Kannel, 1980).

Subsequent research examining the association between Type A and heart disease, however, failed to replicate these earlier findings (Glassman, 2007; Myrtek, 2001). Because Type A theory did not pan out as well as they had hoped, researchers shifted their attention toward determining if any of the specific elements of Type A predict heart disease.

Extensive research clearly suggests that the anger/hostility dimension of Type A behaviour pattern may be one of the most important factors in the development of heart disease. This relationship was initially described in the Haynes et al.

(1980) study mentioned above: Suppressed hostility was found to substantially elevate the risk of heart disease for both men and women. Also, one investigation followed over 1,000 male medical students from 32 to 48 years. At the beginning of the study, these men completed a questionnaire assessing how they react to pressure; some indicated that they respond with high levels of anger, whereas others indicated that they respond with less anger. Decades later, researchers found that those who earlier had indicated the highest levels of anger were over 6 times more likely than those who indicated less anger to have had a heart attack by age 55, and they were 3.5 times more likely to have experienced heart disease by the same age (Chang, Ford, Meoni, Wang, & Klag, 2002). From a health standpoint, it clearly does not pay to be an angry person.

After reviewing and statistically summarizing 35 studies from 1983 to 2006, Chida and Steptoe (2009) concluded that the bulk of the evidence suggests that anger and hostility constitute serious long-term risk factors for adverse cardiovascular outcomes among both healthy individuals and those already suffering from heart disease. One reason angry and hostile moods might contribute to cardiovascular diseases is that such moods can create social strain, mainly in the form of antagonistic social encounters with others. This strain could then lay the foundation for disease-promoting cardiovascular responses among hostile individuals (Vella, Kamarck, Flory, & Manuck, 2012). In this transactional model, hostility and social strain form a cycle (Figure SH.17).

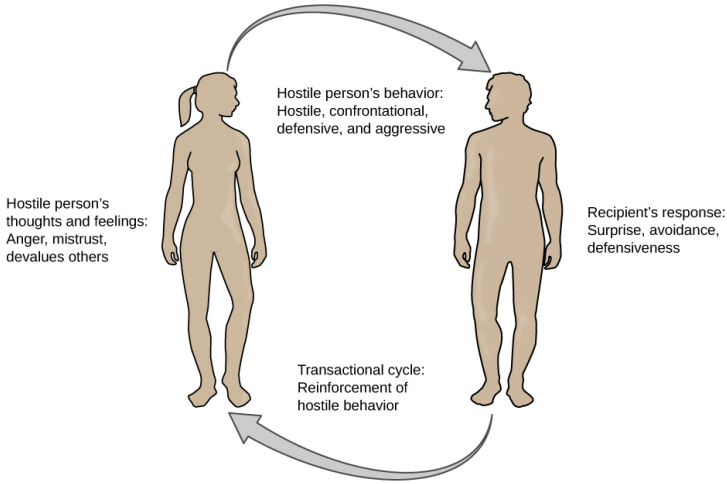


Figure SH.17 According to the transactional model of hostility for predicting social interactions (Vella et al., 2012), the thoughts and feelings of a hostile person promote antagonistic behaviour toward others, which in turn reinforces complimentary reactions from others, thereby intensifying ones' hostile disposition and intensifying the cyclical nature of this relationship.

For example, suppose Parker has a hostile disposition; they have a cynical, distrustful attitude toward others and often thinks that other people are out to get them. Parker is very defensive around people, even those they have known for years, and they are always looking for signs that others are either disrespecting or belittling them. In the shower each morning before work, Parker often mentally rehearses what she would say to someone who said or did something that angered them, such as making a political statement that was counter to their own ideology. As Parker goes through these mental rehearsals,

they often grin and think about the retaliation on anyone who will irk them that day.

Socially, Parker is confrontational and tends to use a harsh tone with people, which often leads to very disagreeable and sometimes argumentative social interactions. As you might imagine, Parker is not especially popular with others, including coworkers, neighbours, and even members of their own family. They either avoid Parker at all costs or snap back at them, which causes Parker to become even more cynical and distrustful of others, making their disposition even more hostile. Parker's hostility—through their own doing—has created an antagonistic environment that cyclically causes them to become even more hostile and angry, thereby potentially setting the stage for cardiovascular problems.

In addition to anger and hostility, a number of other negative emotional states have been linked with heart disease, including negative affectivity and depression (Suls & Bunde, 2005). **Negative affectivity** is a tendency to experience distressed emotional states involving anger, contempt, disgust, guilt, fear, and nervousness (Watson, Clark, & Tellegen, 1988). It has been linked with the development of both hypertension and heart disease. For example, over 3,000 initially healthy participants in one study were tracked longitudinally, up to 22 years. Those with higher levels of negative affectivity at the time the study began were substantially more likely to develop and be treated for hypertension during the ensuing years than were those with lower levels of negative affectivity (Jonas &

Lando, 2000). In addition, a study of over 10,000 middle-aged London-based civil servants who were followed an average of 12.5 years revealed that those who earlier had scored in the upper third on a test of negative affectivity were 32% more likely to have experienced heart disease, heart attack, or angina over a period of years than were those who scored in the lowest third (Nabi, Kivimaki, De Vogli, Marmot, & Singh-Manoux, 2008). Hence, negative affectivity appears to be a potentially vital risk factor for the development of cardiovascular disorders.

Depression and the Heart

For centuries, poets and folklore have asserted that there is a connection between moods and the heart (Glassman & Shapiro, 1998). You are no doubt familiar with the notion of a broken heart following a disappointing or depressing event and have encountered that notion in songs, films, and literature.

Perhaps the first to recognize the link between depression and heart disease was Benjamin Malzberg (1937), who found that the death rate among institutionalized patients with melancholia (an archaic term for depression) was six times higher than that of the population. A classic study in the late 1970s looked at over 8,000 people diagnosed with manic-depressive disorder (now classified as bipolar disorder) in Denmark, finding a nearly 50% increase in deaths from heart

disease among these patients compared with the general Danish population (Weeke, 1979). By the early 1990s, evidence began to accumulate showing that depressed individuals who were followed for long periods of time were at increased risk for heart disease and cardiac death (Glassman, 2007). In one investigation of over 700 Denmark residents, those with the highest depression scores were 71% more likely to have experienced a heart attack than were those with lower depression scores (Barefoot & Schroll, 1996). Figure SH.18 illustrates the gradation in risk of heart attacks for both men and women.

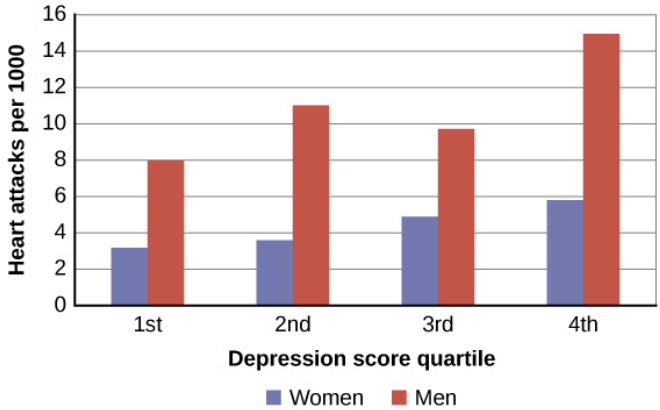


Figure SH.18 This graph shows the incidence of heart attacks among men and women by depression score quartile (adapted from Barefoot & Schroll, 1996).

After more than two decades of research, it is now clear that a relationship exists: Patients with heart disease have more depression than the general population, and people with

depression are more likely to eventually develop heart disease and experience higher mortality than those who do not have depression (Hare, Toukhsati, Johansson, & Jaarsma, 2013); the more severe the depression, the higher the risk (Glassman, 2007). Consider the following:

- In one study, death rates from cardiovascular problems was substantially higher in depressed people; depressed men were 50% more likely to have died from cardiovascular problems, and depressed women were 70% more likely (Ösby, Brandt, Correia, Ekbom, & Sparén, 2001).
- A statistical review of 10 longitudinal studies involving initially healthy individuals revealed that those with elevated depressive symptoms have, on average, a 64% greater risk of developing heart disease than do those with fewer symptoms (Wulsin & Singal, 2003).
- A study of over 63,000 registered nurses found that those with more depressed symptoms when the study began were 49% more likely to experience fatal heart disease over a 12-year period (Whang et al., 2009).

The American Heart Association, fully aware of the established importance of depression in cardiovascular diseases, several years ago recommended routine depression screening for all heart disease patients (Lichtman et al., 2008).

Recently, they have recommended including depression as a risk factor for heart disease patients (AHA, 2014).

Although the exact mechanisms through which depression might produce heart problems have not been fully clarified, a recent investigation examining this connection in early life has shed some light. In an ongoing study of childhood depression, adolescents who had been diagnosed with depression as children were more likely to be obese, smoke, and be physically inactive than were those who had not received this diagnosis (Rottenberg et al., 2014). One implication of this study is that depression, especially if it occurs early in life, may increase the likelihood of living an unhealthy lifestyle, thereby predisposing people to an unfavourable cardiovascular disease risk profile.

It is important to point out that depression may be just one piece of the emotional puzzle in elevating the risk for heart disease, and that chronically experiencing several negative emotional states may be especially important. A longitudinal investigation of Vietnam War veterans found that depression, anxiety, hostility, and trait anger each independently predicted the onset of heart disease (Boyle, Michalek, & Suarez, 2006). However, when each of these negative psychological attributes was combined into a single variable, this new variable (which researchers called psychological risk factor) predicted heart disease more strongly than any of the individual variables. Thus, rather than examining the predictive power of isolated psychological risk factors, it seems crucial for future researchers to examine the effects of combined and more

general negative emotional and psychological traits in the development of cardiovascular illnesses.

Asthma

Asthma is a chronic and serious disease in which the airways of the respiratory system become obstructed, leading to great difficulty expelling air from the lungs. The airway obstruction is caused by inflammation of the airways (leading to thickening of the airway walls) and a tightening of the muscles around them, resulting in a narrowing of the airways (Figure SH.19) (American Lung Association, 2010). Because airways become obstructed, a person with asthma will sometimes have great difficulty breathing and will experience repeated episodes of wheezing, chest tightness, shortness of breath, and coughing, the latter occurring mostly during the morning and night (CDC, 2006).

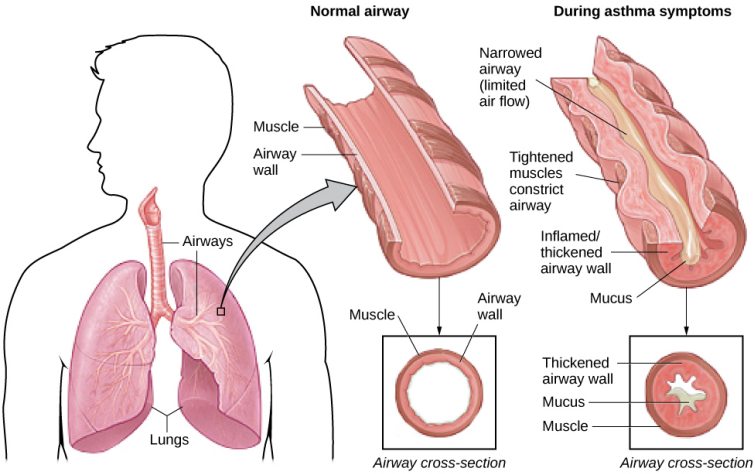


Figure SH.19 In asthma, the airways become inflamed and narrowed.

According to the Centers for Disease Control and Prevention (CDC), around 4,000 people die each year from asthma-related causes, and asthma is a contributing factor to another 7,000 deaths each year (CDC, 2013a). The CDC has revealed that asthma affects 18.7 million U.S. adults and is more common among people with lower education and income levels (CDC, 2013b). Especially concerning is that asthma is on the rise, with rates of asthma increasing 157% between 2000 and 2010 (CDC, 2013b).

Asthma attacks are acute episodes in which an asthma sufferer experiences the full range of symptoms. Asthma exacerbation is often triggered by environmental factors, such as air pollution, allergens (e.g., pollen, mold, and pet hairs),

cigarette smoke, airway infections, cold air or a sudden change in temperature, and exercise (CDC, 2013b).

Psychological factors appear to play an important role in asthma (Wright, Rodriguez, & Cohen, 1998), although some believe that psychological factors serve as potential triggers in only a subset of asthma patients (Ritz, Steptoe, Bobb, Harris, & Edwards, 2006). Many studies over the years have demonstrated that some people with asthma will experience asthma-like symptoms if they expect to experience such symptoms, such as when breathing an inert substance that they (falsely) believe will lead to airway obstruction (Sodergren & Hyland, 1999). As stress and emotions directly affect immune and respiratory functions, psychological factors likely serve as one of the most common triggers of asthma exacerbation (Trueba & Ritz, 2013).

People with asthma tend to report and display a high level of negative emotions such as anxiety, and asthma attacks have been linked to periods of high emotionality (Lehrer, Isenberg, & Hochron, 1993). In addition, high levels of emotional distress during both laboratory tasks and daily life have been found to negatively affect airway function and can produce asthma-like symptoms in people with asthma (von Leupoldt, Ehnes, & Dahme, 2006). In one investigation, 20 adults with asthma wore preprogrammed wristwatches that signalled them to breathe into a portable device that measures airway function. Results showed that higher levels of negative emotions and stress were associated with increased airway

obstruction and self-reported asthma symptoms (Smyth, Soefer, Hurewitz, Kliment, & Stone, 1999). In addition, D'Amato, Liccardi, Cecchi, Pellegrino, & D'Amato (2010) described a case study of an 18-year-old man with asthma whose girlfriend had broken up with him, leaving him in a depressed state. She had also unfriended him on Facebook, while friending other young males. Eventually, the young man was able to "friend" her once again and could monitor her activity through Facebook. Subsequently, he would experience asthma symptoms whenever he logged on and accessed her profile. When he later resigned not to use Facebook any longer, the asthma attacks stopped. This case suggests that the use of Facebook and other forms of social media may represent a new source of stress—it may be a triggering factor for asthma attacks, especially in depressed asthmatic individuals.

Exposure to stressful experiences, particularly those that involve parental or interpersonal conflicts, has been linked to the development of asthma throughout the lifespan. A longitudinal study of 145 children found that parenting difficulties during the first year of life increased the chances that the child developed asthma by 107% (Klinnert et al., 2001). In addition, a cross-sectional study of over 10,000 Finnish college students found that high rates of parent or personal conflicts (e.g., parental divorce, separation from spouse, or severe conflicts in other long-term relationships) increased the risk of asthma onset (Kilpeläinen, Koskenvuo, Helenius, & Terho, 2002). Further, a study of over 4,000

middle-aged men who were interviewed in the early 1990s and again a decade later found that breaking off an important life partnership (e.g., divorce or breaking off relationship from parents) increased the risk of developing asthma by 124% over the time of the study (Loerbroks, Apfelbacher, Thayer, Debling, & Stürmer, 2009).

Headaches

A headache is a continuous pain anywhere in the head and neck region. Inflammation of the sinuses caused by an infection or allergic reaction can cause sinus headaches, which are experienced as pain in the cheeks and forehead. Migraine headaches are a type of headache thought to be caused by blood vessel swelling and increased blood flow (McIntosh, 2013). Migraines are characterized by severe pain on one or both sides of the head, an upset stomach, and disturbed vision. They are more frequently experienced by women than by men (American Academy of Neurology, 2014). Tension headaches are triggered by tightening/tensing of facial and neck muscles; they are the most commonly experienced kind of headache, accounting for about 42% of all headaches worldwide (Stovner et al., 2007). In the United States, well over one-third of the population experiences tension headaches each year, and 2–3% of the population suffers from chronic tension headaches (Schwartz, Stewart, Simon, & Lipton, 1998).

A number of factors can contribute to tension headaches,

including sleep deprivation, skipping meals, eye strain, overexertion, muscular tension caused by poor posture, and stress (MedicineNet, 2013). Although there is uncertainty regarding the exact mechanisms through which stress can produce tension headaches, stress has been demonstrated to increase sensitivity to pain (Caceres & Burns, 1997; Logan et al., 2001). In general, tension headache sufferers, compared to non-sufferers, have a lower threshold for and greater sensitivity to pain (Ukestad & Wittrock, 1996), and they report greater levels of subjective stress when faced with a stressor (Myers, Wittrock, & Foreman, 1998). Thus, stress may contribute to tension headaches by increasing pain sensitivity in already-sensitive pain pathways in tension headache sufferers (Cathcart, Petkov, & Pritchard, 2008).

124.

REGULATION OF STRESS

Learning Objectives

By the end of this section, you will be able to:

- Define coping and differentiate between problem-focused and emotion-focused coping
- Describe the importance of perceived control in our reactions to stress
- Explain how social support is vital in health and longevity

As we learned in the previous section, stress—especially if it is chronic—takes a toll on our bodies and can have enormously

negative health implications. When we experience events in our lives that we appraise as stressful, it is essential that we use effective coping strategies to manage our stress. **Coping** refers to mental and behavioural efforts that we use to deal with problems relating to stress.

Coping Styles

Lazarus and Folkman (1984) distinguished two fundamental kinds of coping: problem-focused coping and emotion-focused coping. In problem-focused coping, one attempts to manage or alter the problem that is causing one to experience stress (i.e., the stressor). Problem-focused coping strategies are similar to strategies used in everyday problem-solving: they typically involve identifying the problem, considering possible solutions, weighing the costs and benefits of these solutions, and then selecting an alternative (Lazarus & Folkman, 1984). As an example, suppose Darby receives a midterm notice that they are failing statistics class. If Darby adopts a problem-focused coping approach to managing their stress, they would be proactive in trying to alleviate the source of the stress. Darby might contact their professor to discuss what must be done to raise their grade, they might also decide to set aside two hours daily to study statistics assignments, and they may seek tutoring assistance. A problem-focused approach to managing stress means we actively try to do things to address the problem.

Emotion-focused coping, in contrast, consists of efforts to change or reduce the negative emotions associated with stress. These efforts may include avoiding, minimizing, or distancing oneself from the problem, or positive comparisons with others ("I'm not as bad off as they are"), or seeking something positive in a negative event ("Now that I've been fired, I can sleep in for a few days"). In some cases, emotion-focused coping strategies involve reappraisal, whereby the stressor is construed differently (and somewhat self-deceptively) without changing its objective level of threat (Lazarus & Folkman, 1984). For example, a person sentenced to federal prison who thinks, "This will give me a great chance to network with others," is using reappraisal. If Darby adopted an emotion-focused approach to managing their midterm deficiency stress, they might watch a comedy movie, play video games, or spend hours on social media to take their mind off the situation. In a certain sense, emotion-focused coping can be thought of as treating the symptoms rather than the actual cause.

While many stressors elicit both kinds of coping strategies, problem-focused coping is more likely to occur when encountering stressors we perceive as controllable, while emotion-focused coping is more likely to predominate when faced with stressors that we believe we are powerless to change (Folkman & Lazarus, 1980). Clearly, emotion-focused coping is more effective in dealing with uncontrollable stressors. For example, the stress you experience when a loved one dies can be overwhelming. You are simply powerless to change the

situation as there is nothing you can do to bring this person back. The most helpful coping response is emotion-focused coping aimed at minimizing the pain of the grieving period.

Fortunately, most stressors we encounter can be modified and are, to varying degrees, controllable. A person who cannot stand their job can quit and look for work elsewhere; a middle-aged divorcee can find another potential partner; the freshman who fails an exam can study harder next time, and a breast lump does not necessarily mean that one is fated to die of breast cancer.

Control and Stress

The desire and ability to predict events, make decisions, and affect outcomes—that is, to enact control in our lives—is a basic tenet of human behaviour (Everly & Lating, 2002). Albert Bandura (1997) stated that "the intensity and chronicity of human stress is governed largely by perceived control over the demands of one's life" (p. 262). As cogently described in his statement, our reaction to potential stressors depends to a large extent on how much control we feel we have over such things. **Perceived control** is our beliefs about our personal capacity to exert influence over and shape outcomes, and it has major implications for our health and happiness (Infurna & Gerstorf, 2014). Extensive research has demonstrated that perceptions of personal control are associated with a variety of favourable outcomes, such as better

physical and mental health and greater psychological well-being (Diehl & Hay, 2010). Greater personal control is also associated with lower reactivity to stressors in daily life. For example, researchers in one investigation found that higher levels of perceived control at one point in time were later associated with lower emotional and physical reactivity to interpersonal stressors (Neupert, Almeida, & Charles, 2007). Further, a daily diary study with 34 older widows found that their stress and anxiety levels were significantly reduced on days during which the widows felt greater perceived control (Ong, Bergeman, & Bisconti, 2005).

Dig Deeper

Learned Helplessness

When we lack a sense of control over the events in our lives, particularly when those events are threatening, harmful, or noxious, the psychological consequences can be profound. In one of the better illustrations of this concept, psychologist Martin Seligman conducted a series of classic experiments

in the 1960s (Seligman & Maier, 1967) in which dogs were placed in a chamber where they received electric shocks from which they could not escape. Later, when these dogs were given the opportunity to escape the shocks by jumping across a partition, most failed to even try; they seemed to just give up and passively accept any shocks the experimenters chose to administer. In comparison, dogs who were previously allowed to escape the shocks tended to jump the partition and escape the pain (Figure SH.20).

Figure SH.20 Seligman's learned helplessness experiments with dogs used an apparatus that measured when the animals would move from a floor delivering shocks to one without.

Seligman believed that the dogs who failed to try to

escape the later shocks were demonstrating learned helplessness: They had acquired a belief that they were powerless to do anything about the stimulation they were receiving. Seligman also believed that the passivity and lack of initiative these dogs demonstrated was similar to that observed in human depression. Therefore, Seligman speculated that learned helplessness might be an important cause of depression in humans: Humans who experience negative life events that they believe they are unable to control may become helpless. As a result, they give up trying to change the situation and some may become depressed and show lack of initiative in future situations in which they can control the outcomes (Seligman, Maier, & Geer, 1968). Sadly, learned helplessness was later used to justify the torture of prisoners by U.S. military personnel following the 2001 attacks on the World Trade Center. The hypothesis was that detainees who were subjected to uncontrollable afflictions would eventually become passive and compliant, making them more likely to reveal information to their interrogators. There is little evidence that the program achieved worthwhile results. It is now widely regarded as unethical and unjustified. This example emphasizes the need to

consistently consider the ethics of research studies and their applications (Konnikova, 2015).

Seligman and colleagues later reformulated the original learned helplessness model of depression (Abramson, Seligman, & Teasdale, 1978). In their reformulation, they emphasized attributions (i.e., a mental explanation for why something occurred) that fostered a sense of learned helplessness. For example, suppose a coworker shows up late to work; your belief as to what caused the coworker's tardiness would be an attribution (e.g., too much traffic, slept too late, or just doesn't care about being on time).

The reformulated version of Seligman's study holds that the attributions made for negative life events contribute to depression. Consider the example of a student who performs poorly on a midterm exam. This model suggests that the student will make three kinds of attributions for this outcome: internal vs. external (believing the outcome was caused by his own personal inadequacies or by environmental factors), stable vs. unstable (believing the cause can be changed or is permanent), and global vs. specific (believing the outcome is a sign of inadequacy in most everything versus just this area). Assume that

the student makes an internal ("I'm just not smart"), stable ("Nothing can be done to change the fact that I'm not smart") and global ("This is another example of how lousy I am at everything") attribution for the poor performance. The reformulated theory predicts that the student would perceive a lack of control over this stressful event and thus be especially prone to developing depression. Indeed, research has demonstrated that people who have a tendency to make internal, global, and stable attributions for bad outcomes tend to develop symptoms of depression when faced with negative life experiences (Peterson & Seligman, 1984). Fortunately, attribution habits can be changed through practice. Training in healthy attribution habits has been shown to make people less vulnerable to depression (Konnikova, 2015).

Seligman's learned helplessness model has emerged over the years as a leading theoretical explanation for the onset of major depressive disorder. When you study psychological disorders, you will learn more about the latest reformulation of this model—now called hopelessness theory.

People who report higher levels of perceived control view their health as controllable, thereby making it more likely that they

will better manage their health and engage in behaviours conducive to good health (Bandura, 2004). Not surprisingly, greater perceived control has been linked to lower risk of physical health problems, including declines in physical functioning (Infurna, Gerstorf, Ram, Schupp, & Wagner, 2011), heart attacks (Rosengren et al., 2004), and both cardiovascular disease incidence (Stürmer, Hasselbach, & Amelang, 2006) and mortality from cardiac disease (Surtees et al., 2010). In addition, longitudinal studies of British civil servants have found that those in low-status jobs (e.g., clerical and office support staff) in which the degree of control over the job is minimal are considerably more likely to develop heart disease than those with high-status jobs or considerable control over their jobs (Marmot, Bosma, Hemingway, & Stansfeld, 1997).

The link between perceived control and health may provide an explanation for the frequently observed relationship between social class and health outcomes (Kraus, Piff, Mendoza-Denton, Rheinschmidt, & Keltner, 2012). In general, research has found that more affluent individuals experience better health partly because they tend to believe that they can personally control and manage their reactions to life's stressors (Johnson & Krueger, 2006). Perhaps buoyed by the perceived level of control, individuals of higher social class may be prone to overestimating the degree of influence they have over particular outcomes. For example, those of higher social class tend to believe that their votes have greater sway on

election outcomes than do those of lower social class, which may explain higher rates of voting in more affluent communities (Krosnick, 1990). Other research has found that a sense of perceived control can protect less affluent individuals from poorer health, depression, and reduced life-satisfaction—all of which tend to accompany lower social standing (Lachman & Weaver, 1998).

Taken together, findings from these and many other studies clearly suggest that perceptions of control and coping abilities are important in managing and coping with the stressors we encounter throughout life.

Social Support

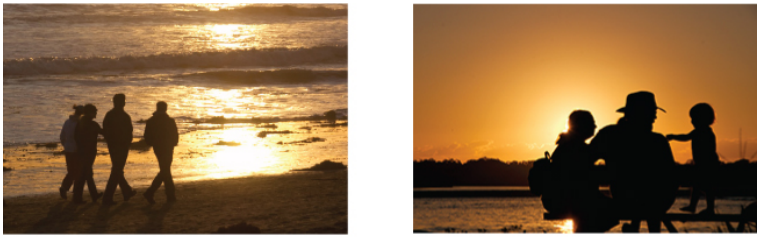
The need to form and maintain strong, stable relationships with others is a powerful, pervasive, and fundamental human motive (Baumeister & Leary, 1995). Building strong interpersonal relationships with others helps us establish a network of close, caring individuals who can provide social support in times of distress, sorrow, and fear. **Social support** can be thought of as the soothing impact of friends, family, and acquaintances (Baron & Kerr, 2003). Social support can take many forms, including advice, guidance, encouragement, acceptance, emotional comfort, and tangible assistance (such as financial help). Thus, other people can be very comforting to us when we are faced with a wide range of life stressors, and they can be extremely helpful in our efforts to manage these

challenges. Even in nonhuman animals, species mates can offer social support during times of stress. For example, elephants seem to be able to sense when other elephants are stressed and will often comfort them with physical contact—such as a trunk touch—or an empathetic vocal response (Krumboltz, 2014).

Scientific interest in the importance of social support first emerged in the 1970s when health researchers developed an interest in the health consequences of being socially integrated (Stroebe & Stroebe, 1996). Interest was further fuelled by longitudinal studies showing that social connectedness reduced mortality. In one classic study, nearly 7,000 Alameda County, California, residents were followed over 9 years. Those who had previously indicated that they lacked social and community ties were more likely to die during the follow-up period than those with more extensive social networks. Compared to those with the most social contacts, isolated men and women were, respectively, 2.3 and 2.8 times more likely to die. These trends persisted even after controlling for a variety of health-related variables, such as smoking, alcohol consumption, self-reported health at the beginning of the study, and physical activity (Berkman & Syme, 1979).

Since the time of that study, social support has emerged as one of the well-documented psychosocial factors affecting health outcomes (Uchino, 2009). A statistical review of 148 studies conducted between 1982 and 2007 involving over 300,000 participants concluded that individuals with stronger

social relationships have a 50% greater likelihood of survival compared to those with weak or insufficient social relationships (Holt-Lunstad, Smith, & Layton, 2010). According to the researchers, the magnitude of the effect of social support observed in this study is comparable with quitting smoking and exceeded many well-known risk factors for mortality, such as obesity and physical inactivity (Figure SH.21).



(a) (b)

Figure SH.21 Close relationships with others, whether (a) a group of friends or (b) a family circle, provide more than happiness and fulfillment—they can help foster good health. (credit a: modification of work by "Damian Gadal_Flickr"/Flickr; credit b: modification of work by Christian Haugen)

A number of large-scale studies have found that individuals with low levels of social support are at greater risk of mortality, especially from cardiovascular disorders (Brummett et al., 2001). Further, higher levels of social supported have been linked to better survival rates following breast cancer (Falagas et al., 2007) and infectious diseases, especially HIV infection (Lee & Rotheram-Borus, 2001). In fact, a person

with high levels of social support is less likely to contract a common cold. In one study, 334 participants completed questionnaires assessing their sociability; these individuals were subsequently exposed to a virus that causes a common cold and monitored for several weeks to see who became ill. Results showed that increased sociability was linearly associated with a decreased probability of developing a cold (Cohen, Doyle, Turner, Alper, & Skoner, 2003).

For many of us, friends are a vital source of social support. But what if you find yourself in a situation in which you have few friends and companions? Many students who leave home to attend and live at college experience drastic reductions in their social support, which makes them vulnerable to anxiety, depression, and loneliness. Social media can sometimes be useful in navigating these transitions (Raney & Troop Gordon, 2012) but might also cause increases in loneliness (Hunt, Marx, Lipson, & Young, 2018). For this reason, many colleges have designed first-year programs, such as peer mentoring (Raymond & Shepard, 2018), that can help students build new social networks. For some people, our families—especially our parents—are a major source of social support.

Social support appears to work by boosting the immune system, especially among people who are experiencing stress (Uchino, Vaughn, Carlisle, & Birmingham, 2012). In a pioneering study, spouses of cancer patients who reported high

levels of social support showed indications of better immune functioning on two out of three immune functioning measures, compared to spouses who were below the median on reported social support (Baron, Cutrona, Hicklin, Russell, & Lubaroff, 1990). Studies of other populations have produced similar results, including those of spousal caregivers of dementia sufferers, medical students, elderly adults, and cancer patients (Cohen & Herbert, 1996; Kiecolt-Glaser, McGuire, Robles, & Glaser, 2002).

In addition, social support has been shown to reduce blood pressure for people performing stressful tasks, such as giving a speech or performing mental arithmetic (Lepore, 1998). In these kinds of studies, participants are usually asked to perform a stressful task either alone, with a stranger present (who may be either supportive or unsupportive), or with a friend present. Those tested with a friend present generally exhibit lower blood pressure than those tested alone or with a stranger (Fontana, Diegnan, Villeneuve, & Lepore, 1999). In one study, 112 female participants who performed stressful mental arithmetic exhibited lower blood pressure when they received support from a friend rather than a stranger, but only if the friend was a male (Phillips, Gallagher, & Carroll, 2009). Although these findings are somewhat difficult to interpret, the authors mention that it is possible that females feel less supported and more evaluated by other females, particularly females whose opinions they value.

Taken together, the findings above suggest one of the

reasons social support is connected to favourable health outcomes is because it has several beneficial physiological effects in stressful situations. However, it is also important to consider the possibility that social support may lead to better health behaviours, such as a healthy diet, exercising, smoking cessation, and cooperation with medical regimens (Uchino, 2009).

Stress Reduction Techniques

Beyond having a sense of control and establishing social support networks, there are numerous other means by which we can manage stress (Figure SH.22). A common technique people use to combat stress is exercise (Salmon, 2001). It is well-established that exercise, both of long (aerobic) and short (anaerobic) duration, is beneficial for both physical and mental health (Everly & Lating, 2002). There is considerable evidence that physically fit individuals are more resistant to the adverse effects of stress and recover more quickly from stress than less physically fit individuals (Cotton, 1990). In a study of more than 500 Swiss police officers and emergency service personnel, increased physical fitness was associated with reduced stress, and regular exercise was reported to protect against stress-related health problems (Gerber, Kellman, Hartman, & Pühse, 2010).

(a) (b) (c)

Figure SH.22 Stress reduction techniques may include (a) exercise, (b) meditation and relaxation, or (c) biofeedback. (credit a: modification of work by "UNE Photos"/Flickr; credit b: modification of work by Caleb Roenigk; credit c: modification of work by Dr. Carmen Russoniello)

One reason exercise may be beneficial is because it might buffer some of the deleterious physiological mechanisms of stress. One study found rats that exercised for six weeks showed a decrease in hypothalamic-pituitary-adrenal responsiveness to mild stressors (Campeau et al., 2010). In high-stress humans, exercise has been shown to prevent telomere shortening, which may explain the common observation of a youthful appearance among those who exercise regularly (Puterman et al., 2010). Further, exercise in later adulthood appears to minimize the detrimental effects of stress on the hippocampus and memory (Head, Singh, & Bugg, 2012). Among cancer survivors, exercise has been shown to reduce anxiety (Speck, Courneya, Masse, Duval, & Schmitz, 2010) and depressive symptoms (Craft, VanIterson, Helenowski, Rademaker, & Courneya, 2012). Clearly, exercise is a highly effective tool for regulating stress.

In the 1970s, Herbert Benson, a cardiologist, developed a stress

reduction method called the relaxation response technique (Greenberg, 2006). The relaxation response technique combines relaxation with transcendental meditation, and consists of four components (Stein, 2001):

1. sitting upright on a comfortable chair with feet on the ground and body in a relaxed position,
2. being in a quiet environment with eyes closed,
3. repeating a word or a phrase—a mantra—to oneself, such as "alert mind, calm body,"
4. passively allowing the mind to focus on pleasant thoughts, such as nature or the warmth of your blood nourishing your body.

The relaxation response approach is conceptualized as a general approach to stress reduction that reduces sympathetic arousal, and it has been used effectively to treat people with high blood pressure (Benson & Proctor, 1994).

Another technique to combat stress, **biofeedback**, was developed by Gary Schwartz at Harvard University in the early 1970s. Biofeedback is a technique that uses electronic equipment to accurately measure a person's neuromuscular and autonomic activity—feedback is provided in the form of visual or auditory signals. The main assumption of this approach is that providing somebody biofeedback will enable the individual to develop strategies that help gain some level of

voluntary control over what are normally involuntary bodily processes (Schwartz & Schwartz, 1995). A number of different bodily measures have been used in biofeedback research, including facial muscle movement, brain activity, and skin temperature, and it has been applied successfully with individuals experiencing tension headaches, high blood pressure, asthma, and phobias (Stein, 2001).

125.

THE PURSUIT OF HAPPINESS

Learning Objectives

By the end of this section, you will be able to:

- Define and discuss happiness, including its determinants
- Describe the field of positive psychology and identify the kinds of problems it addresses
- Explain the meaning of positive affect and discuss its importance in health outcomes
- Describe the concept of flow and its relationship to happiness and fulfillment

Although the study of stress and how it affects us physically and psychologically is fascinating, it is—admittedly—somewhat of a grim topic. Psychology is also interested in the study of a more upbeat and encouraging approach to human affairs—the quest for happiness.

Happiness

America's founders declared that its citizens have an unalienable right to pursue happiness. But what is happiness? When asked to define the term, people emphasize different aspects of this elusive state. Indeed, happiness is somewhat ambiguous and can be defined from different perspectives (Martin, 2012). Some people, especially those who are highly committed to their religious faith, view happiness in ways that emphasize virtuosity, reverence, and enlightened spirituality. Others see happiness as primarily contentment—the inner peace and joy that come from deep satisfaction with one's surroundings, relationships with others, accomplishments, and oneself. Still others view happiness mainly as pleasurable engagement with their personal environment—having a career and hobbies that are engaging, meaningful, rewarding, and exciting. These differences, of course, are merely differences in emphasis. Most people would probably agree that each of these views, in some respects, captures the essence of happiness.

Elements of Happiness

Some psychologists have suggested that happiness consists of three distinct elements: the pleasant life, the good life, and the meaningful life, as shown in Figure SH.23 (Seligman, 2002; Seligman, Steen, Park, & Peterson, 2005). The pleasant life is realized through the attainment of day-to-day pleasures that add fun, joy, and excitement to our lives. For example, evening walks along the beach and a fulfilling sex life can enhance our daily pleasure and contribute to the pleasant life. The good life is achieved through identifying our unique skills and abilities and engaging these talents to enrich our lives; those who achieve the good life often find themselves absorbed in their work or their recreational pursuits. The meaningful life involves a deep sense of fulfillment that comes from using our talents in the service of the greater good: in ways that benefit the lives of others or that make the world a better place. In general, the happiest people tend to be those who pursue the full life—they orient their pursuits toward all three elements (Seligman et al., 2005).

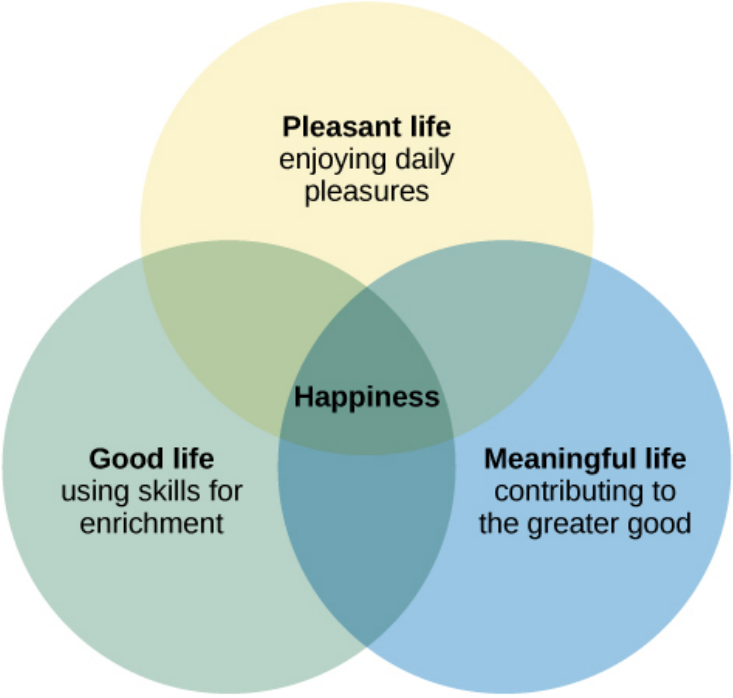


Figure SH.23 Happiness is an enduring state of well-being involving satisfaction in the pleasant, good, and meaningful aspects of life.

For practical purposes, a precise definition of **happiness** might incorporate each of these elements: an enduring state of mind consisting of joy, contentment, and other positive emotions, plus the sense that one's life has meaning and value (Lyubomirsky, 2001). The definition implies that happiness is a long-term state—what is often characterized as subjective well-being—rather than merely a transient positive mood we all experience from time to time.

It is this enduring happiness that has captured the interests of psychologists and other social scientists.

The study of happiness has grown dramatically in the last three decades (Diener, 2013). One of the most basic questions that happiness investigators routinely examine is this: How happy are people in general? The average person in the world tends to be relatively happy and tends to indicate experiencing more positive feelings than negative feelings (Diener, Ng, Harter, & Arora, 2010). When asked to evaluate their current lives on a scale ranging from 0 to 10 (with 0 representing "worst possible life" and 10 representing "best possible life"), people in more than 150 countries surveyed from 2010–2012 reported an average score of 5.2. People who live in North America, Australia, and New Zealand reported the highest average score at 7.1, whereas those living Sub-Saharan Africa reported the lowest average score at 4.6 (Helliwell, Layard, & Sachs, 2013). Worldwide, the five happiest countries are Denmark, Norway, Switzerland, the Netherlands, and Sweden; the United States is ranked 17th happiest (Figure SH.24) (Helliwell et al., 2013).

(a)

(b)

Figure SH.24 (a) Surveys of residents in over 150 countries indicate that Denmark has the happiest citizens in the world. (b) Americans ranked the United States as the 17th happiest country in which to live. (credit a: modification of work by "JamesZ_Flickr"/Flickr; credit b: modification of work by Ryan Swindell)

Several years ago, a Gallup survey of more than 1,000 U.S. adults found that 52% reported that they were "very happy." In addition, more than 8 in 10 indicated that they were "very satisfied" with their lives (Carroll, 2007). However, a recent poll found that only 42% of American adults report being "very happy." The groups that show the greatest declines in happiness are people of colour, those who have not completed a college education, and those who politically identify as Democrats or independents (McCarthy, 2020). These results suggest that challenging economic conditions may be related to declines in happiness. Of course, this interpretation implies that happiness is closely tied to one's finances. But, is it? What factors influence happiness?

Factors Connected to Happiness

What really makes people happy? What factors contribute to sustained joy and contentment? Is it money, attractiveness, material possessions, a rewarding occupation, a satisfying relationship? Extensive research over the years has examined this question. One finding is that age is related to happiness: Life satisfaction usually increases the older people get, but there do not appear to be gender differences in happiness (Diener, Suh, Lucas, & Smith, 1999). Although it is important to point out that much of this work has been correlational, many of the key findings (some of which may surprise you) are summarized below.

Family and other social relationships appear to be key factors correlated with happiness. Studies show that married people report being happier than those who are single, divorced, or widowed (Diener et al., 1999). Happy individuals also report that their marriages are fulfilling (Lyubomirsky, King, & Diener, 2005). In fact, some have suggested that satisfaction with marriage and family life is the strongest predictor of happiness (Myers, 2000). Happy people tend to have more friends, more high-quality social relationships, and stronger social support networks than less happy people (Lyubomirsky et al., 2005). Happy people also have a high frequency of contact with friends (Pinquart & Sörensen, 2000).

Can money buy happiness? In general, extensive research

suggests that the answer is yes, but with several caveats. While a nation's per capita gross domestic product (GDP) is associated with happiness levels (Helliwell et al., 2013), changes in GDP (which is a less certain index of household income) bear little relationship to changes in happiness (Diener, Tay, & Oishi, 2013). On the whole, residents of affluent countries tend to be happier than residents of poor countries; within countries, wealthy individuals are happier than poor individuals, but the association is much weaker (Diener & Biswas-Diener, 2002). To the extent that it leads to increases in purchasing power, increases in income are associated with increases in happiness (Diener, Oishi, & Ryan, 2013). However, income within societies appears to correlate with happiness only up to a point. In a study of over 450,000 U.S. residents surveyed by the Gallup Organization, Kahneman and Deaton (2010) found that well-being rises with annual income, but only up to $75,000. The average increase in reported well-being for people with incomes greater than $75,000 was null. As implausible as these findings might seem—after all, higher incomes would enable people to indulge in Hawaiian vacations, prime seats as sporting events, expensive automobiles, and expansive new homes—higher incomes may impair people's ability to savour and enjoy the small pleasures of life (Kahneman, 2011). Indeed, researchers in one study found that participants exposed to a subliminal reminder of wealth spent less time savouring a chocolate candy bar and exhibited less enjoyment of this experience than did

participants who were not reminded of wealth (Quoidbach, Dunn, Petrides, & Mikolajczak, 2010).

What about education and employment? Happy people, compared to those who are less happy, are more likely to graduate from college and secure more meaningful and engaging jobs. Once they obtain a job, they are also more likely to succeed (Lyubomirsky et al., 2005). While education shows a positive (but weak) correlation with happiness, intelligence is not appreciably related to happiness (Diener et al., 1999).

Does religiosity correlate with happiness? In general, the answer is yes (Hackney & Sanders, 2003). However, the relationship between religiosity and happiness depends on societal circumstances. Nations and states with more difficult living conditions (e.g., widespread hunger and low life expectancy) tend to be more highly religious than societies with more favourable living conditions. Among those who live in nations with difficult living conditions, religiosity is associated with greater well-being; in nations with more favourable living conditions, religious and nonreligious individuals report similar levels of well-being (Diener, Tay, & Myers, 2011).

Clearly the living conditions of one's nation can influence factors related to happiness. What about the influence of one's culture? To the extent that people possess characteristics that are highly valued by their culture, they tend to be happier (Diener, 2012). For example, self-esteem is a stronger predictor of life satisfaction in individualistic cultures than in

collectivistic cultures (Diener, Diener, & Diener, 1995), and extraverted people tend to be happier in extraverted cultures than in introverted cultures (Fulmer et al., 2010).

So we've identified many factors that exhibit some correlation to happiness. What factors don't show a correlation? Researchers have studied both parenthood and physical attractiveness as potential contributors to happiness, but no link has been identified. Although people tend to believe that parenthood is central to a meaningful and fulfilling life, aggregate findings from a range of countries indicate that people who do not have children are generally happier than those who do (Hansen, 2012). And although one's perceived level of attractiveness seems to predict happiness, a person's objective physical attractiveness is only weakly correlated with their happiness (Diener, Wolsic, & Fujita, 1995).

Life Events and Happiness

An important point should be considered regarding happiness. People are often poor at affective forecasting: predicting the intensity and duration of their future emotions (Wilson & Gilbert, 2003). In one study, nearly all newlywed spouses predicted their marital satisfaction would remain stable or improve over the following four years; despite this high level of initial optimism, their marital satisfaction actually declined during this period (Lavner, Karner, & Bradbury, 2013). In addition, we are often incorrect when estimating

how our long-term happiness would change for the better or worse in response to certain life events. For example, it is easy for many of us to imagine how euphoric we would feel if we won the lottery, were asked on a date by an attractive celebrity, or were offered our dream job. It is also easy to understand how long-suffering fans of the Chicago Cubs baseball team, which had not won a World Series championship since 1908, thought they would feel permanently elated when their team finally won another World Series in 2016. Likewise, it is easy to predict that we would feel permanently miserable if we suffered a disabling accident or if a romantic relationship ended.

However, something similar to sensory adaptation often occurs when people experience emotional reactions to life events. In much the same way our senses adapt to changes in stimulation (e.g., our eyes adapting to bright light after walking out of the darkness of a movie theatre into the bright afternoon sun), we eventually adapt to changing emotional circumstances in our lives (Brickman & Campbell, 1971; Helson, 1964). When an event that provokes positive or negative emotions occurs, at first we tend to experience its emotional impact at full intensity. We feel a burst of pleasure following such things as a marriage proposal, birth of a child, acceptance to law school, an inheritance, and the like; as you might imagine, lottery winners experience a surge of happiness after hitting the jackpot (Lutter, 2007). Likewise, we experience a surge of misery following the death of a loved one,

a divorce, or a layoff from work. In the long run, however, we eventually adjust to the emotional new normal; the emotional impact of the event tends to erode, and we eventually revert to our original baseline happiness levels. Thus, what was at first a thrilling lottery windfall or World Series championship eventually loses its lustre and becomes the status quo (Figure SH.25). Indeed, dramatic life events have much less long-lasting impact on happiness than might be expected (Brickman, Coats, & Janoff-Bulman, 1978).

(a)

(b)

Figure SH.25 (a) Long-suffering Chicago Cub fans felt elated in 2016 when their team won a World Series championship, a feat that had not been accomplished by that franchise in over a century. (b) In ways that are similar, those who play the lottery rightfully think that choosing the correct numbers and winning millions would lead to a surge in happiness. However, the initial burst of elation following such elusive events would most likely erode with time. (credit a: modification of work by Phil Roeder; credit b: modification of work by Robert S. Donovan)

Recently, some have raised questions concerning the extent to which important life events can permanently alter people's

happiness set points (Diener, Lucas, & Scollon, 2006). Evidence from a number of investigations suggests that, in some circumstances, happiness levels do not revert to their original positions. For example, although people generally tend to adapt to marriage so that it no longer makes them happier or unhappier than before, they often do not fully adapt to unemployment or severe disabilities (Diener, 2012). Figure SH.26, which is based on longitudinal data from a sample of over 3,000 German respondents, shows life satisfaction scores several years before, during, and after various life events, and it illustrates how people adapt (or fail to adapt) to these events. German respondents did not get lasting emotional boosts from marriage; instead, they reported brief increases in happiness, followed by quick adaptation. In contrast, widows and those who had been laid off experienced sizeable decreases in happiness that appeared to result in long-term changes in life satisfaction (Diener et al., 2006). Further, longitudinal data from the same sample showed that happiness levels changed significantly over time for nearly a quarter of respondents, with 9% showing major changes (Fujita & Diener, 2005). Thus, long-term happiness levels can and do change for some people.

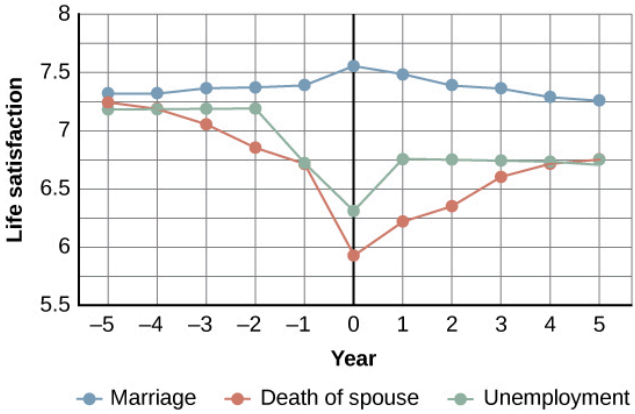


Figure SH.26 This graphs shows life satisfaction scores several years before and after three significant life events (0 represents the year the event happened) (Diener et al., 2006).

Increasing Happiness

Some recent findings about happiness provide an optimistic picture, suggesting that real changes in happiness are possible. For example, thoughtfully developed well-being interventions designed to augment people's baseline levels of happiness may increase happiness in ways that are permanent and long-lasting, not just temporary. These changes in happiness may be targeted at individual, organizational, and societal levels (Diener et al., 2006). Researchers in one study found that a series of happiness interventions involving such exercises as writing down three good things that occurred each day led to increases in happiness that lasted over six months (Seligman et al., 2005).

Measuring happiness and well-being at the societal level over time may assist policy makers in determining if people are generally happy or miserable, as well as when and why they might feel the way they do. Studies show that average national happiness scores (over time and across countries) relate strongly to six key variables: per capita gross domestic product (GDP, which reflects a nation's economic standard of living), social support, freedom to make important life choices, healthy life expectancy, freedom from perceived corruption in government and business, and generosity (Helliwell et al., 2013). Investigating why people are happy or unhappy might help policymakers develop programs that increase happiness and well-being within a society (Diener et al., 2006). Resolutions about contemporary political and social issues that are frequent topics of debate—such as poverty, taxation, affordable health care and housing, clean air and water, and income inequality—might be best considered with people's happiness in mind.

Positive Psychology

In 1998, Seligman (the same person who conducted the learned helplessness experiments mentioned earlier), who was then president of the American Psychological Association, urged psychologists to focus more on understanding how to build human strength and psychological well-being. In deliberately setting out to create a new direction and new

orientation for psychology, Seligman helped establish a growing movement and field of research called positive psychology (Compton, 2005). In a very general sense, **positive psychology** can be thought of as the science of happiness; it is an area of study that seeks to identify and promote those qualities that lead to greater fulfillment in our lives. This field looks at people's strengths and what helps individuals to lead happy, contented lives, and it moves away from focusing on people's pathology, faults, and problems. According to Seligman and Csikszentmihalyi (2000), positive psychology:

> "...at the subjective level is about valued subjective experiences: well-being, contentment, and satisfaction (in the past); hope and optimism (for the future); and... happiness (in the present). At the individual level, it is about positive individual traits: the capacity for love and vocation, courage, interpersonal skill, aesthetic sensibility, perseverance, forgiveness, originality, future mindedness, spirituality, high talent, and wisdom." (p. 5)

Some of the topics studied by positive psychologists include altruism and empathy, creativity, forgiveness and compassion, the importance of positive emotions, enhancement of immune system functioning, savoUring the fleeting moments of life, and strengthening virtues as a way to increase authentic happiness (Compton, 2005). Recent efforts in the field of positive psychology have focused on extending its principles toward peace and well-being at the level of the global community. In a war-torn world in which conflict, hatred,

and distrust are common, such an extended "positive peace psychology" could have important implications for understanding how to overcome oppression and work toward global peace (Cohrs, Christie, White, & Das, 2013).

Positive Affect and Optimism

Taking a cue from positive psychology, extensive research over the last 10-15 years has examined the importance of positive psychological attributes in physical well-being. Qualities that help promote psychological well-being (e.g., having meaning and purpose in life, a sense of autonomy, positive emotions, and satisfaction with life) are linked with a range of favourable health outcomes (especially improved cardiovascular health) mainly through their relationships with biological functions and health behaviours (such as diet, physical activity, and sleep quality) (Boehm & Kubzansky, 2012). The quality that has received attention is **positive affect**, which refers to pleasurable engagement with the environment, such as happiness, joy, enthusiasm, alertness, and excitement (Watson, Clark, & Tellegen, 1988). The characteristics of positive affect, as with negative affect (discussed earlier), can be brief, long-lasting, or trait-like (Pressman & Cohen, 2005). Independent of age, gender, and income, positive affect is associated with greater social connectedness, emotional and practical support, adaptive coping efforts, and lower depression; it is also associated with longevity and favourable physiological functioning (Steptoe, O'Donnell, Marmot, & Wardle, 2008).

Positive affect also serves as a protective factor against heart disease. In a 10-year study of Nova Scotians, the rate of heart disease was 22% lower for each one-point increase on the measure of positive affect, from 1 (no positive affect expressed) to 5 (extreme positive affect) (Davidson, Mostofsky, & Whang, 2010). In terms of our health, the expression, "don't worry, be happy" is helpful advice indeed. There has also been much work suggesting that **optimism**—the general tendency to look on the bright side of things—is also a significant predictor of positive health outcomes.

Although positive affect and optimism are related in some ways, they are not the same (Pressman & Cohen, 2005). Whereas positive affect is mostly concerned with positive feeling states, optimism has been regarded as a generalized tendency to expect that good things will happen (Chang, 2001). It has also been conceptualized as a tendency to view life's stressors and difficulties as temporary and external to oneself (Peterson & Steen, 2002). Numerous studies over the years have consistently shown that optimism is linked to longevity, healthier behaviours, fewer post-surgical complications, better immune functioning among men with prostate cancer, and better treatment adherence (Rasmussen & Wallio, 2008). Further, optimistic people report fewer physical symptoms, less pain, better physical functioning, and are less likely to be rehospitalized following heart surgery (Rasmussen, Scheier, & Greenhouse, 2009).

Flow

Another factor that seems to be important in fostering a deep sense of well-being is the ability to derive flow from the things we do in life. **Flow** is described as a particular experience that is so engaging and engrossing that it becomes worth doing for its own sake (Csikszentmihalyi, 1997). It is usually related to creative endeavours and leisure activities, but it can also be experienced by workers who like their jobs or students who love studying (Csikszentmihalyi, 1999). Many of us instantly recognize the notion of flow. In fact, the term derived from respondents' spontaneous use of the term when asked to describe how it felt when what they were doing was going well. When people experience flow, they become involved in an activity to the point where they feel they lose themselves in the activity. They effortlessly maintain their concentration and focus, they feel as though they have complete control of their actions, and time seems to pass more quickly than usual (Csikszentmihalyi, 1997). Flow is considered a pleasurable experience, and it typically occurs when people are engaged in challenging activities that require skills and knowledge they know they possess. For example, people would be more likely report flow experiences in relation to their work or hobbies than in relation to eating. When asked the question, "Do you ever get involved in something so deeply that nothing else seems to matter, and you lose track of time?" about 20% of

Americans and Europeans report having these flow-like experiences regularly (Csikszentmihalyi, 1997).

Although wealth and material possessions are nice to have, the notion of flow suggests that neither are prerequisites for a happy and fulfilling life. Finding an activity that you are truly enthusiastic about, something so absorbing that doing it is reward itself (whether it be playing tennis, studying Arabic, writing children's novels, or cooking lavish meals) is perhaps the real key. According to Csikszentmihalyi (1999), creating conditions that make flow experiences possible should be a top social and political priority. How might this goal be achieved? How might flow be promoted in school systems? In the workplace? What potential benefits might be accrued from such efforts?

In an ideal world, scientific research endeavours should inform us on how to bring about a better world for all people. The field of positive psychology promises to be instrumental in helping us understand what truly builds hope, optimism, happiness, healthy relationships, flow, and genuine personal fulfillment.

126.

KEY TERMS FOR STRESS & HEALTH

alarm reaction

first stage of the general adaptation syndrome; characterized as the body's immediate physiological reaction to a threatening situation or some other emergency; analogous to the fight-or-flight response

asthma

psychophysiological disorder in which the airways of the respiratory system become obstructed, leading to great difficulty expelling air from the lungs

biofeedback

stress-reduction technique using electronic equipment to measure a person's involuntary (neuromuscular and autonomic) activity and provide feedback to help the person gain a level of voluntary control over these processes

cardiovascular disorders

disorders that involve the heart and blood circulation system

coping

mental or behavioural efforts used to manage problems relating to stress, including its cause and the unpleasant feelings and emotions it produces

cortisol

stress hormone released by the adrenal glands when encountering a stressor; helps to provide a boost of energy, thereby preparing the individual to take action

daily hassles

minor irritations and annoyances that are part of our everyday lives and are capable of producing stress

distress

bad form of stress; usually high in intensity; often leads to exhaustion, fatigue, feeling burned out; associated with erosions in performance and health

eustress

good form of stress; low to moderate in intensity; associated with positive feelings, as well as optimal health and performance

fight-or-flight response

set of physiological reactions (increases in blood pressure, heart rate, respiration rate, and sweat) that occur when an individual encounters a perceived threat; these reactions are produced by activation of the sympathetic nervous system and the endocrine system

flow

state involving intense engagement in an activity; usually

is experienced when participating in creative, work, and leisure endeavours

general adaptation syndrome

Hans Selye's three-stage model of the body's physiological reactions to stress and the process of stress adaptation: alarm reaction, stage of resistance, and stage of exhaustion

happiness

enduring state of mind consisting of joy, contentment, and other positive emotions; the sense that one's life has meaning and value

health psychology

subfield of psychology devoted to studying psychological influences on health, illness, and how people respond when they become ill

heart disease

several types of adverse heart conditions, including those that involve the heart's arteries or valves or those involving the inability of the heart to pump enough blood to meet the body's needs; can include heart attack and stroke

hypertension

high blood pressure

hypothalamic-pituitary-adrenal (HPA) axis

set of structures found in both the limbic system (hypothalamus) and the endocrine system (pituitary gland and adrenal glands) that regulate many of the

body's physiological reactions to stress through the release of hormones

immune system

various structures, cells, and mechanisms that protect the body from foreign substances that can damage the body's tissues and organs

immunosuppression

decreased effectiveness of the immune system

job burnout

general sense of emotional exhaustion and cynicism in relation to one's job; consists of three dimensions: exhaustion, depersonalization, and sense of diminished personal accomplishment

job strain

work situation involving the combination of excessive job demands and workload with little decision making latitude or job control

lymphocytes

white blood cells that circulate in the body's fluids and are especially important in the body's immune response

negative affectivity

tendency to experience distressed emotional states involving anger, contempt, disgust, guilt, fear, and nervousness

optimism

tendency toward a positive outlook and positive expectations

perceived control

peoples' beliefs concerning their capacity to influence and shape outcomes in their lives

positive affect

state or a trait that involves pleasurable engagement with the environment, the dimensions of which include happiness, joy, enthusiasm, alertness, and excitement

positive psychology

scientific area of study seeking to identify and promote those qualities that lead to happy, fulfilled, and contented lives

primary appraisal

judgment about the degree of potential harm or threat to well-being that a stressor might entail

psychoneuroimmunology

field that studies how psychological factors (such as stress) influence the immune system and immune functioning

psychophysiological disorders

physical disorders or diseases in which symptoms are brought about or worsened by stress and emotional factors

relaxation response technique

stress reduction technique combining elements of relaxation and meditation

secondary appraisal

judgment of options available to cope with a stressor and

their potential effectiveness

Social Readjustment Rating Scale (SRRS)

popular scale designed to measure stress; consists of 43 potentially stressful events, each of which has a numerical value quantifying how much readjustment is associated with the event

social support

soothing and often beneficial support of others; can take different forms, such as advice, guidance, encouragement, acceptance, emotional comfort, and tangible assistance

stage of exhaustion

third stage of the general adaptation syndrome; the body's ability to resist stress becomes depleted; illness, disease, and even death may occur

stage of resistance

second stage of the general adaptation syndrome; the body adapts to a stressor for a period of time

stress

process whereby an individual perceives and responds to events that one appraises as overwhelming or threatening to one's well-being

stressors

environmental events that may be judged as threatening or demanding; stimuli that initiate the stress process

Type A

psychological and behaviour pattern exhibited by

individuals who tend to be extremely competitive, impatient, rushed, and hostile toward others

Type B

psychological and behaviour pattern exhibited by a person who is relaxed and laid back

127.

SUMMARY FOR STRESS & HEALTH

14.1 What Is Stress?

Stress is a process whereby an individual perceives and responds to events appraised as overwhelming or threatening to one's well-being. The scientific study of how stress and emotional factors impact health and well-being is called health psychology, a field devoted to studying the general impact of psychological factors on health. The body's primary physiological response during stress, the fight-or-flight response, was first identified in the early 20th century by Walter Cannon. The fight-or-flight response involves the coordinated activity of both the sympathetic nervous system and the hypothalamic-pituitary-adrenal (HPA) axis. Hans Selye, a noted endocrinologist, referred to these physiological reactions to stress as part of general adaptation syndrome, which occurs in three stages: alarm reaction (fight-or-flight reactions begin), resistance (the body begins to adapt to continuing stress), and exhaustion (adaptive energy is depleted, and stress begins to take a physical toll).

14.2 Stressors

Stressors can be chronic (long term) or acute (short term), and can include traumatic events, significant life changes, daily hassles, and situations in which people are frequently exposed to challenging and unpleasant events. Many potential stressors include events or situations that require us to make changes in our lives, such as a divorce or moving to a new residence. Thomas Holmes and Richard Rahe developed the Social Readjustment Rating Scale (SRRS) to measure stress by assigning a number of life change units to life events that typically require some adjustment, including positive events. Although the SRRS has been criticized on a number of grounds, extensive research has shown that the accumulation of many LCUs is associated with increased risk of illness. Many potential stressors also include daily hassles, which are minor irritations and annoyances that can build up over time. In addition, jobs that are especially demanding, offer little control over one's working environment, or involve unfavourable working conditions can lead to job strain, thereby setting the stage for job burnout.

14.3 Stress and Illness

Psychophysiological disorders are physical diseases that are either brought about or worsened by stress and other emotional factors. One of the mechanisms through which

stress and emotional factors can influence the development of these diseases is by adversely affecting the body's immune system. A number of studies have demonstrated that stress weakens the functioning of the immune system. Cardiovascular disorders are serious medical conditions that have been consistently shown to be influenced by stress and negative emotions, such as anger, negative affectivity, and depression. Other psychophysiological disorders that are known to be influenced by stress and emotional factors include asthma and tension headaches.

14.4 Regulation of Stress

When faced with stress, people must attempt to manage or cope with it. In general, there are two basic forms of coping: problem-focused coping and emotion-focused coping. Those who use problem-focused coping strategies tend to cope better with stress because these strategies address the source of stress rather than the resulting symptoms. To a large extent, perceived control greatly impacts reaction to stressors and is associated with greater physical and mental well-being. Social support has been demonstrated to be a highly effective buffer against the adverse effects of stress. Extensive research has shown that social support has beneficial physiological effects for people, and it seems to influence immune functioning. However, the beneficial effects of social support may be related to its influence on promoting healthy behaviours.

14.5 The Pursuit of Happiness

Happiness is conceptualized as an enduring state of mind that consists of the capacity to experience pleasure in daily life, as well as the ability to engage one's skills and talents to enrich one's life and the lives of others. Although people around the world generally report that they are happy, there are differences in average happiness levels across nations. Although people have a tendency to overestimate the extent to which their happiness set points would change for the better or for the worse following certain life events, researchers have identified a number of factors that are consistently related to happiness. In recent years, positive psychology has emerged as an area of study seeking to identify and promote qualities that lead to greater happiness and fulfillment in our lives. These components include positive affect, optimism, and flow.

128.

REVIEW QUESTIONS FOR STRESS & HEALTH

Click here for Answer Key

Multiple Choice Questions

1. Negative effects of stress are most likely to be experienced when an event is perceived as _____.

a. negative, but it is likely to affect one's friends rather than oneself
b. challenging
c. confusing
d. threatening, and no clear options for dealing with it are apparent

2. Between 2006 and 2009, the greatest increases in stress levels were found to occur among _____.

a. Black people
b. those aged 45–64
c. the unemployed
d. those without college degrees

3. At which stage of Selye's general adaptation syndrome is a person especially vulnerable to illness?

a. exhaustion
b. alarm reaction
c. fight-or-flight
d. resistance

4. During an encounter judged as stressful, cortisol is released by the _____.

a. sympathetic nervous system
b. hypothalamus
c. pituitary gland
d. adrenal glands

5. According to the Holmes and Rahe scale, which life event requires the greatest amount of readjustment?

a. marriage
b. personal illness
c. divorce
d. death of spouse

6. While waiting to pay for their weekly groceries at the supermarket, Harley had to wait about 20 minutes in a long line at the checkout because only one cashier was on duty.

When Harley was finally ready to pay, their debit card was declined because they did not have enough money left in their checking account. Because Harley had left their credit cards at home, they had to place the groceries back into the cart and head home to retrieve a credit card. While driving back to their home, traffic was backed up two miles due to an accident. These events that Harley had to endure are best characterized as _____.

a. chronic stressors
b. acute stressors
c. daily hassles
d. readjustment occurrences

7. What is one of the major criticisms of the Social Readjustment Rating Scale?

a. It has too few items.
b. It was developed using only people from the New England region of the United States.
c. It does not take into consideration how a person appraises an event.
d. None of the items included are positive.

8. Which of the following is not a dimension of job burnout?

a. depersonalization

b. hostility
c. exhaustion
d. diminished personal accomplishment

9. The white blood cells that attack foreign invaders to the body are called _____.

a. antibodies
b. telomeres
c. lymphocytes
d. immune cells

10. The risk of heart disease is especially high among individuals with _____.

a. depression
b. asthma
c. telomeres
d. lymphocytes

11. The most lethal dimension of Type A behaviour pattern seems to be _____.

a. hostility
b. impatience
c. time urgency
d. competitive drive

12. Which of the following statements pertaining to asthma is *false*?

a. Parental and interpersonal conflicts have been tied to the development of asthma.
b. Asthma sufferers can experience asthma-like symptoms simply by believing that an inert substance they breathe will lead to airway obstruction.
c. Asthma has been shown to be linked to periods of depression.
d. Rates of asthma have decreased considerably since 2000.

13. Emotion-focused coping would likely be a better method than problem-focused coping for dealing with which of the following stressors?

a. terminal cancer
b. poor grades in school
c. unemployment
d. divorce

14. Studies of British civil servants have found that those in the lowest status jobs are much more likely to develop heart disease than those who have high status jobs. These findings attest to the importance of _____ in dealing with stress.

a. biofeedback

b. social support
c. perceived control
d. emotion-focused coping

15. Relative to those with low levels of social support, individuals with high levels of social support _____.

a. are more likely to develop asthma
b. tend to have less perceived control
c. are more likely to develop cardiovascular disorders
d. tend to tolerate stress well

16. The concept of learned helplessness was formulated by Seligman to explain the _____.

a. inability of dogs to attempt to escape avoidable shocks after having received inescapable shocks
b. failure of dogs to learn to from prior mistakes
c. ability of dogs to learn to help other dogs escape situations in which they are receiving uncontrollable shocks
d. inability of dogs to learn to help other dogs escape situations in which they are receiving uncontrollable electric shocks

17. Which of the following is *not* one of the presumed components of happiness?

a. using our talents to help improve the lives of others
b. learning new skills
c. regular pleasurable experiences
d. identifying and using our talents to enrich our lives

18. Researchers have identified a number of factors that are related to happiness. Which of the following is *not* one of them?

a. age
b. annual income up to $75,000
c. physical attractiveness
d. marriage

19. How does positive affect differ from optimism?

a. Optimism is more scientific than positive affect.
b. Positive affect is more scientific than optimism.
c. Positive affect involves feeling states, whereas optimism involves expectations.
d. Optimism involves feeling states, whereas positive affect involves expectations.

20. Carson enjoys writing mystery novels, and has even managed to publish some of his work. When Carson's writing, they become extremely focused on their work; in fact, Carson becomes so absorbed that that he often loses track of time,

often staying up well past 3 a.m. Carson's experience best illustrates the concept of _____.

a. happiness set point
b. adaptation
c. positive affect
d. flow

Critical Thinking Questions

21. Provide an example (other than the one described earlier) of a situation or event that could be appraised as either threatening or challenging.

22. Provide an example of a stressful situation that may cause a person to become seriously ill. How would Selye's general adaptation syndrome explain this occurrence?

23. Review the items on the Social Readjustment Rating Scale. Select one of the items and discuss how it might bring about distress and eustress.

24. Discuss the concept of Type A behaviour pattern, its history, and what we now know concerning its role in heart disease.

25. Consider the study in which volunteers were given nasal drops containing the cold virus to examine the relationship between stress and immune function (Cohen et al., 1998).

How might this finding explain how people seem to become sick during stressful times in their lives (e.g., final exam week)?

26. Although problem-focused coping seems to be a more effective strategy when dealing with stressors, do you think there are any kinds of stressful situations in which emotion-focused coping might be a better strategy?

27. Describe how social support can affect health both directly and indirectly.

28. In considering the three dimensions of happiness discussed in this section (the pleasant life, the good life, and the meaningful life), what are some steps you could take to improve your personal level of happiness?

29. The day before the drawing of a $300 million Powerball lottery, you notice that a line of people waiting to buy their Powerball tickets is stretched outside the door of a nearby convenience store. Based on what you've learned, provide some perspective on why these people are doing this, and what would likely happen if one of these individuals happened to pick the right numbers.

Personal Application Questions

30. Think of a time in which you and others you know (family members, friends, and classmates) experienced an event that some viewed as threatening and others viewed as challenging.

What were some of the differences in the reactions of those who experienced the event as threatening compared to those who viewed the event as challenging? Why do you think there were differences in how these individuals judged the same event?

31. Suppose you want to design a study to examine the relationship between stress and illness, but you cannot use the Social Readjustment Rating Scale. How would you go about measuring stress? How would you measure illness? What would you need to do in order to tell if there is a cause-effect relationship between stress and illness?

32. If a family member or friend of yours has asthma, talk to that person (if he or she is willing) about their symptom triggers. Does this person mention stress or emotional states? If so, are there any commonalities in these asthma triggers?

33. Try to think of an example in which you coped with a particular stressor by using problem-focused coping. What was the stressor? What did your problem-focused efforts involve? Were they effective?

34. Think of an activity you participate in that you find engaging and absorbing. For example, this might be something like playing video games, reading, or a hobby. What are your experiences typically like while engaging in this activity? Do your experiences conform to the notion of flow? If so, how?

Do you think these experiences have enriched your life? Why or why not?

129.

ACKNOWLEDGEMENTS & ATTRIBUTIONS

CHAPTER XIV
PSYCHOPATHOLOGY

130.

INTRODUCTION TO PSYCHOPATHOLOGY

Chapter Outline

- What is Psychopathology?
- Diagnosing and Classifying Psychological Disorders
- Perspectives on Psychopathology
- Neurodiversity
- Schizophrenia
- Mood Disorders
- Anxiety Disorders
- Obsessive-Compulsive Related Disorders
- Post-Traumatic Stress Disorder
- Dissociative Disorders
- Personality Disorders

PY.1 Many university students may experience challenges, set-backs, and low-moods, but when should they (or their friends and family) be concerned? (credit: Pexels user Sofia Alejandra)

Esmé is an 18-year-old from Hamilton, ON (Figure PY.1). She did well in high school and received scholarships to attend university in Halifax, NS. Esmé is excited to start this new

chapter in her life, even though she'll be almost 2000 kms away from home.

When the semester began, Esmé was optimistic about her courses and future degree. She made friends and was engaged in her courses. Halfway through the semester, however, Esmé's friends noticed that she seemed disinterested in social activities and was falling behind in her classes. When they asked about her change in behaviour, Esmé said that she was just a bit homesick. Towards the end of the term, Esmé seemed even more withdrawn from her friends, classes, and other activities. She was spending most of her time alone in her room and was failing most of her courses. Esmé's friends decide to contact the Health & Wellness Centre on campus for support. With regular counselling sessions and support from her friends and family, Esmé was able to deal with her depression and made significant improvements the following semester.

Esmé's story is hypothetical but may be similar to the experience of many undergraduate students across the country. As you'll learn in this chapter, the experiences and journeys of everyone are different, and with different outcomes. In this chapter, we'll explore the difference between atypical and dysfunctional, the concept of psychopathology, and symptoms and signs of common psychological disorders.

131.

WHAT ARE PSYCHOLOGICAL DISORDERS?

Learning Objectives

By the end of this section, you will be able to:

- Understand the problems inherent in defining the concept of psychological disorder
- Describe what is meant by harmful dysfunction
- Identify the formal criteria that thoughts, feelings, and behaviours must meet to be considered abnormal and, thus, symptomatic

of a psychological disorder

A psychological disorder is a condition characterized by abnormal thoughts, feelings, and behaviours. Psychopathology is the study of psychological disorders, including their symptoms, etiology (i.e., their causes), and treatment. The term *psychopathology* can also refer to the manifestation of a psychological disorder. Although consensus can be difficult, it is extremely important for mental health professionals to agree on what kinds of thoughts, feelings, and behaviours are truly abnormal in the sense that they genuinely indicate the presence of psychopathology. Certain patterns of behaviour and inner experience can easily be labeled as abnormal and clearly signify some kind of psychological disturbance. The person who washes their hands 40 times per day and the person who claims to hear the voices of demons exhibit behaviours and inner experiences that most would regard as abnormal: beliefs and behaviours that suggest the existence of a psychological disorder. But, consider the nervousness a young man feels when talking to an attractive person or the loneliness and longing for home a first-year student experiences during her first semester of college—these feelings may not be regularly present, but they fall in the range of normal. So, what kinds of thoughts, feelings, and

behaviours represent a true psychological disorder? Psychologists work to distinguish psychological disorders from inner experiences and behaviours that are merely situational, idiosyncratic, or unconventional.

Definition of a Psychological Disorder

Perhaps the simplest approach to conceptualizing psychological disorders is to label behaviours, thoughts, and inner experiences that are atypical, distressful, dysfunctional, and sometimes even dangerous, as signs of a disorder. For example, if you ask a classmate for a date and you are rejected, you probably would feel a little dejected. Such feelings would be normal. If you felt extremely depressed—so much so that you lost interest in activities, had difficulty eating or sleeping, felt utterly worthless, and contemplated suicide—your feelings would be atypical, would deviate from the norm, and could signify the presence of a psychological disorder. Just because something is atypical, however, does not necessarily mean it is disordered.

For example, only about 2-6% of people in Canada have red hair, so red hair is considered an atypical characteristic (Figure PY.2), but it is not considered disordered, it's just unusual. And it is less unusual in Scotland, where approximately 13% of the population has red hair ("DNA Project Aims," 2012). As you will learn, some disorders, although not exactly typical,

are far from atypical, and the rates in which they appear in the population are surprisingly high.

(a) (b) (c)

Figure PY.2 Red hair is considered unusual, but not abnormal. (a) Isla Fischer, (b) Prince Harry, and (c) Marcia Cross are three natural redheads. (credit a: modification of work by Richard Goldschmidt; credit b: modification of work by Glyn Lowe; credit c: modification of work by Kirk Weaver)

If we can agree that merely being atypical is an insufficient criterion for a having a psychological disorder, is it reasonable to consider behaviour or inner experiences that differ from widely expected cultural values or expectations as disordered? Using this criterion, a person who walks around a subway platform wearing a heavy winter coat in July while screaming obscenities at strangers may be considered as exhibiting symptoms of a psychological disorder. Their actions and clothes violate socially accepted rules governing appropriate dress and behaviour; these characteristics are atypical.

Cultural Expectations

Violating cultural expectations is not, in and of itself, a satisfactory means of identifying the presence of a psychological disorder. Since behaviour varies from one culture to another, what may be expected and considered appropriate in one culture may not be viewed as such in other cultures. For example, returning a stranger's smile is expected in the United States because a pervasive social norm dictates that we reciprocate friendly gestures. A person who refuses to acknowledge such gestures might be considered socially awkward—perhaps even disordered—for violating this expectation. However, such expectations are not universally shared. Cultural expectations in Japan involve showing reserve, restraint, and a concern for maintaining privacy around strangers. Japanese people are generally unresponsive to smiles from strangers (Patterson et al., 2007). Eye contact provides another example. In the United States and Europe, eye contact with others typically signifies honesty and attention. However, most Latin-American, Asian, and African cultures interpret direct eye contact as rude, confrontational, and aggressive (Pazain, 2010). Thus, someone who makes eye contact with you could be considered appropriate and respectful or brazen and offensive, depending on your culture (Figure PY.3).

Figure PY.3 Eye contact is one of many social gestures that vary from culture to culture. (credit: Joi Ito)

Hallucinations (seeing or hearing things that are not physically present) in Western societies is a violation of cultural expectations, and a person who reports such inner experiences is readily labeled as psychologically disordered. In other cultures, visions that, for example, pertain to future events may be regarded as normal experiences that are positively valued (Bourguignon, 1970). Finally, it is important to recognize that cultural norms change over time: what might be considered typical in a society at one time may no longer be viewed this way later, similar to how fashion trends from one era may elicit quizzical looks decades later—imagine how the lace collars, broad-brimmed hats, and slashed sleeves, high-fashion in the 1600's (PY.4), would go over on your campus today.

PY.4 Frans Hals "The Laughing Cavalier" (Public Domain)

Dig Deeper

The Myth of Mental Illness

In the 1950s and 1960s, the concept of mental illness was widely criticized. One of the major criticisms focused on the notion that mental illness was a "myth that justifies psychiatric intervention in socially disapproved behaviour" (Wakefield, 1992). Thomas Szasz (1960), a noted psychiatrist, was perhaps the biggest proponent of this view. Szasz argued that the notion of mental illness was invented by society (and the mental health establishment) to stigmatize and subjugate people whose behaviour violates accepted social and legal norms. Indeed, Szasz suggested that what appear to be symptoms of mental illness are more appropriately characterized as "problems in living" (Szasz, 1960).

In his 1961 book, *The Myth of Mental Illness: Foundations of a Theory of Personal Conduct*, Szasz expressed his disdain for the concept of mental illness and for the field of psychiatry in general (Oliver, 2006). The basis for Szasz's attack was his contention that detectable abnormalities in bodily structures and functions (e.g.,

infections and organ damage or dysfunction) represent the defining features of genuine illness or disease, and because symptoms of purported mental illness are not accompanied by such detectable abnormalities, so-called psychological disorders are not disorders at all. Szasz (1961/2010) proclaimed that "disease or illness can only affect the body; hence, there can be no mental illness" (p. 267).

Today, we recognize the extreme level of psychological suffering experienced by people with psychological disorders: the painful thoughts and feelings they experience, the disordered behaviour they demonstrate, and the levels of distress and impairment they exhibit. This makes it very difficult to deny the reality of mental illness.

However controversial Szasz's views and those of his supporters might have been, they have influenced the mental health community and society in several ways. First, lay people, politicians, and professionals now often refer to mental illness as mental health "problems," implicitly acknowledging the "problems in living" perspective Szasz described (Buchanan-Barker & Barker, 2009). Also influential was Szasz's view of homosexuality. Szasz was perhaps the first psychiatrist to openly challenge the idea that homosexuality represented a form of mental illness or disease (Szasz, 1965). By challenging the idea that homosexuality represented a form a mental illness, Szasz helped pave the way for the social and civil

rights that gay and lesbian people now have (Barker, 2010). His work also inspired legal changes that protect the rights of people in psychiatric institutions and allow such individuals a greater degree of influence and responsibility over their lives (Buchanan-Barker & Barker, 2009).

Harmful Dysfunction

If none of the criterion discussed so far is adequate by itself to define the presence of a psychological disorder, how can a disorder be conceptualized? Many efforts have been made to identify the specific dimensions of psychological disorders, yet none is entirely satisfactory. No universal definition of psychological disorder exists that can apply to all situations in which a disorder is thought to be present (Zachar & Kendler, 2007). However, one of the more influential conceptualizations was proposed by Wakefield (1992), who defined psychological disorder as a harmful dysfunction. Wakefield argued that natural internal mechanisms—that is, psychological processes honed by evolution, such as cognition, perception, and learning—have important functions, such as enabling us to experience the world the way others do and to engage in rational thought, problem solving, and communication. For example, learning allows us to associate

a fear with a potential danger in such a way that the intensity of fear is roughly equal to the degree of actual danger. Dysfunction occurs when an internal mechanism breaks down and can no longer perform its normal function. But, the presence of a dysfunction by itself does not determine a disorder. The dysfunction must be harmful in that it leads to negative consequences for the individual or for others, as judged by the standards of the individual's culture. The harm may include significant internal anguish (e.g., high levels of anxiety or depression) or problems in day-to-day living (e.g., in one's social or work life).

To illustrate, Danon has an extreme fear of spiders. Danon's fear might be considered a dysfunction in that it signals that the internal mechanism of learning is not working correctly (i.e., a faulty process prevents Danon from appropriately associating the magnitude of fear with the actual threat posed by spiders). Danon's fear of spiders has a significant negative influence on daily life: Danon avoids all situations in which they suspect spiders to be present (e.g., the basement or a friend's home), and they quit their job last month because they saw a spider in the restroom at work and is now unemployed. According to the harmful dysfunction model, Danon's condition would signify a disorder because (a) there is a dysfunction in an internal mechanism, and (b) the dysfunction has resulted in harmful consequences. Similar to how the symptoms of physical illness reflect dysfunctions in biological processes, the symptoms of psychological disorders

presumably reflect dysfunctions in mental processes. The internal mechanism component of this model is especially appealing because it implies that disorders may occur through a breakdown of biological functions that govern various psychological processes, thus supporting contemporary neurobiological models of psychological disorders (Fabrega, 2007).

The American Psychiatric Association (APA) Definition

Many of the features of the harmful dysfunction model are incorporated in a formal definition of psychological disorder developed by the American Psychiatric Association (APA). According to the APA (2013), a psychological disorder is a condition that is said to consist of the following:

- **There are significant disturbances in thoughts, feelings, and behaviours**. A person must experience inner states (e.g., thoughts and/or feelings) and exhibit behaviours that are clearly disturbed—that is, unusual, but in a negative, self-defeating way. Often, such disturbances are troubling to those around the individual who experiences them. For example, an individual who is uncontrollably preoccupied by thoughts of germs spends hours each day bathing, has inner experiences, and displays behaviours that most

would consider atypical and negative (disturbed) and that would likely be troubling to family members.

- **The disturbances reflect some kind of biological, psychological, or developmental dysfunction**. Disturbed patterns of inner experiences and behaviours should reflect some flaw (dysfunction) in the internal biological, psychological, and developmental mechanisms that lead to normal, healthy psychological functioning. For example, the hallucinations observed in schizophrenia could be a sign of brain abnormalities.
- **The disturbances lead to significant distress or disability in one's life**. A person's inner experiences and behaviours are considered to reflect a psychological disorder if they cause the person considerable distress, or greatly impair their ability to function as a normal individual (often referred to as functional impairment, or occupational and social impairment). As an illustration, a person's fear of social situations might be so distressing that it causes the person to avoid all social situations (e.g., preventing that person from being able to attend class or apply for a job).
- **The disturbances do not reflect expected or culturally approved responses to certain events**. Disturbances in thoughts, feelings, and behaviours must be socially unacceptable responses to certain events that often happen in life. For example, it is perfectly natural (and expected) that a person would experience great

sadness and might wish to be left alone following the death of a close family member. Because such reactions are in some ways culturally expected, the individual would not be assumed to signify a mental disorder.

Some believe that there is no essential criterion or set of criteria that can definitively distinguish all cases of disorder from non-disorder (Lilienfeld & Marino, 1999). In truth, no single approach to defining a psychological disorder is adequate by itself, nor is there universal agreement on where the boundary is between disordered and not disordered. From time to time we all experience anxiety, unwanted thoughts, and moments of sadness; our behaviour at other times may not make much sense to ourselves or to others. These inner experiences and behaviours can vary in their intensity, but are only considered disordered when they are highly disturbing to us and/or others, suggest a dysfunction in normal mental functioning, and are associated with significant distress or disability in social or occupational activities.

132.

DIAGNOSING AND CLASSIFYING PSYCHOLOGICAL DISORDERS

Learning Objectives

By the end of this section, you will be able to:

- Explain why classification systems are necessary in the study of psychopathology
- Describe the basic features of the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5)
- Discuss changes in the DSM over time,

including criticisms of the current edition
- Identify which disorders are generally the most common

A first step in the study of psychological disorders is carefully and systematically discerning significant signs and symptoms. How do mental health professionals ascertain whether or not a person's inner states and behaviours truly represent a psychological disorder? Arriving at a proper diagnosis—that is, appropriately identifying and labeling a set of defined symptoms—is absolutely crucial. This process enables professionals to use a common language with others in the field and aids in communication about the disorder with the patient, colleagues and the public. A proper diagnosis is an essential element to guide proper and successful treatment. For these reasons, classification systems that organize psychological disorders systematically are necessary.

The Diagnostic and Statistical Manual of Mental Disorders (DSM)

Although a number of classification systems have been developed over time, the one that is used by most mental health professionals in the United States is the *Diagnostic and*

Statistical Manual of Mental Disorders (DSM-5), published by the American Psychiatric Association (2013). (Note that the American Psychiatric Association differs from the American Psychological Association; both are abbreviated APA.) The first edition of the DSM, published in 1952, classified psychological disorders according to a format developed by the U.S. Army during World War II (Clegg, 2012). In the years since, the DSM has undergone numerous revisions and editions. The most recent edition, published in 2013, is the DSM-5 (APA, 2013). The DSM-5 includes many categories of disorders (e.g., anxiety disorders, depressive disorders, and dissociative disorders). Each disorder is described in detail, including an overview of the disorder (diagnostic features), specific symptoms required for diagnosis (diagnostic criteria), prevalence information (what percent of the population is thought to be afflicted with the disorder), and risk factors associated with the disorder. Figure PY.5 shows lifetime prevalence rates—the percentage of people in a population who develop a disorder in their lifetime—of various psychological disorders among U.S. adults. These data were based on a national sample of 9,282 U.S. residents (National Comorbidity Survey, 2007).

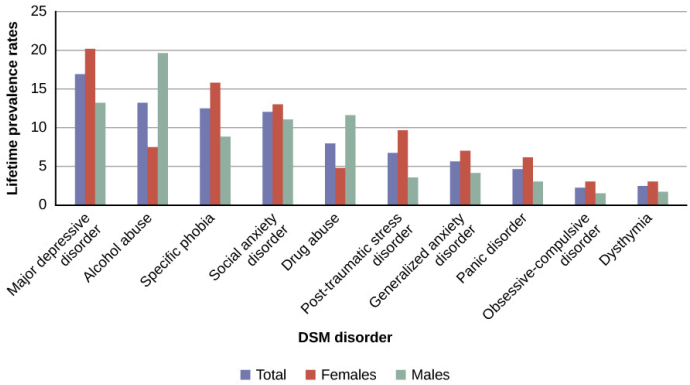


Figure PY.5 The graph shows the breakdown of psychological disorders, comparing the percentage prevalence among adult males and adult females in the United States. Because the data is from 2007, the categories shown here are from the DSM-IV, which has been supplanted by the DSM-5. Most categories remain the same; however, alcohol abuse now falls under a broader Alcohol Use Disorder category.

The DSM-5 also provides information about comorbidity; the co-occurrence of two disorders. For example, the DSM-5 mentions that 41% of people with obsessive-compulsive disorder (OCD) also meet the diagnostic criteria for major depressive disorder (Figure PY.6). Drug use is highly comorbid with other mental illnesses; 6 out of 10 people who have a substance use disorder also suffer from another form of mental illness (National Institute on Drug Abuse [NIDA], 2007).

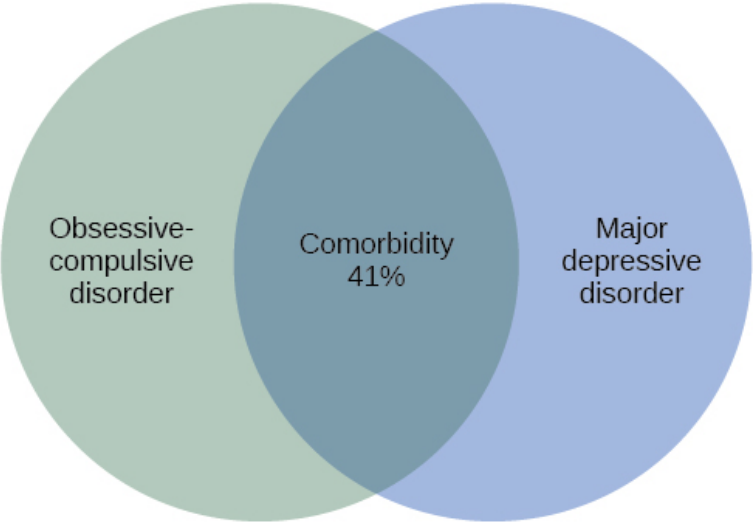


Figure PY.6 Obsessive-compulsive disorder and major depressive disorder frequently occur in the same person.

Everyday Connection

Comorbidity

As you've learned in the text, comorbidity refers to situations in which an individual suffers from more than one disorder, and often the symptoms of each

can interact in negative ways. Co-occurrence and comorbidity of psychological disorders are quite common, and some of the most pervasive comorbidities involve substance use disorders that co-occur with psychological disorders. Indeed, some estimates suggest that around a quarter of people who suffer from the most severe cases of mental illness exhibit substance use disorder as well. Conversely, around 10 percent of individuals seeking treatment for substance use disorder have serious mental illnesses. Observations such as these have important implications for treatment options that are available. When people with a mental illness are also habitual drug users, their symptoms can be exacerbated and resistant to treatment. Furthermore, it is not always clear whether the symptoms are due to drug use, the mental illness, or a combination of the two. Therefore, it is recommended that behaviour is observed in situations in which the individual has ceased using drugs and is no longer experiencing withdrawal from the drug in order to make the most accurate diagnosis (NIDA, 2018).

Obviously, substance use disorders are not the only possible comorbidities. In fact, some of the most common psychological disorders tend to co-occur.

For instance, more than half of individuals who have a primary diagnosis of depressive disorder are estimated to exhibit some sort of anxiety disorder. The reverse is also true for those diagnosed with a primary diagnosis of an anxiety disorder. Further, anxiety disorders and major depression have a high rate of comorbidity with several other psychological disorders (Al-Asadi, Klein, & Meyer, 2015).

The DSM has changed considerably in the half-century since it was originally published. The first two editions of the DSM, for example, listed homosexuality as a disorder; however, in 1973, the APA voted to remove it from the manual (Silverstein, 2009). While the DSM-III did not list homosexuality as a disorder, it introduced a new diagnosis, ego-dystonic homosexuality, which emphasized homosexual arousal that the patient viewed as interfering with desired heterosexual relationships and causing distress for the individual. This new diagnosis was considered by many as a compromise to appease those who viewed homosexuality as a mental illness. Other professionals questioned how appropriate it was to have a separate diagnosis that described the content of an individual's distress. In 1986, the diagnosis was removed from the DSM-III-R (Herek, 2012). Additionally, beginning with the DSM-III in 1980, mental

disorders have been described in much greater detail, and the number of diagnosable conditions has grown steadily, as has the size of the manual itself. DSM-I included 106 diagnoses and was 130 total pages, whereas DSM-III included more than 2 times as many diagnoses (265) and was nearly seven times its size (886 total pages) (Mayes & Horowitz, 2005). Although DSM-5 is longer than DSM-IV, the volume includes only 237 disorders, a decrease from the 297 disorders that were listed in DSM-IV. The latest edition, DSM-5, includes revisions in the organization and naming of categories and in the diagnostic criteria for various disorders (Regier, Kuhl, & Kupfer, 2012), while emphasizing careful consideration of the importance of gender and cultural difference in the expression of various symptoms (Fisher, 2010).

Some believe that establishing new diagnoses might over-pathologize the human condition by turning common human problems into mental illnesses (The Associated Press, 2013). Indeed, the finding that nearly half of all Americans will meet the criteria for a DSM disorder at some point in their life (Kessler et al., 2005) likely fuels much of this skepticism. The DSM-5 is also criticized on the grounds that its diagnostic criteria have been loosened, thereby threatening to "turn our current diagnostic inflation into diagnostic hyperinflation" (Frances, 2012, para. 22). For example, DSM-IV specified that the symptoms of major depressive disorder must not be attributable to normal bereavement (loss of a loved one). The DSM-5, however, has removed this bereavement exclusion,

essentially meaning that grief and sadness after a loved one's death can constitute major depressive disorder.

The International Classification of Diseases

A second classification system, the *International Classification of Diseases* (ICD), is also widely recognized. Published by the World Health Organization (WHO), the ICD was developed in Europe shortly after World War II and, like the DSM, has been revised several times. The categories of psychological disorders in both the DSM and ICD are similar, as are the criteria for specific disorders; however, some differences exist. Although the ICD is used for clinical purposes, this tool is also used to examine the general health of populations and to monitor the prevalence of diseases and other health problems internationally (WHO, 2013). The ICD is in its 10th edition (ICD-10); however, efforts are now underway to develop a new edition (ICD-11) that, in conjunction with the changes in DSM-5, will help harmonize the two classification systems as much as possible (APA, 2013).

A study that compared the use of the two classification systems found that worldwide the ICD is more frequently used for clinical diagnosis, whereas the DSM is more valued for research (Mezzich, 2002). Most research findings concerning the etiology and treatment of psychological disorders are based on criteria set forth in the DSM (Oltmanns & Castonguay,

2013). The DSM also includes more explicit disorder criteria, along with an extensive and helpful explanatory text (Regier et al., 2012). The DSM is the classification system of choice among U.S. mental health professionals, and this chapter is based on the DSM paradigm.

The Compassionate View of Psychological Disorders

As these disorders are outlined, please bear two things in mind. First, remember that psychological disorders represent *extremes* of inner experience and behaviour. If, while reading about these disorders, you feel that these descriptions begin to personally characterize you, do not worry—this moment of enlightenment probably means nothing more than you are normal. Each of us experiences episodes of sadness, anxiety, and preoccupation with certain thoughts—times when we do not quite feel ourselves. These episodes should not be considered problematic unless the accompanying thoughts and behaviours become extreme and have a disruptive effect on one's life. Second, understand that people with psychological disorders are far more than just embodiments of their disorders. We do not use terms such as schizophrenics, depressives, or phobics because they are labels that objectify people who suffer from these conditions, thus promoting biased and disparaging assumptions about them. It is important to remember that a psychological disorder is

not what a person *is*; it is something that a person *experiences*—through no fault of his or her own. As is the case with cancer or diabetes, those with psychological disorders suffer debilitating, often painful conditions that are not of their own choosing. These individuals deserve to be viewed and treated with compassion, understanding, and dignity.

TRICKY TOPIC: DIAGNOSING PSYCHOLOGICAL CONDITIONS

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For a full transcript of this video, click here

133.

PERSPECTIVES ON PSYCHOLOGICAL DISORDERS

Learning Objectives

By the end of this section, you will be able to:

- Discuss supernatural perspectives on the origin of psychological disorders, in their historical context
- Describe modern biological and psychological perspectives on the origin of psychological disorders
- Identify which disorders generally show the

highest degree of heritability
- Describe the diathesis-stress model and its importance to the study of psychopathology

Scientists, mental health professionals, and cultural healers may adopt different perspectives in attempting to understand or explain the underlying mechanisms that contribute to the development of a psychological disorder. The specific perspective used in explaining a psychological disorder is extremely important. Each perspective explains psychological disorders, their causes or etiology, and effective treatments from a different viewpoint. Different perspectives provide alternate ways for how to think about the nature of psychopathology.

Supernatural Perspectives of Psychological Disorders

For centuries, psychological disorders were viewed from a supernatural perspective: attributed to a force beyond scientific understanding. Those afflicted were thought to be practitioners of black magic or possessed by spirits (Figure PY.7) (Maher & Maher, 1985). For example, convents throughout Europe in the 16th and 17th centuries reported

hundreds of nuns falling into a state of frenzy in which the afflicted foamed at the mouth, screamed and convulsed, sexually propositioned priests, and confessed to having carnal relations with devils or Christ. Although, today, these cases would suggest serious mental illness; at the time, these events were routinely explained as possession by devilish forces (Waller, 2009a). Similarly, grievous fits by young girls are believed to have precipitated the witch panic in New England late in the 17th century (Demos, 1983). Such beliefs in supernatural causes of mental illness are still held in some societies today; for example, beliefs that supernatural forces cause mental illness are common in some cultures in modern-day Nigeria (Aghukwa, 2012).

Figure PY.7 In The Extraction of the Stone of Madness, a 15th century painting by Hieronymus Bosch, a practitioner is using a tool to extract an object (the supposed "stone of madness") from the head of an afflicted person.

Dig Deeper

Dancing Mania

Between the 11th and 17th centuries, a curious epidemic swept across Western Europe. Groups of people would suddenly begin to dance with wild abandon. This compulsion to dance—referred to as dancing mania—sometimes gripped thousands of people at a time (Figure PY.8). Historical accounts indicate that those afflicted would sometimes dance with bruised and bloody feet for days or weeks, screaming of terrible visions and begging priests and monks to save their souls (Waller, 2009b). What caused dancing mania is not known, but several explanations have been proposed, including spider venom and ergot poisoning ("Dancing Mania," 2011).

Figure PY.8 Although the cause of dancing mania, depicted in this painting, was unclear, the behaviour was attributed to supernatural forces.

Historian John Waller (2009a, 2009b) has provided a comprehensive and convincing explanation of dancing mania that suggests the phenomenon was attributable to a combination of three factors: psychological distress, social contagion, and belief in supernatural forces. Waller argued that various disasters of the time (such as famine, plagues, and floods) produced high levels of psychological distress that could increase the likelihood of succumbing to an involuntary trance state. Waller indicated that anthropological studies and accounts of possession rituals show that people are more likely to enter a trance state if they expect it to happen, and that entranced individuals behave in a

ritualistic manner, their thoughts and behaviour shaped by the spiritual beliefs of their culture. Thus, during periods of extreme physical and mental distress, all it took were a few people—believing themselves to have been afflicted with a dancing curse—to slip into a spontaneous trance and then act out the part of one who is cursed by dancing for days on end.

Biological Perspectives of Psychological Disorders

The biological perspective views psychological disorders as linked to biological phenomena, such as genetic factors, chemical imbalances, and brain abnormalities; it has gained considerable attention and acceptance in recent decades (Wyatt & Midkiff, 2006). Evidence from many sources indicates that most psychological disorders have a genetic component; in fact, there is little dispute that some disorders are largely due to genetic factors. The graph in Figure PY.9 shows heritability estimates for schizophrenia.

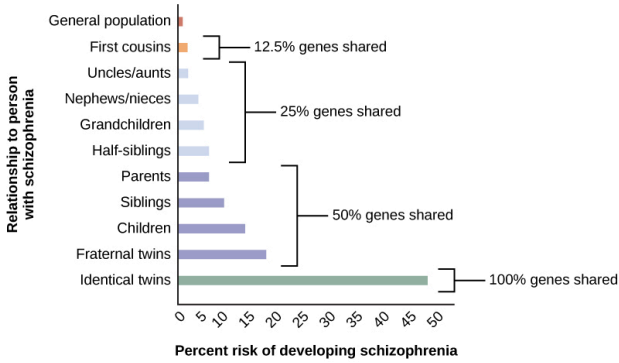

Figure PY.9 A person's risk of developing schizophrenia increases if a relative has schizophrenia. The closer the genetic relationship, the higher the risk.

Findings such as these have led many of today's researchers to search for specific genes and genetic mutations that contribute to mental disorders. Also, sophisticated neural imaging technology in recent decades has revealed how abnormalities in brain structure and function might be directly involved in many disorders, and advances in our understanding of neurotransmitters and hormones have yielded insights into their possible connections. The biological perspective is currently thriving in the study of psychological disorders.

The Diathesis-Stress Model of Psychological Disorders

Despite advances in understanding the biological basis of psychological disorders, the psychosocial perspective is still

very important. This perspective emphasizes the importance of learning, stress, faulty and self-defeating thinking patterns, and environmental factors. Perhaps the best way to think about psychological disorders, then, is to view them as originating from a combination of biological and psychological processes. Many develop not from a single cause, but from a delicate fusion between partly biological and partly psychosocial factors.

The diathesis-stress model (Zuckerman, 1999) integrates biological and psychosocial factors to predict the likelihood of a disorder. This diathesis-stress model suggests that people with an underlying predisposition for a disorder (i.e., a diathesis) are more likely than others to develop a disorder when faced with adverse environmental or psychological events (i.e., stress), such as childhood maltreatment, negative life events, trauma, and so on. A diathesis is not always a biological vulnerability to an illness; some diatheses may be psychological (e.g., a tendency to think about life events in a pessimistic, self-defeating way).

The key assumption of the diathesis-stress model is that both factors, diathesis and stress, are necessary in the development of a disorder. Different models explore the relationship between the two factors: the level of stress needed to produce the disorder is inversely proportional to the level of diathesis.

TRICKY TOPIC: DIATHESIS-STRESS

MODEL

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For a full transcript of this video, click here

134.

NEURODIVERSITY

Learning Objectives

By the end of this section, you will be able to:

- Describe traits currently used in the diagnosis of ADHD and autism, as well as other traits, strengths, and barriers common to people in these populations
- Identify possible causes and factors underlying behavioural and neurological differences associated with ADHD and autism
- Identify supports commonly used to help overcome barriers affecting those with ADHD and autism
- Compare and contrast sensory processing

similarities and differences between autism and ADHD

In most introductory psychology texts, including the first edition of this one, this section is entitled 'Neurodevelopmental Disorders'. This terminology presents atypical brain organization and development as disordered. All brains differ to some degree, so neurodivergence is a normal variation in the structure and function of a nervous system, even if it's less common (Chappel & Worsley, 2021). Instead, this chapter will use the term **neurodiversity**, which was coined by autistic sociologist Judy Singer to acknowledge the diversity of **neurotypes** (different kinds of brain organization and function) that can appear in a population of healthy people. Your neurotype is present from birth to the end of your life, influencing development, cognition, sensory perception, emotional and behavioural regulation, and social behaviour, so it's a fundamental part of who you are, guiding and informing your experience of the world. In this view, people who fall within the average range of neurotypes are **neurotypical** (NT), and people who exist outside of it are **neurodivergent (**Baumer & Frueh, 2021**).** In fact, the term 'neurotypical' doesn't refer to a specific neurotype, since there's a lot of variation between the brains of neurotypical

people as well. Differences in function that result from a person's neurotype can change over time, and some people may not be identified as neurodiverse until adulthood. This section will focus on **autism spectrum disorder (ASD)** and **attention deficit hyperactivity disorder (ADHD)**, but dyslexia, dyscalculia, Down syndrome, hyperlexia, dyspraxia, Meares-Irlen Syndrome and Tourette Syndrome are often also considered to be types of neurodivergence as well.

Dig Deeper

Discussing Disability and Neurodivergence

The shift from 'neurodevelopmental disorders' to 'neurodiversity' reflects a change in the way we understand disability and neurodivergence. Historically, **the medical model** was used to define disability as defects in disabled people that should be cured or prevented (Hogan, 2019). Following this logic, poor outcomes like low employment and educational attainment are a result of disabled

people's limitations, and systemic factors that make these goals unattainable for them aren't addressed. This means that under the medical model, disabled people are expected to overcome barriers related to disability, even if those barriers could be eliminated by making changes at a social level so that a wider variety of needs are considered. This model values the prevention of disability over the rights and wellbeing of disabled people and has even been used to argue for the prevention or 'curing' of things like same-gender attraction, which are not disabilities. Even in Canada, some provinces continued to classify homosexuality as a medical disorder until 2010 (CBC News, 2010).

An alternative promoted by many disabled people is **the social model**, which argues that disability mostly happens when systemic social factors disadvantage people with certain types of bodies and brains (Hogan, 2019; World Health Organization, 2022). Consider a person with colour deficiency trying to read a map. If the map uses colours affected by their colour deficiency, they may not be able to see the borders between countries, making the map useless to them. This person isn't limited in their ability to understand maps, they are disadvantaged because their needs weren't

considered when the map was made. The social model isn't meant to replace medical treatment when it's needed, its primary goal is to improve and protect the rights of disabled people, which includes making treatment and accommodations more accessible (Guevara, 2021).

A related change involves '**person first language**' (e.g., "a person with autism"), which is intended to reduce stigma by separating the condition from the person (Baumer & Frueh, 2021). This sometimes conflicts with language used by neurodivergent people; for example, many autistic people prefer **identity-first language** (e.g., "Autistic person"). This is meant to acknowledge that autism is a fundamental part of an autistic person, and that respecting personhood shouldn't require the separation of a person from their neurotype (Kenny, 2015; Brown, 2011). However, not all neurodiverse people prefer identity-first language and in this text, we wish to respect differences in language preferences within these communities, with the understanding that discussions are ongoing. In this section, a mix of identity first and person first language will be used in order to acknowledge the lack of consensus and to respect both positions that may be held by neurodiverse people.

Attention-Deficit/Hyperactivity Disorder

Consider the following scenarios:

Samar is writing a quiz in class. He studied for it, but he has trouble holding attention long enough to follow along with lectures, so he listened over the recording several times to review. He's proud of himself for keeping track of the quiz date and prepping in time, as he has trouble managing and remembering dates, and has missed important dates in the past. Samar speeds through it, feeling confident. Later he realizes he may have misread the instructions and missed a question. Despite studying and understanding the material, Samar doesn't get the mark he hoped for. He goes to office hours, but he misplaced his quiz and the professor gets frustrated with him for losing focus when she is speaking to him. Outside of class, Samar struggles to connect with others because he loses track of conversations and often feels out of the loop. Samar may have **primarily inattentive attention-deficit-hyperactivity-disorder (ADHD-PI)**.

Alaiya is writing a quiz in class. She can't help tapping her feet and pencil, and she nearly stands up to pace, but she knows she'll get in trouble for doing that. She tried to study, but she was jittery, and she couldn't focus. The feeling made her so anxious that she gave up and played video games to calm down, though she didn't mean to. She tried to join a study group, but she had trouble following the flow of conversation,

blurting things out before others had finished talking. She left the group embarrassed and worried that they thought she was rude. Despite her effort, Aliya is discouraged when she gets her mark back. She goes to office hours, but there's a line and she only manages to wait in it for a few minutes before she feels stressed and under stimulated and has to leave. Alaiya may have **primarily hyperactive-impulsive ADHD (ADHD-HI)**.

As demonstrated above, ADHD presents in many ways. People like Samar mainly experience inattentive-type symptoms, having difficulty with sustained attention and tasks involving working memory. Others like Alaiya have more hyperactive-impulsive-type symptoms, meaning they're motivated to seek stimulation and struggle with self-control. Others present with a combination of inattentive and hyperactive-impulsive traits **(ADHD-C)**. Interestingly, the proportion of people with ADHD-PI increases with age, while the proportion with ADHD-HI decreases. For example, 23% of preschool age children with ADHD are primarily inattentive, but this percentage rises 75% in high school. In contrast, about 5% of preschool children are primarily hyperactive, and by high school only about 1.1% of people with ADHD are primarily inattentive. (de la Peña, 2020; Willcutt, 2012). This makes sense, since impulse control and sustained attention rely on brain systems that are still developing at this age, even for neurotypical children.

Symptoms and Traits

There are many ways that ADHD can present, so it's likely that it represents a number of neurotypes with similar features. Since ADHD is neurodevelopmental, these traits are present since early childhood and exist across different settings. It's also important to remember that some of the behavioural issues seen in people with ADHD are also seen in people experiencing trauma, sleep disorders, sensory processing disorders, and autism spectrum disorder. Some of these conditions can also coexist with ADHD. (Wolraich et al., 2019). The criteria currently used to diagnose ADHD come from the DSM-5, and involve inattentiveness, hyperactivity and impulsivity.

Inattention

Inattentive symptoms involve difficulty keeping attention, so people with these symptoms often struggle to complete tasks, follow instructions, and use organizational skills. They may also have trouble holding attention for play or leisure activities, and may feel easily distracted (APA, 2013). Like Samar with his professor, people with these kinds of symptoms may have trouble maintaining attention in conversation or during interaction and are sometimes misunderstood as being distracted or withdrawn by others. As a result of these difficulties, they may struggle with self-esteem and social interaction, and may be reluctant to do things that require

sustained attention. Some of these symptoms appear to be related to differences in sensory processing and may mean that people with these symptoms need more time to register and respond to stimuli (de la Peña, 2020).

Hyperactivity and Impulsivity

People with hyperactive and impulsive symptoms may have trouble being still. For example, children with ADHD may have trouble remaining seated when it's expected for them to do so and may have a tendency to run or climb in inappropriate situations. For teens and adults with ADHD, this is commonly experienced as an intense discomfort and restlessness, even if they can suppress the urge to move. People with these symptoms may have trouble waiting their turn in conversation, and unintentionally interrupt others. As with inattentive symptoms, people with hyperactive-impulsive symptoms may have trouble engaging in play and leisure activities in the same way that neurotypical people do, and they may feel or appear to be constantly on the go (APA, 2013). Like Aliyah in her study group, people with these traits are sometimes misunderstood by others, and can experience social difficulties as a result.

Common Traits and Experiences

ADHD and Executive Function

Executive functions are skills that allow us to direct attention, focus, plan, control our behaviour, and regulate emotions (Diamond, 2012). Executive dysfunction occurs when those skills are impaired, resulting in difficulty with time management, impulse control, and emotional regulation. Many people with ADHD experience significant impairment relating to executive function (Silverstein et al., 2018). A specific executive function associated with ADHD is **working memory** (WM; sometimes used interchangeably with *short-term memory*). This is the component of memory that allows us to hold information in mind so we can work with it in the moment. Many people with ADHD have a lower WM capacity and have more difficulty manipulating information in WM (Martinussen et al., 2005).

Given the range of skills involved in executive function, it's not surprising that executive dysfunction could contribute to many impairments that people with ADHD experience. It isn't yet known if executive dysfunction is a core feature of ADHD, but some studies found that executive function abilities in early childhood can predict ADHD symptoms later in life (Sjöwall et al., 2015; Brocki et al. 2009), and many people with ADHD score differently than neurotypical people on certain executive function skills (Fan & Wang, 2022). There is evidence that parts of the frontal and parietal lobes involved

in executive function processes are less active in people with ADHD (Faraone et al., 2015), Further evidence can be found in people with ADHD who respond well to stimulant medication, since they're more likely than non-responders to show reduced activity in frontal lobe areas involved in executive functions (Ogrim & Kroptov, 2019). These differences in brain activity and response to stimulants help to explain the range of ways ADHD can present.

ADHD and Attention

The name itself implies that ADHD is a lack of attention, but this isn't totally accurate. Instead, the brains of people with ADHD have trouble directing attention the way neurotypical brains do, so they do more **local processing**, or processing of individual details that make up a big picture rather than processing the picture as a whole (Song & Hakoda, 2012), which is called **global processing** (Figure PY. 10). As a result, someone taking a test may focus on a single multiple-choice option without reading the question itself as a whole, as Samar did. Samar had trouble focusing his attention on the expected parts of the test, and he also had trouble shifting his attention to more relevant information.

Local and global processing skills can be tested using a Compound Digit Cancelation Test (Figure PY.10). In this test, Digits are arranged spatially to make up larger compound digits. Digits making up compound digits require local processing, since they can be processed as individual details.

The compound digits require global processing, since the subject must combine local features to understand them. In this example, the subject was told to cross out twos and eights, whether they appeared at the local or global level. They correctly selected the two made of eights, the six made of twos, and the eight made of twos, but they missed the eight made of sevens, indicating that they may be better at local than global processing, since they more frequently identified twos and eights at the local level.

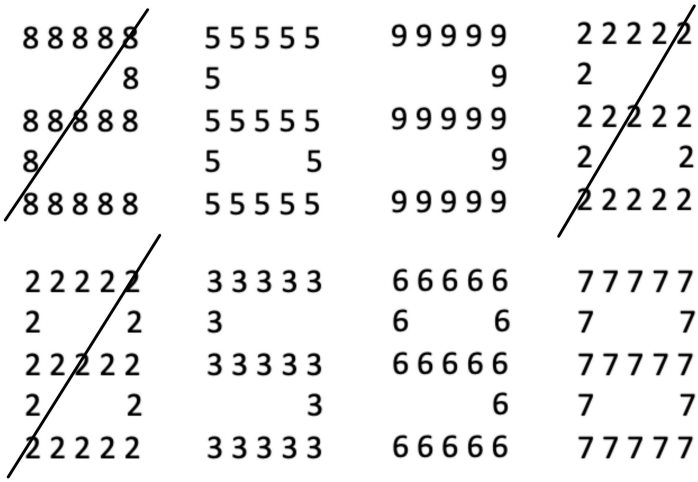

Figure PY.10 An example of a Compound Digit Cancellation Test (CDCT), used to assess global and local processing abilities. Digits are arranged spatially to make up larger compound digits. For example, a series of two's lined up in the shape of a six. (credit: original work, Max Dysart)

An interesting result of this difference in attention is

hyperfocus, a state of increased attention and motivation directed towards a particular subject. Hyperfocus is also reported by neurotypical people, but it's more common in autistic people and those with ADHD (Groen et al., 2020). People experiencing hyperfocus often lose their sense of time and ignore other stimuli, including bodily needs, because they can't disengage. Hyperfocus can be a negative experience when focused on subjects that cause anxiety or which interfere with function, but it can also be enjoyable, resulting in increased productivity if focused on tasks that are beneficial to the individual (Hupfeld, 2018).

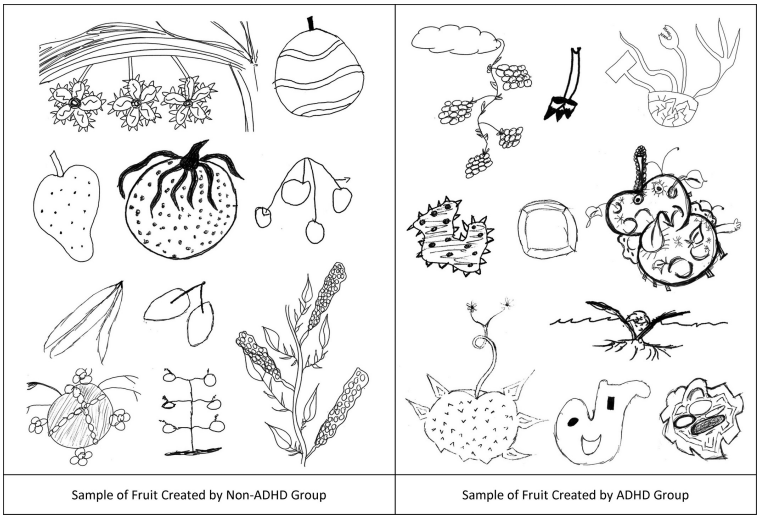

Figure PY. 11 When asked to design and describe 'alien fruit', participants with ADHD (on the right) designed fruit that were rated as more original and had more atypical features than participants without ADHD (on the left). (credit: White, 2018)

Strengths for People with ADHD

Like other kinds of neurodivergence, ADHD involves both impairments and special skills less common in neurotypical people. One strength for people with ADHD is creativity, a skill that is enhanced by the ability to combine information in new and unexpected ways. People with ADHD on average display more flexible thinking than neurotypical people on word association tasks (White & Shah, 2016), and are less restricted by existing knowledge during drawing tasks, resulting in more original creations (Figure PY.11; White, 2018). Traits like impulsivity and difficulty ignoring 'irrelevant' stimuli, both associated with ADHD, are also more common in people who display high levels of creativity (Zabelina et al., 2015, Zabelina et al., 2013), so there may be common features in the neurobiology of ADHD and creativity. Beyond creativity, ADHD adults identified higher levels of energy, courage, adventurousness, and non-conformity as positive factors they associate with their ADHD (Holthe & Langvik, 2017, Sedgwick et al., 2018). There is also a higher-than-average rate of ADHD in populations of athletes, suggesting that some aspects of this neurotype support athletic engagement, like quick decision making and high energy (Han, 2019). In fact, Olympic athletes Simone Biles, Michael Phelps, and Molly Seidel all have ADHD. Other Icons with ADHD include musicians Solange Knowles, Henry Lau and engineer Dean Kamen, who invented the Segway and iBOT (Figure PY.12).

Figure PY.12 (a) Solange Knowles performing at Coachella in 2014 (Adapted from work by Neon Tommy, licensed under CC BY 2.0) (b) Henry Lau at the 2020 Korea First Brand Awards ceremony (Adapted from work by NewsInstar, licensed under CC BY 3.0) (c) Dean Kamen speaking at the FIRST robotics world championship in 2012 (Adapted from work by Greg Heartsfield, licensed under CC BY 2.0) (d) Simone Biles with a gold medal at the 2016 olympics

(Adapted from work by Agência Brasil Fotografias, licensed under CC BY 2.0)

Causes of ADHD

Given that ADHD can present in a variety of ways, it makes sense that there are a variety of contributing factors. It appears that ADHD is about 74% heritable, with many genes making small contributions, but environmental factors can also have an influence. For example, ADHD is more likely in those born premature, and those with early childhood infection. This may be because premature birth and infection cause inflammation, which alters neuron and synapse development. Many of the genes associated with ADHD are also involved in the growth and activity of neurons and synapses, especially those that use the neurotransmitters dopamine and norepinephrine. Indeed, the most common drug therapies for ADHD are stimulants like methylphenidate, which target dopamine and norepinephrine systems (Nùñez-Jaramillo et al., 2021).

Stimulants were first prescribed in the 1930's to treat headaches, but they were more effective for helping some people to concentrate. Later, researchers discovered that **stimulant medications** increased dopamine activity in certain areas, so they started studying dopamine systems in people with ADHD (Lange et al., 2010). Now we know that some people with ADHD have less dopamine activity in the basal ganglia, the frontal lobes, and the circuits that connect

the two. Working together these areas are involved in motivation, guiding attention and impulse control using dopamine as a messenger, so this pattern is more associated with attentional and hyperactive traits (Chu et al., 2021) than with inattentive traits. Other people with ADHD have higher than average connectivity between the prefrontal cortex and a subcortical area called the basal ganglia. This area is involved in perceptions of reward, and heightened connectivity here is associated with more impulsivity (Nùñez-Jaramillo et al., 2021).

Treatment and Support

Because there are a variety of factors that can result in the development of ADHD, treatments must be personalized. As we learned earlier, people with ADHD who have less frontal lobe activity respond better to treatment with stimulants, with reduced hyperactivity, impulsivity, and inattention. Commonly prescribed stimulants are amphetamine and related drugs including methylphenidate, which blocks reuptake dopamine and norepinephrine to increase their levels in the synapse; and atomoxetine, which only blocks reuptake of norepinephrine. This increased activity of dopamine supports increased activity in the frontal areas that are less active in some people with ADHD (Nùñez-Jaramillo et al., 2021). However, these drugs aren't effective for everyone, and people taking them usually need other kinds of support.

There are also effective non-pharmacological therapies for

people with ADHD, which aim to teach families and people with ADHD to manage stress and emotions, communicate effectively, and implement strategies to help maintain and direct attention. Some examples of this are **Behavioural Parent Training**, which teaches parents of children with ADHD how to support their children, **Cognitive Behavioural Therapy (CBT)** which aims to alter maladaptive thought patterns, and **Mindfulness training**, which can help in the self-regulation of attention (Modest-Lowe et al., 2015).

Link to Learning

Regular exercise can increase the effectiveness of ADHD drugs, possibly by boosting activity in the prefrontal cortex (Choi et al., 2015). Exercise also improves symptoms of depression and anxiety, especially in combination with psychotherapy, and may also be effective in preventing future depressive symptoms (Hu et al. 2020; Martinsen, 2008). Read this article about exercise intervention for ADHD from the Children and Adults with

Attention deficit/hyperactivity disorder (CHADD) organization, to learn more.

The Autism Spectrum

Min is sitting in class. The fluorescent lights buzz and flicker like strobe lights across their vision. It becomes harder to understand the professor's words in the cloud of static, and they begin to panic. They need to go somewhere darker and quieter, but lectures aren't recorded, and they have trouble interacting with strangers so they don't know anyone to get notes from. They want to rock in their seat so they can calm down and self-regulate, but they've been told it's disruptive. As Min leaves after class, someone speaks to them, but they're so overwhelmed that they can't understand, and it feels like there's something stopping the words in their brain from getting to their mouth. They put a practiced 'friendly' expression on their face, hoping it was appropriate for the social context. They get home just in time to start crying and rocking in the privacy of their room. They can't think or stop, and they're exhausted after. As the term goes on it gets harder to be in class and by the end, Min struggles to speak and leave the house. They have to ask for extensions on their final projects.

Symptoms and Traits

The term 'autism' describes a range of neurotypes that share underlying patterns of activity and connectivity. For this reason, it's referred to as autism spectrum disorder (ASD), acknowledging that autistic people can present in a variety of ways with many different needs. Some autistic people refer to themselves as having 'low-support needs', meaning the impairment they experience requires relatively less support. Others refer to themselves as having 'high support needs', meaning that they need relatively more support to go about daily life. Min's experience represents someone with lower support needs. Autistic people in these groups have the same kinds of traits, many of which can be categorized as differences in social communication and interaction with neurotypical people, or as restricted, repetitive behaviours. These two categories of traits come from the DSM-5, which is currently used in the diagnosis of ASD.

Social Communication and Interaction

There are 3 types of symptoms that may indicate differences in social communication and interaction (APA, 2013):

1. Differences in or absence of social and emotional back and forth, like turn taking in conversation or sharing interests and emotions
2. Differences in or absence of nonverbal communication

behaviours such as eye contact, facial expression, gesture, and other body language
3. Difficulty understanding and performing according to neurotypical social expectations, and difficulty or a lack of interest in developing and maintaining relationships

Because of differences in social behaviour and processing, many autistic people have trouble identifying lies and non-literal language (Williams et al., 2018, Pexman et al., 2010), and benefit from direct communication about social expectations. Autistic non-verbal communication can manifest in different ways; some autistic people have trouble making contact, possibly because the subcortical areas that respond to eye contact are more active in autistic brains, in particular, the amygdala (Hadjikhani, 2017). However, other autistic people have a tendency to stare. Some in the autistic community argue that these traits should be seen as a difference rather than an impairment, as they do not experience the same mismatch in social skills when interacting with other autistic people (Crompton et al., 2020; Davis & Crompton, 2021).

Restrictive and Repetitive Patterns of Behaviour

There are four types of symptoms that may indicate restrictive and repetitive patterns of behaviour (APA, 2013):

1. Repetitive movements, speech or use of objects

2. Preference for sameness and anxiety in response to changes or unexpected events
3. Extremely focused or intense interests, including strong attachments to objects, preoccupation with specific subjects or activities
4. **Hyperreactivity**, an increased response to certain sensory stimuli, and/or **hyporeactivity**, a decreased reactivity to certain sensory stimuli

Because they process sensory stimuli differently, some sensations can be more painful or more pleasurable than they would be for neurotypical people. This can lead to an insistence on sameness, as a way to avoid stimuli that is overwhelming and difficult to deal with (MacLennan, 2020). When sensory differences make sensations more pleasurable, autistic people may be motivated to engage with them repeatedly both because they are enjoyable, and to reduce anxiety. Often, these kinds of repetitive behaviours are called '**stims**" by autistic people, though non-autistic people also stim sometimes (e.g., tapping your foot or twirling your hair). Another common pattern of repeated behaviour for autistic people is the development of intense, long-lasting interests in particular subjects, often called special interests (Grove et al., 2018). Like people with ADHD, autistic people may be prone to hyperfocus, especially when engaging with a special interest.

Common Traits and Experiences

Shutdowns and Meltdowns

Shutdowns and meltdowns are a well-known but under-researched experience for many autistic people. **Meltdowns** are an externalization or release of stress that overwhelms an autistic person's coping mechanisms, often preceded by sensory overload (Phung et al., 2021, Schaber, 2014). Externalization may involve screaming, stomping, sometimes self-injurious stimming and other similar behaviours that allow the autistic person to reduce internal tension.

Shutdowns are the internalized version of meltdowns, also occurring when the individual can't deal with stress and sensory overload. Rather than releasing tension externally, the individual shuts down or dissociates to reduce their exposure to the sensory environment. Adults with autism report that this involves decreased sensation- for example, they may experience physical numbness and narrowing of vision. An autistic person experiencing shutdown may be unresponsive and exhausted (Phung et al., 2021, Schaber, 2014).

During meltdowns and shutdowns, autistic people report impaired cognitive and sensory processing, loss of communication skills, and less control over their body (Nason, 2019). Meltdowns and shutdowns are not intentional and generally can't be stopped once they start. People experiencing meltdown should never be held down, as this practice has the potential to injure and in the worst cases can be fatal (Bartlett

& Ellis, 2020, Vogel, 2014). Rather, care must be taken to help them escape triggering environments and reduce the amount of stimulation and stress they're experiencing so they can recover (Myles & Southwick, 1999).

Dig Deeper

Autistic Masking and Burnout

Masking involves suppressing autistic traits and using a learned set of rules or scripts to blend in with neurotypical people. Not all autistic people can mask, and while masking may help some overcome certain social barriers, it's described as tiring and anxiety provoking (Hull et al., 2017), and is associated with autistic burnout. **Autistic burnout** involves long-term exhaustion, reduced cognitive function, loss of previously mastered skills, social withdrawal and an increase in autistic traits (Higgins et al., 2021, Raymaker et al., 2020). One might lose the ability to perform facial expressions or use verbal language, sensory processing issues intensify, and the

individual may need to spend less time socializing, speaking, and masking (Phung et al, 2021). While unmasking may be beneficial for long term health, it may also put autistic people at increased risk of violence. Data from police reports indicates that 42% of people killed by police in Canada were in mental distress, and data from the US indicates that 33-50% of people killed by police were disabled (Nicholson & Marcoux, 2018; Perry & Carter-Long, 2016). In many of these cases, disabled people displaying non-violent distress or behaviour associated with their disability or neurotype were reported as acting suspicious and were unable to respond to law enforcement as expected, at which point, police proceeded to use violent force. This was the case for Elijah Mccain, who was reported because he 'looked sketchy'. In fact, Elijah was harmlessly stimming by waving his arms, and was wearing an open-faced ski mask to combat cold as a result of his chronic anemia. He had not committed any crime, but he was killed during the encounter because he was visibly distressed, and 'tensed up' when restrained (Thompkin, 2020). As in Elijah's case, this risk is increased for those particularly affected by anti-Black or Indigenous racism, who are already more likely to be victims of police violence

(Lett et al., 2020; Diamond & Hogue, 2021). In order to make it safe for all autistic people to take care of themselves and unmask, systemic forms of oppression must also be addressed.

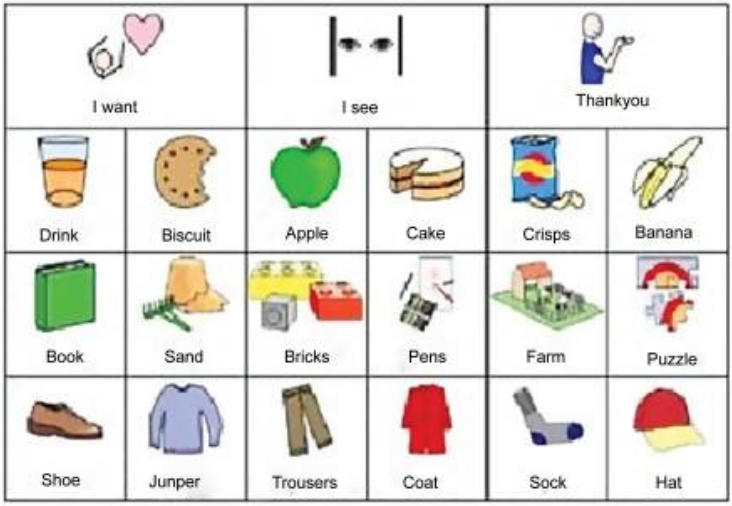

Figure PY.13 An example of a picture exchange communication system. Many AAC devices and apps combine image-based communication with text-to-speech so that users can communicate out loud. (Authors: Shashidhar Chandrashekhar and Jyothi S. Bommangoudar, licensed under CC BY-SA 3.0)

Non-Verbal Autism

Approximately 25-30% of autistic children don't develop

verbal language. Some may develop verbal language skills as they age, while others won't. For years it was assumed that non-verbal autistic people couldn't communicate or advocate for themselves, and while some do have trouble understanding language, others have good comprehension even if they can't speak themselves (Rapin et al., 2009). In these cases, they may need access to alternate forms of communication like picture cards or text-to-speech apps (Figure PY.13). Autistic people given **Augmentative and Alternative Communication (AAC)** methods or technologies communicate significantly more and have better communication skills (Ganz et al., 2012). Forms of sign language are effective for many people on the spectrum and are helpful in improving outcomes autistic children (Goldstein, 2002), and autistic people with intellectual disabilities. Because verbal language is commonly lost during burnouts and meltdowns, AAC can also be helpful for those who are able to speak most of the time.

Link to Learning

Watch these videos on Augmentative and

Alternative Communication (AAC), to learn more. This video from Fairfax County Schools, outlines Augmentative and Alternative Communication (AAC) devices and how they help give students a voice in their learning, and this video from Louisiana AEM showing how to create your own AAC board at home.

Autistic Strengths

Autistic people demonstrate several perceptual advantages, including above average pitch perception, spatial reasoning and recognition of visual patterns (Soulières et al., 2011, Stevenson & Gernsbacher, 2013). For example, some autistic people are **hyperlexic**, meaning that they can read at a higher level than expected for their age, possibly because they have an enhanced ability to recognize the visual characteristics of words (Mottron, 2006). This superior processing for lower-level sensory information also results in superior memory abilities for some autistic people like Stephen Wiltshire, whose exceptional visual memory allows him to accurately illustrate entire cityscapes after a single flight across the skyline. Many autistic people also demonstrate subtle differences in empathic processes and moral reasoning. For example, one study found that they were less likely than neurotypical people to

compromise their moral beliefs for personal gain, even when they were unobserved (Hu et al., 2020), and another found that they were less likely than neurotypical people to show bias towards members of their own group (Uono et al., 2021). Other autistic icons include animal behaviour consultant Temple Grandin, climate activist Greta Thunberg, artist Stephen Wiltshire, and multidisciplinary filmmaker Jorge R. Gutiérrez, who co-wrote and directed *The Book of Life* (Figure PY.14).

Figure PY.14 (a) Stephen Wiltshire, working on cityscape drawing from memory (Adapted from work by Gobierno CDMX, licensed under CC0 1.0). (b) Greta Thunberg, speaking at a climate strike in front of the Reichstag, Berlin (adapted from work by Stefan Müller, licensed under CC BY 2.0). (c) Temple Grandin delivering a TED talk in 2010 (adapted from work by Red Maxwell, licensed under CC BY 2.0). (d) Jorge R. Gutiérrez speaking at a panel on The Book of Life at San Diego comic con in 2014 (adapted from work by Gage Skidmore, licensed under CC BY-SA 2.0).

Causes of Autism

The strongest evidence suggests that autism is mostly heritable. One study involving 2 million children across multiple countries found that genetics accounted for almost 80% of one's likelihood of being diagnosed with autism (Bai et al., 2019). Relatives of people with autism also have higher rates of related genetic syndromes and autistic-like traits (Chaste

& Leboyer, 2022). Hundreds of genes have been identified as having some contribution, and many are involved in neural development, neurotransmitter function, synapse function (Hodges et al., 2020). One of these genes is SHANK3, which codes for synapses that use glutamate. Many autistic people have higher levels of glutamate in the primary motor and somatosensory cortices, and this difference is associated with atypical sensory processing.

Evidence also suggests that some of these genes affect the balance of certain neurotransmitters. For example, some autistic people have higher levels of excitatory neurotransmitters and lower levels of inhibitory neurotransmitters than neurotypical people, and this difference is associated with autistic social cognition and sensory processing (Al-Otaish et al., 2018; Cochran, 2015; He et al., 2021). Differences have also been found in the growth patterns of grey and white matter in certain areas of the cerebellum that are connected to the frontal and parietal lobes, and these differences are associated with autistic social traits and repetitive behaviour (D'Mello et al., 2015). As you might expect, people with autism also have more activity in primary sensory areas, which are associated with differences in sensory processing (Samson, 2011).

There is no support for the theory that vaccines or mercury contribute to the development of autism (DeStefano, 2007), and the paper that suggested this connection was found to

have fabricated evidence (Godlee et al., 2011). Overall, evidence for environmental factors is weak and inconsistent.

Support for Autistic People and Caregivers

Historically, many techniques have aimed to suppress autistic traits, rather than helping autistic people to overcome disadvantages and meet their specific needs. For example, **applied behavioural analysis** (ABA) focuses on punishing autistic behaviours and coping mechanisms like stimming. ABA has been identified as an abusive therapy by the Autistic community (ASAN, 2021; Sandoval-Norton & Shkedy, 2019). Many adult autistics report that punishment for stimming negatively affects their self-confidence and sense of control over their bodies (Kapp et al., 2019, Gardiner, 2017). Stimming indicates that an autistic person may be coping with something overwhelming, so it's better to help them address that if they need assistance. This is especially important for autistic children and non-verbal people with autism, who experience barriers in communicating their needs (Sandoval-Norton & Shkedy, 2019). If someone stims when they are in rooms with yellow light, the light may be overwhelming and could be changed to make them more comfortable. Alternatively, if they can tolerate wearing glasses, coloured lenses might help. If you don't have these kinds of sensitivities, consider how it feels to try and walk with a rock in your shoe. If you can't take the rock out, it might become the only thing you can think about, making it increasingly difficult to engage

with your environment. However, if you take the rock out, you can recover and re-engage. These simple strategies can greatly impact an autistic person's comfort and functioning.

Some autistic people find **Social Skills Training** (SST) helpful. Others argue that SST teaches neurodivergent people to mask and treat social interaction like math problems rather than engaging authentically and learning to identify and communicate their feelings (Roberts, 2022). It is argued that SST devalues neurodivergent social skills, and as we learned earlier autistic people don't experience the same social issues when interacting with each other (Roberts, 2021; Davis & Crompton, 2021). SST may enhance an autistic person's ability to mask and succeed in some domains, but this may also come at a cost to their own wellbeing, and it is possible that it wouldn't be necessary if society were more socially accessible to them.

Given the diversity of people on the spectrum, appropriate supports and accommodations vary widely. Some have already been discussed. For example, AAC can be helpful for those struggling with verbal communication, and alterations to the environment can help with sensory issues. Autistic people may also benefit from **occupational therapy** to learn skills that can help them live more independently and meet their goals. For example, many autistic people have issues with coordination, and benefit from physical training to develop fine motor skills. Occupational therapists can also help identify autistic strengths and recommend modifications to activities and

environments that allow autistic people to perform at their full capacity.

Autistic people and caregivers also experience higher rates of anxiety and depression than neurotypical people, in part because of social stigma and a lack of accessibility. There is evidence that CBT and mindfulness training are effective for treating anxiety and depression in autistic people and caregivers (Ridderinkhof et al., 2017), and that mindfulness training may also have a positive impact on emotional and sensory regulation (White et al., 2018).

Similarities and Differences: Diagnostic Bias

Classically, ADHD and autism are considered conditions that affect White, cisgender AMAB children (*assigned male at birth*). Some estimates suggest that there are four times as many AMAB children as AFAB (*assigned female at birth*) children diagnosed with these conditions (Ramtekkar, 2010). Recently however, adult diagnosis has become more common, and new data indicates that this gender difference shrinks with age (Rutherford et al., 2016). On average, AFAB people are more likely to be misdiagnosed or diagnosed later in life (Adamis, 2022; Dworzynski et al., 2012). This may result from lack of awareness about different presentations of autism and ADHD. For example, AFAB people with ADHD are more likely to have ADHD-PI symptoms, and AFAB autistic people have fewer social traits and more sensory traits (Lai et al., 2011;

Adamis, 2022) than AMAB children. There is likely also a gender bias, as AMAB children are more likely to be referred for diagnosis than AFAB children with equivalent traits (Scuitto et al., 2004). On average AFAB autistic children with official diagnosis also have higher levels of autistic traits than AMAB children, suggesting that AFAB children need to experience more impairment to be diagnosed (Rutherford et al., 2016). Interestingly some data indicates that there are higher than average rates of transgender or gender-diverse identity in neurodiverse populations. For example, Warrier et al. (2020) found that 24% of gender-diverse people in their sample had autism, as compared to only 5% of cisgender people.

Evidence suggests there is also a diagnostic bias against people of color, particularly Black people, as Black autistic children are 2 more likely to be misdiagnosed with conduct disorder than White autistic children with the same traits (Mandell et al., 2006; Fombonne & Zuckerman, 2022). Similarly, Black children are 5.1 times more likely to be diagnosed with adjustment disorder and 2.4 times more likely to be diagnosed with conduct disorder, while White children with the same traits are more likely to be diagnosed with ADHD (Ballentine, 2019). No difference has been found in levels of ADHD or autism-related traits between these groups. If children of color and non-Hispanic White children display the same rates of ADHD and autism-like behaviours but are diagnosed differently, then it's likely that race-based bias is

affecting the way they are being perceived by diagnosticians (Fadus et al., 2019).

Similarities and Differences: Sensory Processing

People with ADHD and/or autism have differences in sensory processing that affect the way they react to stimuli. For example, some are hypo-reactive to interoceptive stimuli, which are sensations that come from inside the body, like hunger pains or the feeling of a full bladder. If you have trouble with **interoception**, you may struggle to identify sensations like pain or hunger, which can cause distress as you may not know how to address unpleasant sensory experiences. Many autistic people also have **alexithymia**, meaning that they have trouble sensing and identifying their own emotions and the emotions of others. Others are hyper-reactive to certain stimuli, like sound, light, and physical sensation. These people may need to wear tinted lenses or ear plugs and may avoid certain kinds of material for clothing in order to avoid becoming overstimulated. It is also possible to be both under and over responsive to a kind of stimuli, and to switch between the two (Wigham, 2014), and some sensory differences can also result in positive experiences. For example, a heightened response to sound can enhance enjoyment of music, while differences in somatosensory processing might make it feel really good or soothing to rock back and forth. Everyone engages in this kind of sensory seeking behaviour sometimes,

but autistic people may be motivated to do this more often, both for enjoyment and for self-care.

Sensory differences influence cognitive and behavioural differences as well. For example, someone with ADHD may have trouble maintaining attention because they are hyper-reactive to sound and are distracted by noises in the environment. This hyper-reactivity could result from a reduced ability to filter stimuli as evidenced by neuroimaging studies, which have found higher activity in lower-level sensory areas like the superior and inferior colliculi, which help the body direct itself toward visual and auditory stimuli (Panagiotidi et al., 2020). Alternatively, people with ADHD may appear inattentive because they have low sensitivity to sound and attempts to get their attention haven't registered (Shimizu et al., 2014). One theory suggests that some people with ADHD are under stimulated at baseline, resulting in hyper-activity and sensation-seeking behaviours to self-generate stimulation. There is evidence that increased environmental simulation can enhance performance for some people with ADHD. For example, Söderlund et al. (2007) found that subjects with ADHD did better on cognitive tasks with white noise in the background. Remember also that stimulant medications prescribed to people with ADHD act by increasing neural stimulation in areas that are under-active (Ogrim et al., 2013).

In people with autism, sensory reactivity can predict stimming, insistence on sameness, and special interests (Kapp

et al., 2019). Like people with ADHD, people with autism have trouble ignoring certain stimuli. This might be because Autistic people take longer to **habituate**, meaning that their nervous systems keep reacting to unchanging stimuli longer than neurotypical people's systems do. Autistic people also seem to filter and group stimuli less than neurotypical people, possibly resulting from differences in association areas, which combine information from different senses. Some evidence suggests that in autistic people, these differences result in better processing for individual stimuli than for groups (Proff et al., 2022; Quintin, 2019). This is a tendency toward local processing, like people with ADHD. For those with ADHD however, this might result from difficulty shifting attention from one detail to another (Gargaro et al., 2015; Cardillo et al., 2020).

135.

SCHIZOPHRENIA

Learning Objectives

By the end of this section, you will be able to:

- Recognize the essential nature of schizophrenia, avoiding the misconception that it involves a split personality
- Categorize and describe the major symptoms of schizophrenia
- Understand the interplay between genetic, biological, and environmental factors that are associated with the development of schizophrenia
- Discuss the importance of research examining prodromal symptoms of schizophrenia

Schizophrenia is a devastating psychological disorder that is characterized by major disturbances in thought, perception, emotion, and behaviour. About 1% of the population experiences schizophrenia in their lifetime, and usually the disorder is first diagnosed during early adulthood (early to mid-20s). Most people with schizophrenia experience significant difficulties in many day-to-day activities, such as holding a job, paying bills, caring for oneself (grooming and hygiene), and maintaining relationships with others. Frequent hospitalizations are more often the rule rather than the exception with schizophrenia. Even when they receive the best treatments available, many with schizophrenia will continue to experience serious social and occupational impairment throughout their lives.

What is schizophrenia? First, schizophrenia is *not* a condition involving a split personality; that is, schizophrenia is not the same thing as dissociative identity disorder (better known as multiple personality disorder). These disorders are sometimes confused because the word *schizophrenia* first coined by the Swiss psychiatrist Eugen Bleuler in 1911, derives from Greek words that refer to a "splitting" (schizo) of psychic functions (phrene) (Green, 2001).

Schizophrenia is considered a psychotic disorder, or one in which the person's thoughts, perceptions, and behaviours are impaired to the point where she is not able to function normally in life. In informal terms, one who suffers from a

psychotic disorder (that is, has a psychosis) is disconnected from the world in which most of us live.

Symptoms of Schizophrenia

The main symptoms of schizophrenia include hallucinations, delusions, disorganized thinking, disorganized or abnormal motor behaviour, and negative symptoms (APA, 2013). A hallucination is a perceptual experience that occurs in the absence of external stimulation. Auditory hallucinations (hearing voices) occur in roughly two-thirds of patients with schizophrenia and are by far the most common form of hallucination (Andreasen, 1987). The voices may be familiar or unfamiliar, they may have a conversation or argue, or the voices may provide a running commentary on the person's behaviour (Tsuang, Farone, & Green, 1999).

Less common are visual hallucinations (seeing things that are not there) and olfactory hallucinations (smelling odours that are not actually present).

Delusions are beliefs that are contrary to reality and are firmly held even in the face of contradictory evidence. Many of us hold beliefs that some would consider odd, but a delusion is easily identified because it is clearly absurd. A person with schizophrenia may believe that his mother is plotting with the FBI to poison his coffee, or that his neighbour is an enemy spy who wants to kill him. These kinds of delusions are known as paranoid delusions, which involve the (false) belief that

other people or agencies are plotting to harm the person. People with schizophrenia also may hold grandiose delusions, beliefs that one holds special power, unique knowledge, or is extremely important. For example, the person who claims to be Jesus Christ, or who claims to have knowledge going back 5,000 years, or who claims to be a great philosopher is experiencing grandiose delusions. Other delusions include the belief that one's thoughts are being removed (thought withdrawal) or thoughts have been placed inside one's head (thought insertion). Another type of delusion is somatic delusion, which is the belief that something highly abnormal is happening to one's body (e.g., that one's kidneys are being eaten by cockroaches).

Disorganized thinking refers to disjointed and incoherent thought processes—usually detected by what a person says. The person might ramble, exhibit loose associations (jump from topic to topic), or talk in a way that is so disorganized and incomprehensible that it seems as though the person is randomly combining words. Disorganized thinking is also exhibited by blatantly illogical remarks (e.g., "Fenway Park is in Boston. I live in Boston. Therefore, I live at Fenway Park.") and by tangentiality: responding to others' statements or questions by remarks that are either barely related or unrelated to what was said or asked. For example, if a person diagnosed with schizophrenia is asked if she is interested in receiving special job training, she might state that she once rode on a train somewhere. To a person with schizophrenia, the tangential

(slightly related) connection between job *training* and riding a *train* are sufficient enough to cause such a response.

Disorganized or abnormal motor behaviour refers to unusual behaviours and movements: becoming unusually active, exhibiting silly child-like behaviours (giggling and self-absorbed smiling), engaging in repeated and purposeless movements, or displaying odd facial expressions and gestures. In some cases, the person will exhibit catatonic behaviours, which show decreased reactivity to the environment, such as posturing, in which the person maintains a rigid and bizarre posture for long periods of time, or catatonic stupor, a complete lack of movement and verbal behaviour.

Negative symptoms are those that reflect noticeable decreases and absences in certain behaviours, emotions, or drives (Green, 2001). A person who exhibits diminished emotional expression shows no emotion in his facial expressions, speech, or movements, even when such expressions are normal or expected. Avolition is characterized by a lack of motivation to engage in self-initiated and meaningful activity, including the most basic of tasks, such as bathing and grooming. Alogia refers to reduced speech output; in simple terms, patients do not say much. Another negative symptom is asociality, or social withdrawal and lack of interest in engaging in social interactions with others. A final negative symptom, anhedonia, refers to an inability to experience pleasure. One who exhibits anhedonia expresses little interest

in what most people consider to be pleasurable activities, such as hobbies, recreation, or sexual activity.

Causes of Schizophrenia

There is considerable evidence suggesting that schizophrenia has a genetic basis. The risk of developing schizophrenia is nearly 6 times greater if one has a parent with schizophrenia than if one does not (Goldstein, Buka, Seidman, & Tsuang, 2010). Additionally, one's risk of developing schizophrenia increases as genetic relatedness to family members diagnosed with schizophrenia increases (Gottesman, 2001).

Genes

When considering the role of genetics in schizophrenia, as in any disorder, conclusions based on family and twin studies are subject to criticism. This is because family members who are closely related (such as siblings) are more likely to share similar environments than are family members who are less closely related (such as cousins); further, identical twins may be more likely to be treated similarly by others than might fraternal twins. Thus, family and twin studies cannot completely rule out the possible effects of shared environments and experiences. Such problems can be corrected by using adoption studies, in which children are separated from their parents at an early age. One of the first adoption studies of

schizophrenia conducted by Heston (1966) followed 97 adoptees, including 47 who were born to mothers with schizophrenia, over a 36-year period. Five of the 47 adoptees (11%) whose mothers had schizophrenia were later diagnosed with schizophrenia, compared to none of the 50 control adoptees. Other adoption studies have consistently reported that for adoptees who are later diagnosed with schizophrenia, their biological relatives have a higher risk of schizophrenia than do adoptive relatives (Shih, Belmonte, & Zandi, 2004).

Although adoption studies have supported the hypothesis that genetic factors contribute to schizophrenia, they have also demonstrated that the disorder most likely arises from a combination of genetic and environmental factors, rather than just genes themselves. For example, investigators in one study examined the rates of schizophrenia among 303 adoptees (Tienari et al., 2004). A total of 145 of the adoptees had biological mothers with schizophrenia; these adoptees constituted the high genetic risk group. The other 158 adoptees had mothers with no psychiatric history; these adoptees composed the low genetic risk group. The researchers managed to determine whether the adoptees' families were either healthy or disturbed. For example, the adoptees were considered to be raised in a disturbed family environment if the family exhibited a lot of criticism, conflict, and a lack of problem-solving skills. The findings revealed that adoptees whose mothers had schizophrenia (high genetic risk) *and* who had been raised in a disturbed family environment were much

more likely to develop schizophrenia or another psychotic disorder (36.8%) than were adoptees whose biological mothers had schizophrenia but who had been raised in a healthy environment (5.8%), or than adoptees with a low genetic risk who were raised in either a disturbed (5.3%) or healthy (4.8%) environment. Because the adoptees who were at high genetic risk were likely to develop schizophrenia *only* if they were raised in a disturbed home environment, this study supports a diathesis-stress interpretation of schizophrenia—both genetic vulnerability and environmental stress are necessary for schizophrenia to develop, genes alone do not show the complete picture.

Neurotransmitters

If we accept that schizophrenia is at least partly genetic in origin, as it seems to be, it makes sense that the next step should be to identify biological abnormalities commonly found in people with the disorder. Perhaps not surprisingly, a number of neurobiological factors have indeed been found to be related to schizophrenia. One such factor that has received considerable attention for many years is the neurotransmitter dopamine. Interest in the role of dopamine in schizophrenia was stimulated by two sets of findings: drugs that increase dopamine levels can produce schizophrenia-like symptoms, and medications that block dopamine activity reduce the symptoms (Howes & Kapur, 2009). The dopamine hypothesis of schizophrenia proposed that an overabundance

of dopamine or too many dopamine receptors are responsible for the onset and maintenance of schizophrenia (Snyder, 1976). More recent work in this area suggests that abnormalities in dopamine vary by brain region and thus contribute to symptoms in unique ways. In general, this research has suggested that an overabundance of dopamine in the limbic system may be responsible for some symptoms, such as hallucinations and delusions, whereas low levels of dopamine in the prefrontal cortex might be responsible primarily for the negative symptoms (avolition, alogia, asociality, and anhedonia) (Davis, Kahn, Ko, & Davidson, 1991). In recent years, serotonin has received attention, and newer antipsychotic medications used to treat the disorder work by blocking serotonin receptors (Baumeister & Hawkins, 2004).

Brain Anatomy

Brain imaging studies reveal that people with schizophrenia have enlarged ventricles, the cavities within the brain that contain cerebral spinal fluid (Green, 2001). This finding is important because larger than normal ventricles suggests that various brain regions are reduced in size, thus implying that schizophrenia is associated with a loss of brain tissue. In addition, many people with schizophrenia display a reduction in grey matter (cell bodies of neurons) in the frontal lobes (Lawrie & Abukmeil, 1998), and many show less frontal lobe activity when performing cognitive tasks (Buchsbaum et al.,

1990). The frontal lobes are important in a variety of complex cognitive functions, such as planning and executing behaviour, attention, speech, movement, and problem solving. Hence, abnormalities in this region provide merit in explaining why people with schizophrenia experience deficits in these of areas.

Events During Pregnancy

Why do people with schizophrenia have these brain abnormalities? A number of environmental factors that could impact normal brain development might be at fault. High rates of obstetric complications in the births of children who later developed schizophrenia have been reported (Cannon, Jones, & Murray, 2002). In addition, people are at an increased risk for developing schizophrenia if the pregnant parent was exposed to influenza during the first trimester of pregnancy (Brown et al., 2004). Research has also suggested that a pregnant parent's emotional stress during pregnancy may increase the risk of schizophrenia in offspring. One study reported that the risk of schizophrenia is elevated substantially in offspring whose pregnant parent experienced the death of a relative during the first trimester of pregnancy (Khashan et al., 2008).

Marijuana

Another variable that is linked to schizophrenia

is marijuana use. Although a number of reports have shown that individuals with schizophrenia are more likely to use marijuana than are individuals without schizophrenia (Thornicroft, 1990), such investigations cannot determine if marijuana use leads to schizophrenia, or vice versa. However, a number of longitudinal studies have suggested that marijuana use is, in fact, a risk factor for schizophrenia. A classic investigation of over 45,000 Swedish conscripts who were followed up after 15 years found that those individuals who had reported using marijuana at least once by the time of conscription were more than 2 times as likely to develop schizophrenia during the ensuing 15 years than were those who reported never using marijuana; those who had indicated using marijuana 50 or more times were 6 times as likely to develop schizophrenia (Andréasson, Allbeck, Engström, & Rydberg, 1987). More recently, a review of 35 longitudinal studies found a substantially increased risk of schizophrenia and other psychotic disorders in people who had used marijuana, with the greatest risk in the most frequent users (Moore et al., 2007). Other work has found that marijuana use is associated with an onset of psychotic disorders at an earlier age (Large, Sharma, Compton, Slade, & Nielssen, 2011). Overall, the available evidence seems to indicate that marijuana use plays a causal role in the development of schizophrenia, although it is important to point out that marijuana use is not an essential or sufficient risk factor as not all people with schizophrenia have used marijuana and the majority of

marijuana users do not develop schizophrenia (Casadio, Fernandes, Murray, & Di Forti, 2011). One plausible interpretation of the data is that early marijuana use may disrupt normal brain development during important early maturation periods in adolescence (Trezza, Cuomo, & Vanderschuren, 2008). Thus, early marijuana use may set the stage for the development of schizophrenia and other psychotic disorders, especially among individuals with an established vulnerability (Casadio et al., 2011).

TRICKY TOPIC: CAUSES OF SCHIZOPHRENIA

One or more interactive elements has been excluded from this version of the text. You can view them online here: https://caul-cbua.pressbooks.pub/intropsychneuro/?p=547#oembed-1

If the video above does not load, click here: https://youtu.be/MO2xyB3T7WQ
For a full transcript of this video, click here

Schizophrenia: Early Warning Signs

Early detection and treatment of conditions such as heart disease and cancer have improved survival rates and quality of life for people who suffer from these conditions. A new approach involves identifying people who show minor symptoms of psychosis, such as unusual thought content, paranoia, odd communication, delusions, problems at school or work, and a decline in social functioning—which are coined prodromal symptoms—and following these individuals over time to determine which of them develop a psychotic disorder and which factors best predict such a disorder. A number of factors have been identified that predict a greater likelihood that prodromal individuals will develop a psychotic disorder: genetic risk (a family history of psychosis), recent deterioration in functioning, high levels of unusual thought content, high levels of suspicion or paranoia, poor social functioning, and a history of substance abuse (Fusar-Poli et al., 2013). Further research will enable a more accurate prediction of those at greatest risk for developing schizophrenia, and thus to whom early intervention efforts should be directed.

136.

MOOD DISORDERS

Learning Objectives

By the end of this section, you will be able to:

- Distinguish normal states of sadness and euphoria from states of depression and mania
- Describe the symptoms of major depressive disorder and bipolar disorder
- Understand the differences between major depressive disorder and persistent depressive disorder, and identify two subtypes of depression
- Define the criteria for a manic episode
- Understand genetic, biological, and psychological explanations of major

depressive disorder

Blake cries all day and feels worthless and that life is hopeless; he cannot get out of bed. Crystal stays up all night, talks very rapidly, and went on a shopping spree in which she spent $3,000 on furniture, although she cannot afford it. Jordan recently had a baby, and feels overwhelmed, teary, anxious, and panicked practically every day since the baby was born. Jordan also believes they are a terrible parent. All these individuals demonstrate symptoms of a potential mood disorder.

Mood disorders (Figure PY.14) are characterized by severe disturbances in mood and emotions—most often depression, but also mania and elation (Rothschild, 1999). All of us experience fluctuations in our moods and emotional states, and often these fluctuations are caused by events in our lives. We become elated if our favourite team wins the World Series and dejected if a romantic relationship ends or if we lose our job. At times, we feel fantastic or miserable for no clear reason. People with mood disorders also experience mood fluctuations, but their fluctuations are extreme, distort their outlook on life, and impair their ability to function.

Figure PY.14 Mood disorders are characterized by massive disruptions in mood. Symptoms can range from the extreme sadness and hopelessness of depression to the extreme elation and irritability of mania. (credit: Kiran Foster)

The DSM-5 lists two general categories of mood disorders. Depressive disorders are a group of disorders in which depression is the main feature. Depression is a vague

term that, in everyday language, refers to an intense and persistent sadness. Depression is a heterogeneous mood state—it consists of a broad spectrum of symptoms that range in severity. Depressed people feel sad, discouraged, and hopeless. These individuals lose interest in activities once enjoyed, often experience a decrease in drives such as hunger and sex, and frequently doubt personal worth. Depressive disorders vary by degree, but this chapter highlights the most well-known: major depressive disorder (sometimes called unipolar depression).

Bipolar and related disorders are a group of disorders in which mania is the defining feature. Mania is a state of extreme elation and agitation. When people experience mania, they may become extremely talkative, behave recklessly, or attempt to take on many tasks simultaneously. The most recognized of these disorders is bipolar disorder.

Major Depressive Disorder

According to the DSM-5, the defining symptoms of major depressive disorder include "depressed mood most of the day, nearly every day" (feeling sad, empty, hopeless, or appearing tearful to others), and loss of interest and pleasure in usual activities (APA, 2013). In addition to feeling overwhelmingly sad most of each day, people with depression will no longer show interest or enjoyment in activities that previously were gratifying, such as hobbies, sports, sex, social events, time spent

with family, and so on. Friends and family members may notice that the person has completely abandoned previously enjoyed hobbies; for example, an avid tennis player who develops major depressive disorder no longer plays tennis (Rothschild, 1999).

To receive a diagnosis of major depressive disorder, one must experience a total of five symptoms for at least a two-week period; these symptoms must cause significant distress or impair normal functioning, and they must not be caused by substances or a medical condition. At least one of the two symptoms mentioned above must be present, plus any combination of the following symptoms (APA, 2013):

- significant weight loss (when not dieting) or weight gain and/or significant decrease or increase in appetite;
- difficulty falling asleep or sleeping too much;
- psychomotor agitation (the person is noticeably fidgety and jittery, demonstrated by behaviours like the inability to sit, pacing, hand-wringing, pulling or rubbing of the skin, clothing, or other objects) or psychomotor retardation (the person talks and moves slowly, for example, talking softly, very little, or in a monotone);
- fatigue or loss of energy;
- feelings of worthlessness or guilt;
- difficulty concentrating and indecisiveness; and
- suicidal ideation: thoughts of death (not just fear of dying), thinking about or planning suicide, or making an

actual suicide attempt.

Major depressive disorder is considered episodic: its symptoms are typically present at their full magnitude for a certain period of time and then gradually abate. Approximately 50%–60% of people who experience an episode of major depressive disorder will have a second episode at some point in the future; those who have had two episodes have a 70% chance of having a third episode, and those who have had three episodes have a 90% chance of having a fourth episode (Rothschild, 1999). Although the episodes can last for months, a majority a people diagnosed with this condition (around 70%) recover within a year. However, a substantial number do not recover; around 12% show serious signs of impairment associated with major depressive disorder after 5 years (Boland & Keller, 2009). In the long-term, many who do recover will still show minor symptoms that fluctuate in their severity (Judd, 2012).

Results of Major Depressive Disorder

Major depressive disorder is a serious and incapacitating condition that can have a devastating effect on the quality of one's life. The person suffering from this disorder lives a profoundly miserable existence that often results in unavailability for work or education, abandonment of promising careers, and lost wages; occasionally, the condition requires hospitalization. The majority of those with major depressive disorder report having faced some kind of

discrimination, and many report that having received such treatment has stopped them from initiating close relationships, applying for jobs for which they are qualified, and applying for education or training (Lasalvia et al., 2013). Major depressive disorder also takes a toll on health. Depression is a risk factor for the development of heart disease in healthy patients, as well as adverse cardiovascular outcomes in patients with preexisting heart disease (Whooley, 2006).

Risk Factors for Major Depressive Disorder

Major depressive disorder is often referred to as the common cold of psychiatric disorders. Around 6.6% of the U.S. population experiences major depressive disorder each year; 16.9% will experience the disorder during their lifetime (Kessler & Wang, 2009). It is more common among women than among men, affecting approximately 20% of women and 13% of men at some point in their life (National Comorbidity Survey, 2007). The greater risk among women is not accounted for by a tendency to report symptoms or to seek help more readily, suggesting that gender differences in the rates of major depressive disorder may reflect biological and gender-related environmental experiences (Kessler, 2003).

Lifetime rates of major depressive disorder tend to be highest in North and South America, Europe, and Australia; they are considerably lower in Asian countries (Hasin, Fenton, & Weissman, 2011). The rates of major depressive disorder are higher among younger age cohorts than among older cohorts,

perhaps because people in younger age cohorts are more willing to admit depression (Kessler & Wang, 2009).

A number of risk factors are associated with major depressive disorder: unemployment (including homemakers); earning less than $20,000 per year; living in urban areas; or being separated, divorced, or widowed (Hasin et al., 2011). Comorbid disorders include anxiety disorders and substance abuse disorders (Kessler & Wang, 2009).

Subtypes of Depression

The DSM-5 lists several different subtypes of depression. These subtypes—what the DSM-5 refer to as specifiers—are not specific disorders; rather, they are labels used to indicate specific patterns of symptoms or to specify certain periods of time in which the symptoms may be present. One subtype, seasonal pattern, applies to situations in which a person experiences the symptoms of major depressive disorder only during a particular time of year (e.g., fall or winter). In everyday language, people often refer to this subtype as the winter blues.

Another subtype, peripartum onset (commonly referred to as postpartum depression), applies to people who experience major depression during pregnancy or in the four weeks following the birth of their child (APA, 2013). These people often feel very anxious and may even have panic attacks. They may feel guilty, agitated, and be weepy. They may not want to hold or care for their newborn, even in cases in which the

pregnancy was desired and intended. In extreme cases, the parent may have feelings of wanting to harm the child or themselves. In a horrific illustration, a woman named Andrea Yates, who suffered from extreme peripartum-onset depression (as well as other mental illnesses), drowned her five children in a bathtub (Roche, 2002). Most women with peripartum-onset depression do not physically harm their children, but most do have difficulty being adequate caregivers (Fields, 2010). A surprisingly high number of women experience symptoms of peripartum-onset depression. A study of 10,000 women who had recently given birth found that 14% screened positive for peripartum-onset depression, and that nearly 20% reported having thoughts of wanting to harm themselves (Wisner et al., 2013).

People with persistent depressive disorder (previously known as dysthymia) experience depressed moods most of the day nearly every day for at least two years, as well as at least two of the other symptoms of major depressive disorder. People with persistent depressive disorder are chronically sad and melancholy, but do not meet all the criteria for major depression. However, episodes of full-blown major depressive disorder can occur during persistent depressive disorder (APA, 2013).

Bipolar Disorder

A person with bipolar disorder (commonly known as manic

depression) often experiences mood states that vacillate between depression and mania; that is, the person's mood is said to alternate from one emotional extreme to the other (in contrast to unipolar, which indicates a persistently sad mood).

To be diagnosed with bipolar disorder, a person must have experienced a manic episode at least once in their life; although major depressive episodes are common in bipolar disorder, they are not required for a diagnosis (APA, 2013). According to the DSM-5, a manic episode is characterized as a "distinct period of abnormally and persistently elevated, expansive, or irritable mood and abnormally and persistently increased activity or energy lasting at least one week," that lasts most of the time each day (APA, 2013, p. 124). During a manic episode, some experience a mood that is almost euphoric and become excessively talkative, sometimes spontaneously starting conversations with strangers; others become excessively irritable and complain or make hostile comments. The person may talk loudly and rapidly, exhibiting flight of ideas, abruptly switching from one topic to another. These individuals are easily distracted, which can make a conversation very difficult. They may exhibit grandiosity, in which they experience inflated but unjustified self-esteem and self-confidence. For example, they might quit a job in order to "strike it rich" in the stock market, despite lacking the knowledge, experience, and capital for such an endeavour. They may take on several tasks at the same time (e.g., several time-consuming projects at work) and yet show little, if any,

need for sleep; some may go for days without sleep. Patients may also recklessly engage in pleasurable activities that could have harmful consequences, including spending sprees, reckless driving, making foolish investments, excessive gambling, or engaging in sexual encounters with strangers (APA, 2013).

During a manic episode, individuals usually feel as though they are not ill and do not need treatment. However, the reckless behaviours that often accompany these episodes—which can be antisocial, illegal, or physically threatening to others—may require involuntary hospitalization (APA, 2013). Some patients with bipolar disorder will experience a rapid-cycling subtype, which is characterized by at least four manic episodes (or some combination of at least four manic and major depressive episodes) within one year.

Link to Learning

Watch 'The Other Side of Me', in which Julie Kraft

describes her lived experience with biopolar disorder.

Risk Factors for Bipolar Disorder

Bipolar disorder is considerably less frequent than major depressive disorder. In the United States, 1 out of every 167 people meets the criteria for bipolar disorder each year, and 1 out of 100 meet the criteria within their lifetime (Merikangas et al., 2011). The rates are higher in men than in women, and about half of those with this disorder report onset before the age of 25 (Merikangas et al., 2011). Around 90% of those with bipolar disorder have a comorbid disorder, most often an anxiety disorder or a substance abuse problem. Unfortunately, close to half of the people suffering from bipolar disorder do not receive treatment (Merikangas & Tohen, 2011). Suicide rates are extremely high among those with bipolar disorder: around 36% of individuals with this disorder attempt suicide at least once in their lifetime (Novick, Swartz, & Frank, 2010), and between 15%–19% complete suicide (Newman, 2004).

The Biological Basis of Mood Disorders

Mood disorders have been shown to have a strong genetic and biological basis. Relatives of those with major depressive disorder have double the risk of developing major depressive disorder, whereas relatives of patients with bipolar disorder have over nine times the risk (Merikangas et al., 2011). The rate of concordance for major depressive disorder is higher among identical twins than fraternal twins (50% vs. 38%, respectively), as is that of bipolar disorder (67% vs. 16%, respectively), suggesting that genetic factors play a stronger role in bipolar disorder than in major depressive disorder (Merikangas et al. 2011).

People with mood disorders often have imbalances in certain neurotransmitters, particularly norepinephrine and serotonin (Thase, 2009). These neurotransmitters are important regulators of the bodily functions that are disrupted in mood disorders, including appetite, sex drive, sleep, arousal, and mood. Medications that are used to treat major depressive disorder typically boost serotonin and norepinephrine activity, whereas lithium—used in the treatment of bipolar disorder—blocks norepinephrine activity at the synapses (Figure PY.15).

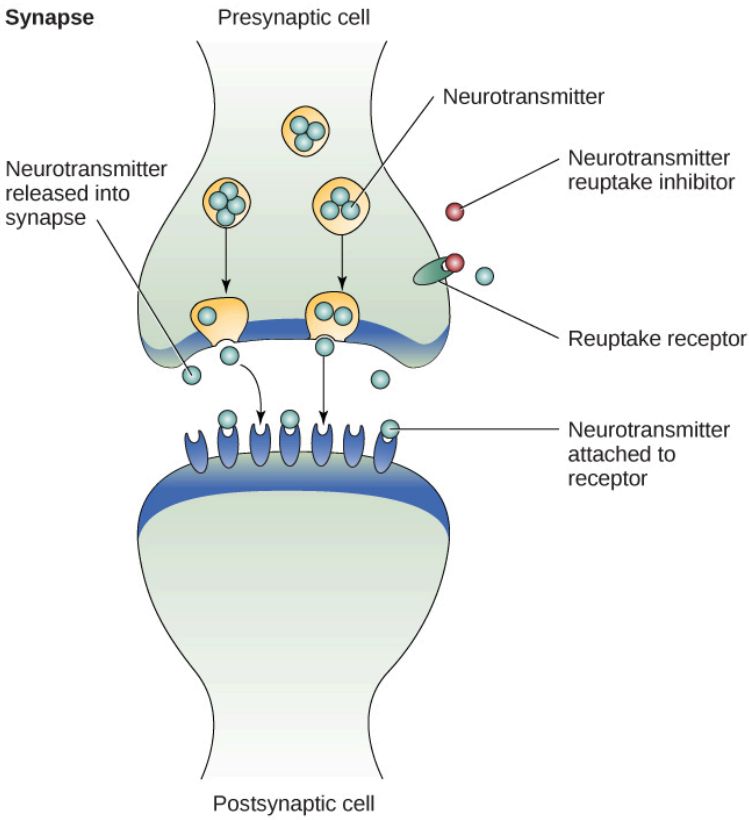

Figure PY.15 Many medications designed to treat mood disorders work by altering neurotransmitter activity in the neural synapse.

Depression is linked to abnormal activity in several regions of the brain (Fitzgerald, Laird, Maller, & Daskalakis, 2008) including those important in assessing the emotional significance of stimuli and experiencing emotions (amygdala), and in regulating and controlling emotions (like the prefrontal cortex, or PFC) (LeMoult, Castonguay, Joormann,

& McAleavey, 2013). Depressed individuals show elevated amygdala activity (Drevets, Bogers, & Raichle, 2002), especially when presented with negative emotional stimuli, such as photos of sad faces (Figure PY.16) (Surguladze et al., 2005). Interestingly, heightened amygdala activation to negative emotional stimuli among depressed persons occurs even when stimuli are presented outside of conscious awareness (Victor, Furey, Fromm, Öhman, & Drevets, 2010), and it persists even after the negative emotional stimuli are no longer present (Siegle, Thompson, Carter, Steinhauer, & Thase, 2007). Additionally, depressed individuals exhibit less activation in the prefrontal, particularly on the left side (Davidson, Pizzagalli, & Nitschke, 2009). Because the PFC can dampen amygdala activation, thereby enabling one to suppress negative emotions (Phan et al., 2005), decreased activation in certain regions of the PFC may inhibit its ability to override negative emotions that might then lead to more negative mood states (Davidson et al., 2009). These findings suggest that depressed persons are more prone to react to emotionally negative stimuli, yet have greater difficulty controlling these reactions.

Figure PY.16 Depressed individuals react to negative emotional stimuli, such as sad faces, with greater amygdala activation than do non-depressed individuals. (credit: Ian Munroe)

Since the 1950s, researchers have noted that depressed individuals have abnormal levels of cortisol, a stress hormone released into the blood by the neuroendocrine system during times of stress (Mackin & Young, 2004). When cortisol is released, the body initiates a fight-or-flight response in reaction to a threat or danger. Many people with depression show elevated cortisol levels (Holsboer & Ising, 2010), especially those reporting a history of early life trauma such as the loss of a parent or abuse during childhood (Baes, Tofoli, Martins, & Juruena, 2012). Such findings raise the question of whether high cortisol levels are a cause or a consequence of depression. High levels of cortisol are a risk factor for future depression (Halligan, Herbert, Goodyer, & Murray, 2007), and cortisol

activates activity in the amygdala while deactivating activity in the PFC (McEwen, 2005)—both brain disturbances are connected to depression. Thus, high cortisol levels may have a causal effect on depression, as well as on its brain function abnormalities (van Praag, 2005). Also, because stress results in increased cortisol release (Michaud, Matheson, Kelly, Anisman, 2008), it is equally reasonable to assume that stress may precipitate depression.

A Diathesis-Stress Model and Major Depressive Disorders

Indeed, it has long been believed that stressful life events can trigger depression, and research has consistently supported this conclusion (Mazure, 1998). Stressful life events include significant losses, such as death of a loved one, divorce or separation, and serious health and money problems; life events such as these often precede the onset of depressive episodes (Brown & Harris, 1989). In particular, exit events—instances in which an important person departs (e.g., a death, divorce or separation, or a family member leaving home)—often occur prior to an episode (Paykel, 2003). Exit events are especially likely to trigger depression if these happenings occur in a way that humiliates or devalues the individual. For example, people who experience the breakup of a relationship initiated by the other person develop major depressive disorder at a rate more

than 2 times that of people who experience the death of a loved one (Kendler, Hettema, Butera, Gardner, & Prescott, 2003).

Likewise, individuals who are exposed to traumatic stress during childhood—such as separation from a parent, family turmoil, and maltreatment (physical or sexual abuse)—are at a heightened risk of developing depression at any point in their lives (Kessler, 1997). A recent review of 16 studies involving over 23,000 subjects concluded that those who experience childhood maltreatment are more than 2 times as likely to develop recurring and persistent depression (Nanni, Uher, & Danese, 2012).

Of course, not everyone who experiences stressful life events or childhood adversities succumbs to depression—indeed, most do not. Clearly, a diathesis-stress interpretation of major depressive disorder, in which certain predispositions or vulnerability factors influence one's reaction to stress, would seem logical. If so, what might such predispositions be? A study by Caspi and others (2003) suggests that an alteration in a specific gene that regulates serotonin (the 5-HTTLPR gene) might be one culprit. These investigators found that people who experienced several stressful life events were significantly more likely to experience episodes of major depression if they carried one or two short versions of this gene than if they carried two long versions. Those who carried one or two short versions of the 5-HTTLPR gene were unlikely to experience an episode, however, if they had experienced few or no stressful life events. Numerous studies have replicated these findings,

including studies of people who experienced maltreatment during childhood (Goodman & Brand, 2009). In a recent investigation conducted in the United Kingdom (Brown & Harris, 2013), researchers found that childhood maltreatment before age 9 elevated the risk of chronic adult depression (a depression episode lasting for at least 12 months) among those individuals having one (LS) or two (SS) short versions of the 5-HTTLPR gene (Figure PY.17). Childhood maltreatment did not increase the risk for chronic depression for those have two long (LL) versions of this gene. Thus, genetic vulnerability may be one mechanism through which stress potentially leads to depression.

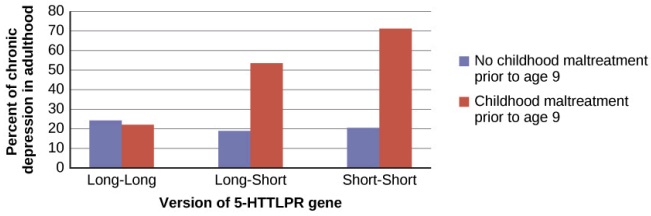

Figure PY.17 A study on gene-environment interaction in people experiencing chronic depression in adulthood suggests a much higher incidence in individuals with a short version of the gene in combination with childhood maltreatment (Brown & Harris, 2013).

Cognitive Theories of Depression

Cognitive theories of depression take the view that depression is triggered by negative thoughts, interpretations, self-evaluations, and expectations (Joormann, 2009).

These diathesis-stress models propose that depression is triggered by a "cognitive vulnerability" (negative and maladaptive thinking) and by precipitating stressful life events (Gotlib & Joormann, 2010). Perhaps the most well-known cognitive theory of depression was developed in the 1960s by psychiatrist Aaron Beck, based on clinical observations and supported by research (Beck, 2008). Beck theorized that depression-prone people possess depressive schemas, or mental predispositions to think about most things in a negative way (Beck, 1976). Depressive schemas contain themes of loss, failure, rejection, worthlessness, and inadequacy, and may develop early in childhood in response to adverse experiences, then remain dormant until they are activated by stressful or negative life events. Depressive schemas prompt dysfunctional and pessimistic thoughts about the self, the world, and the future. Beck believed that this dysfunctional style of thinking is maintained by cognitive biases, or errors in how we process information about ourselves, which lead us to focus on negative aspects of experiences, interpret things negatively, and block positive memories (Beck, 2008). A person whose depressive schema consists of a theme of rejection might be overly attentive to social cues of rejection (more likely to notice another's frown), and he might interpret this cue as a sign of rejection and automatically remember past incidents of rejection. Longitudinal studies have supported Beck's theory, in showing that a preexisting tendency to engage in this negative, self-defeating style of thinking—when combined

with life stress—over time predicts the onset of depression (Dozois & Beck, 2008). Cognitive therapies for depression, aimed at changing a depressed person's negative thinking, were developed as an expansion of this theory (Beck, 1976).

Another cognitive theory of depression, hopelessness theory, postulates that a particular style of negative thinking leads to a sense of hopelessness, which then leads to depression (Abramson, Metalsky, & Alloy, 1989). According to this theory, hopelessness is an expectation that unpleasant outcomes will occur or that desired outcomes will not occur, and there is nothing one can do to prevent such outcomes. A key assumption of this theory is that hopelessness stems from a tendency to perceive negative life events as having stable ("It's never going to change") and global ("It's going to affect my whole life") causes, in contrast to unstable ("It's fixable") and specific ("It applies only to this particular situation") causes, especially if these negative life events occur in important life realms, such as relationships, academic achievement, and the like. Suppose a student who wishes to go to law school does poorly on an admissions test. If the student infers negative life events as having stable and global causes, she may believe that her poor performance has a stable and global cause ("I lack intelligence, and it's going to prevent me from ever finding a meaningful career"), as opposed to an unstable and specific cause ("I was sick the day of the exam, so my low score was a fluke"). Hopelessness theory predicts that people who exhibit this cognitive style in response to undesirable life events will

view such events as having negative implications for their future and self-worth, thereby increasing the likelihood of hopelessness—the primary cause of depression (Abramson et al., 1989). One study testing hopelessness theory measured the tendency to make negative inferences for bad life effects in participants who were experiencing uncontrollable stressors. Over the ensuing six months, those with scores reflecting high cognitive vulnerability were 7 times more likely to develop depression compared to those with lower scores (Kleim, Gonzalo, & Ehlers, 2011).

A third cognitive theory of depression focuses on how people's thoughts about their distressed moods—depressed symptoms in particular—can increase the risk and duration of depression. This theory, which focuses on rumination in the development of depression, was first described in the late 1980s to explain the higher rates of depression in women than in men (Nolen-Hoeksema, 1987). Rumination is the repetitive and passive focus on the fact that one is depressed and dwelling on depressed symptoms, rather that distracting one's self from the symptoms or attempting to address them in an active, problem-solving manner (Nolen-Hoeksema, 1991). When people ruminate, they have thoughts such as "Why am I so unmotivated? I just can't get going. I'm never going to get my work done feeling this way" (Nolen-Hoeksema & Hilt, 2009, p. 393). Women are more likely than men to ruminate when they are sad or depressed (Butler & Nolen-Hoeksema, 1994), and the tendency to ruminate is associated with

increases in depression symptoms (Nolen-Hoeksema, Larson, & Grayson, 1999), heightened risk of major depressive episodes (Abela & Hankin, 2011), and chronicity of such episodes (Robinson & Alloy, 2003).

137.

ANXIETY DISORDERS

Learning Objectives

By the end of this section, you will be able to:

- Distinguish normal anxiety from pathological anxiety
- List and describe the major anxiety disorders, including their main features and prevalence
- Describe basic psychological and biological factors that are suspected to be important in the aetiology of anxiety disorder

Everybody experiences anxiety from time to time. Although anxiety is closely related to fear, the two states possess important differences. Fear involves an instantaneous reaction

to an imminent threat, whereas anxiety involves apprehension, avoidance, and cautiousness regarding a potential threat, danger, or other negative event (Craske, 1999). While anxiety is unpleasant to most people, it is important to our health, safety, and well-being. Anxiety motivates us to take actions—such as preparing for exams, watching our weight, showing up to work on time—that enable us to avert potential future problems. Anxiety also motivates us to avoid certain things—such as running up debts and engaging in illegal activities—that could lead to future trouble. Most individuals' level and duration of anxiety approximates the magnitude of the potential threat they face. Some people experience anxiety that is excessive, persistent, and greatly out of proportion to the actual threat; if one's anxiety has a disruptive influence on one's life, this is a strong indicator that the individual is experiencing an anxiety disorder.

Anxiety disorders are characterized by excessive and persistent fear and anxiety, and by related disturbances in behaviour (APA, 2013). Although anxiety is universally experienced, anxiety disorders cause considerable distress. As a group, anxiety disorders are common: approximately 25%–30% of the U.S. population meets the criteria for at least one anxiety disorder during their lifetime (Kessler et al., 2005). Also, these disorders appear to be much more common in women than they are in men; within a 12-month period, around 23% of women and 14% of men will experience at least one anxiety disorder (National Comorbidity Survey, 2007).

Anxiety disorders are the most frequently occurring class of mental disorders and are often comorbid with each other and with other mental disorders (Kessler, Ruscio, Shear, & Wittchen, 2009).

Specific Phobia

Phobia is a Greek word that means fear. A person diagnosed with a specific phobia (formerly known as simple phobia) experiences excessive, distressing, and persistent fear or anxiety about a specific object or situation (such as animals, enclosed spaces, elevators, or flying) (APA, 2013). Even though people realize their level of fear and anxiety in relation to the phobic stimulus is irrational, some people with a specific phobia may go to great lengths to avoid the phobic stimulus (the object or situation that triggers the fear and anxiety). Typically, the fear and anxiety a phobic stimulus elicits is disruptive to the person's life. For example, a man with a phobia of flying might refuse to accept a job that requires frequent air travel, thus negatively affecting his career. Clinicians who have worked with people who have specific phobias have encountered many kinds of phobias, some of which are shown in Table PY.1.

Table PY.1 Specific Phobias

Phobia	Feared Object or Situation
Acrophobia	heights
Aerophobia	flying
Arachnophobia	spiders
Claustrophobia	enclosed spaces
Cynophobia	dogs
Hematophobia	blood
Ophidiophobia	snakes
Taphophobia	being buried alive
Trypanophobia	injections

Specific phobias are common; in the United States, around 12.5% of the population will meet the criteria for a specific phobia at some point in their lifetime (Kessler et al., 2005). One type of phobia, agoraphobia, is listed in the DSM-5 as a separate anxiety disorder. Agoraphobia, which literally means "fear of the marketplace," is characterized by intense fear, anxiety, and avoidance of situations in which it might be difficult to escape or receive help if one experiences symptoms of a panic attack (a state of extreme anxiety that we will discuss shortly). These situations include public transportation, open spaces (parking lots), enclosed spaces (stores), crowds, or being outside the home alone (APA,

2013). About 1.4% of Americans experience agoraphobia during their lifetime (Kessler et al., 2005).

Acquisition of Phobias Through Learning

Many theories suggest that phobias develop through learning. Rachman (1977) proposed that phobias can be acquired through three major learning pathways. The first pathway is through classical conditioning. As you may recall, classical conditioning is a form of learning in which a previously neutral stimulus is paired with an unconditioned stimulus (UCS) that reflexively elicits an unconditioned response (UCR), eliciting the same response through its association with the unconditioned stimulus. The response is called a conditioned response (CR). For example, a child who has been bitten by a dog may come to fear dogs because of a past association with pain. In this case, the dog bite is the UCS and the fear it elicits is the UCR. Because a dog was associated with the bite, any dog may come to serve as a conditioned stimulus, thereby eliciting fear; the fear the child experiences around dogs, then, becomes a CR.

The second pathway of phobia acquisition is through vicarious learning, such as modelling. For example, a child who observes his cousin react fearfully to spiders may later express the same fears, even though spiders have never presented any danger to him. This phenomenon has been observed in both

humans and nonhuman primates (Olsson & Phelps, 2007). A study of laboratory-reared monkeys readily acquired a fear of snakes after observing wild-reared monkeys react fearfully to snakes (Mineka & Cook, 1993).

The third pathway is through verbal transmission or information. For example, a child whose parents, siblings, friends, and classmates constantly tell her how disgusting and dangerous snakes are may come to acquire a fear of snakes.

Interestingly, people are more likely to develop phobias of things that do not represent much actual danger to themselves, such as animals and heights, and are less likely to develop phobias toward things that present legitimate danger in contemporary society, such as motorcycles and weapons (Öhman & Mineka, 2001). Why might this be so? One theory suggests that the human brain is evolutionarily predisposed to more readily associate certain objects or situations with fear (Seligman, 1971). This theory argues that throughout our evolutionary history, our ancestors associated certain stimuli (e.g., snakes, spiders, heights, and thunder) with potential danger. As time progressed, the mind has become adapted to more readily develop fears of these things than of others. Experimental evidence has consistently demonstrated that conditioned fears develop more readily to fear-relevant stimuli (images of snakes and spiders) than to fear-irrelevant stimuli (images of flowers and berries) (Öhman & Mineka, 2001). Such prepared learning has also been shown to occur in monkeys. In one study (Cook & Mineka, 1989), monkeys

watched videotapes of model monkeys reacting fearfully to either fear-relevant stimuli (toy snakes or a toy crocodile) or fear-irrelevant stimuli (flowers or a toy rabbit). The observer monkeys developed fears of the fear-relevant stimuli but not the fear-irrelevant stimuli.

Social Anxiety Disorder

Social anxiety disorder (formerly called social phobia) is characterized by extreme and persistent fear or anxiety and avoidance of social situations in which the person could potentially be evaluated negatively by others (APA, 2013). As with specific phobias, social anxiety disorder is common in the United States; a little over 12% of all Americans experience social anxiety disorder during their lifetime (Kessler et al., 2005).

The heart of the fear and anxiety in social anxiety disorder is the person's concern that he may act in a humiliating or embarrassing way, such as appearing foolish, showing symptoms of anxiety (blushing), or doing or saying something that might lead to rejection (such as offending others). The kinds of social situations in which individuals with social anxiety disorder usually have problems include public speaking, having a conversation, meeting strangers, eating in restaurants, and, in some cases, using public restrooms. Although many people become anxious in social situations like public speaking, the fear, anxiety, and avoidance experienced in

social anxiety disorder are highly distressing and lead to serious impairments in life. Adults with this disorder are more likely to experience lower educational attainment and lower earnings (Katzelnick et al., 2001), perform more poorly at work and are more likely to be unemployed (Moitra, Beard, Weisberg, & Keller, 2011), and report greater dissatisfaction with their family lives, friends, leisure activities, and income (Stein & Kean, 2000).

When people with social anxiety disorder are unable to avoid situations that provoke anxiety, they typically perform safety behaviours: mental or behavioural acts that reduce anxiety in social situations by reducing the chance of negative social outcomes. Safety behaviours include avoiding eye contact, rehearsing sentences before speaking, talking only briefly, and not talking about oneself (Alden & Bieling, 1998). Other examples of safety behaviours include the following (Marker, 2013):

- assuming roles in social situations that minimize interaction with others (e.g., taking pictures, setting up equipment, or helping prepare food)
- asking people many questions to keep the focus off of oneself
- selecting a position to avoid scrutiny or contact with others (sitting in the back of the room)
- wearing bland, neutral clothes to avoid drawing attention to oneself

- avoiding substances or activities that might cause anxiety symptoms (such as caffeine, warm clothing, and physical exercise)

Although these behaviours are intended to prevent the person with social anxiety disorder from doing something awkward that might draw criticism, these actions usually exacerbate the problem because they do not allow the individual to disconfirm his negative beliefs, often eliciting rejection and other negative reactions from others (Alden & Bieling, 1998).

People with social anxiety disorder may resort to self-medication, such as drinking alcohol, as a means to avert the anxiety symptoms they experience in social situations (Battista & Kocovski, 2010). The use of alcohol when faced with such situations may become negatively reinforcing: encouraging individuals with social anxiety disorder to turn to the substance whenever they experience anxiety symptoms. The tendency to use alcohol as a coping mechanism for social anxiety, however, can come with a hefty price tag: a number of large scale studies have reported a high rate of comorbidity between social anxiety disorder and alcohol use disorder (Morris, Stewart, & Ham, 2005).

As with specific phobias, it is highly probable that the fears inherent to social anxiety disorder can develop through conditioning experiences. For example, a child who is subjected to early unpleasant social experiences (e.g., bullying at school) may develop negative social images of herself that

become activated later in anxiety-provoking situations (Hackmann, Clark, & McManus, 2000). Indeed, one study reported that 92% of a sample of adults with social anxiety disorder reported a history of severe teasing in childhood, compared to only 35% of a sample of adults with panic disorder (McCabe, Antony, Summerfeldt, Liss, & Swinson, 2003).

One of the most well-established risk factors for developing social anxiety disorder is behavioural inhibition (Clauss & Blackford, 2012). Behavioural inhibition is thought to be an inherited trait, and it is characterized by a consistent tendency to show fear and restraint when presented with unfamiliar people or situations (Kagan, Reznick, & Snidman, 1988). Behavioural inhibition is displayed very early in life; behaviourally inhibited toddlers and children respond with great caution and restraint in unfamiliar situations, and they are often timid, fearful, and shy around unfamiliar people (Fox, Henderson, Marshall, Nichols, & Ghera, 2005). A recent statistical review of studies demonstrated that behavioural inhibition was associated with more than a sevenfold increase in the risk of development of social anxiety disorder, demonstrating that behavioural inhibition is a major risk factor for the disorder (Clauss & Blackford, 2012).

Panic Disorder

Imagine that you are at the mall one day with your friends

and—suddenly and inexplicably—you begin sweating and trembling, your heart starts pounding, you have trouble breathing, and you start to feel dizzy and nauseous. This episode lasts for 10 minutes and is terrifying because you start to think that you are going to die. When you visit your doctor the following morning and describe what happened, the doctor tells you that you have experienced a panic attack (Figure PY.18). If you experience another one of these episodes two weeks later and worry for a month or more that similar episodes will occur in the future, it is likely that you have developed panic disorder.

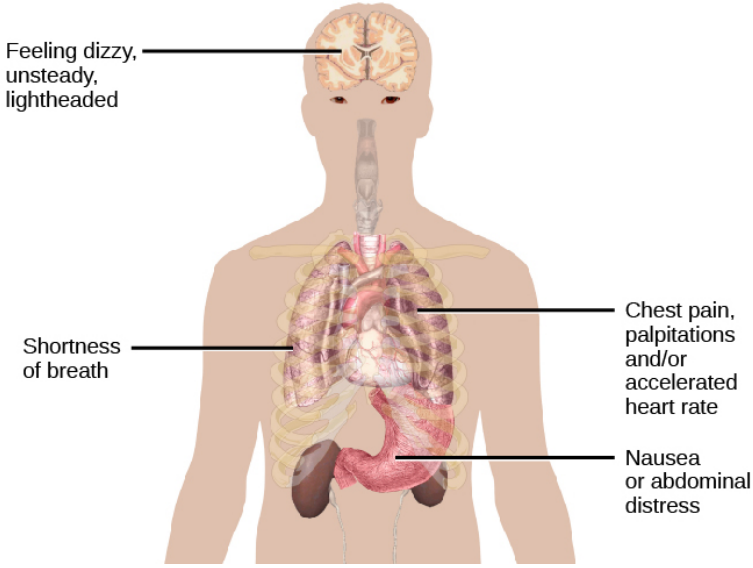

Figure PY.18 Some of the physical manifestations of a panic attack are shown. People may also experience sweating, trembling, feelings of faintness, or a fear of losing control, among other symptoms

People with panic disorder experience recurrent (more than one) and unexpected panic attacks, along with at least one month of persistent concern about additional panic attacks, worry over the consequences of the attacks, or self-defeating changes in behaviour related to the attacks (e.g., avoidance of exercise or unfamiliar situations) (APA, 2013). As is the case with other anxiety disorders, the panic attacks cannot result from the physiological effects of drugs and other substances, a medical condition, or another mental disorder. A panic attack is defined as a period of extreme fear or discomfort that develops abruptly and reaches a peak within 10 minutes. Its symptoms include accelerated heart rate, sweating, trembling, choking sensations, hot flashes or chills, dizziness or lightheadedness, fears of losing control or going crazy, and fears of dying (APA, 2013). Sometimes panic attacks are expected, occurring in response to specific environmental triggers (such as being in a tunnel); other times, these episodes are unexpected and emerge randomly (such as when relaxing). According to the DSM-5, the person must experience unexpected panic attacks to qualify for a diagnosis of panic disorder.

Experiencing a panic attack is often terrifying. Rather than recognizing the symptoms of a panic attack merely as signs of intense anxiety, individuals with panic disorder often misinterpret them as a sign that something is intensely wrong internally (thinking, for example, that the pounding heart represents an impending heart attack). Panic attacks can

occasionally precipitate trips to the emergency room because several symptoms of panic attacks are, in fact, similar to those associated with heart problems (e.g., palpitations, racing pulse, and a pounding sensation in the chest) (Root, 2000). Unsurprisingly, those with panic disorder fear future attacks and may become preoccupied with modifying their behaviour in an effort to avoid future panic attacks. For this reason, panic disorder is often characterized as fear of fear (Goldstein & Chambless, 1978).

Panic attacks themselves are not mental disorders. Indeed, around 23% of Americans experience isolated panic attacks in their lives without meeting the criteria for panic disorder (Kessler et al., 2006), indicating that panic attacks are fairly common. Panic disorder is, of course, much less common, afflicting 4.7% of Americans during their lifetime (Kessler et al., 2005). Many people with panic disorder develop agoraphobia, which is marked by fear and avoidance of situations in which escape might be difficult or help might not be available if one were to develop symptoms of a panic attack. People with panic disorder often experience a comorbid disorder, such as other anxiety disorders or major depressive disorder (APA, 2013).

Researchers are not entirely sure what causes panic disorder. Children are at a higher risk of developing panic disorder if their parents have the disorder (Biederman et al., 2001), and family and twins studies indicate that the heritability of panic disorder is around 43% (Hettema, Neale, & Kendler, 2001).

The exact genes and gene functions involved in this disorder, however, are not well-understood (APA, 2013). Neurobiological theories of panic disorder suggest that a region of the brain called the locus coeruleus may play a role in this disorder. Located in the brainstem, the locus coeruleus is the brain's major source of norepinephrine, a neurotransmitter that triggers the body's fight-or-flight response. Activation of the locus coeruleus is associated with anxiety and fear, and research with nonhuman primates has shown that stimulating the locus coeruleus either electrically or through drugs produces panic-like symptoms (Charney et al., 1990). Such findings have led to the theory that panic disorder may be caused by abnormal norepinephrine activity in the locus coeruleus (Bremner, Krystal, Southwick, & Charney, 1996).

Conditioning theories of panic disorder propose that panic attacks are classical conditioning responses to subtle bodily sensations resembling those normally occurring when one is anxious or frightened (Bouton, Mineka, & Barlow, 2001). For example, consider a child who has asthma. An acute asthma attack produces sensations, such as shortness of breath, coughing, and chest tightness, that typically elicit fear and anxiety. Later, when the child experiences subtle symptoms that resemble the frightening symptoms of earlier asthma attacks (such as shortness of breath after climbing stairs), he may become anxious, fearful, and then experience a panic attack. In this situation, the subtle symptoms would represent

a conditioned stimulus, and the panic attack would be a conditioned response. The finding that panic disorder is nearly three times as frequent among people with asthma as it is among people without asthma (Weiser, 2007) supports the possibility that panic disorder has the potential to develop through classical conditioning.

Cognitive factors may play an integral part in panic disorder. Generally, cognitive theories (Clark, 1996) argue that those with panic disorder are prone to interpret ordinary bodily sensations catastrophically, and these fearful interpretations set the stage for panic attacks. For example, a person might detect bodily changes that are routinely triggered by innocuous events such getting up from a seated position (dizziness), exercising (increased heart rate, shortness of breath), or drinking a large cup of coffee (increased heart rate, trembling). The individual interprets these subtle bodily changes catastrophically ("Maybe I'm having a heart attack!"). Such interpretations create fear and anxiety, which trigger additional physical symptoms; subsequently, the person experiences a panic attack. Support of this contention rests with findings that people with more severe catastrophic thoughts about sensations have more frequent and severe panic attacks, and among those with panic disorder, reducing catastrophic cognitions about their sensations is as effective as medication in reducing panic attacks (Good & Hinton, 2009).

Generalized Anxiety Disorder

Alex has always worried about many things. They worry that their children would drown when they played at the beach. Each time Alex leaves the house, they worry that an electrical short circuit would start a fire in their home. They worried that their life-partner Reese would lose their job at the prestigious law firm. They worried that their child's minor staph infection could turn into a massive life-threatening condition. These and other worries constantly weighed heavily on Alex's mind, so much so that they made it difficult for Alex to make decisions and often left them feeling tense, irritable, and worn out. One night, Reese was to drive their child home from a soccer game. However, Reese stayed after the game and talked with some of the other parents, resulting in Reese arriving home 45 minutes late. Alex had tried to call Reese's cell phone three or four times, but they could not get through because the soccer field did not have a signal. Extremely worried, Alex eventually called the police, convinced that Reese and their child had not arrived home because they had been in a terrible car accident.

Alex suffers from generalized anxiety disorder: a relatively continuous state of excessive, uncontrollable, and pointless worry and apprehension. People with generalized anxiety disorder often worry about routine, everyday things, even though their concerns are unjustified (Figure PY.19). For example, an individual may worry about her health and

finances, the health of family members, the safety of her children, or minor matters (e.g., being late for an appointment) without having any legitimate reason for doing so (APA, 2013). A diagnosis of generalized anxiety disorder requires that the diffuse worrying and apprehension characteristic of this disorder—what Sigmund Freud referred to as free-floating anxiety—is not part of another disorder, occurs more days than not for at least six months, and is accompanied by any three of the following symptoms: restlessness, difficulty concentrating, being easily fatigued, muscle tension, irritability, and sleep difficulties.

Figure PY.19 Worry is a defining feature of generalized anxiety disorder. (credit: Freddie Peña)

About 5.7% of the U.S. population will develop symptoms of generalized anxiety disorder during their lifetime (Kessler et al., 2005), and females are 2 times as likely as males to

experience the disorder (APA, 2013). Generalized anxiety disorder is highly comorbid with mood disorders and other anxiety disorders (Noyes, 2001), and it tends to be chronic. Also, generalized anxiety disorder appears to increase the risk for heart attacks and strokes, especially in people with preexisting heart conditions (Martens et al., 2010).

Although there have been few investigations aimed at determining the heritability of generalized anxiety disorder, a summary of available family and twin studies suggests that genetic factors play a modest role in the disorder (Hettema et al., 2001). Cognitive theories of generalized anxiety disorder suggest that worry represents a mental strategy to avoid more powerful negative emotions (Aikins & Craske, 2001), perhaps stemming from earlier unpleasant or traumatic experiences. Indeed, one longitudinal study found that childhood maltreatment was strongly related to the development of this disorder during adulthood (Moffitt et al., 2007); worrying might distract people from remembering painful childhood experiences.

138.

OBSESSIVE-COMPULSIVE RELATED DISORDERS

Learning Objectives

By the end of this section, you will be able to:

- Describe the main features and prevalence of obsessive-compulsive disorder, body dysmorphic disorder, and hoarding disorder
- Understand some of the factors in the development of obsessive-compulsive disorder

Obsessive-compulsive and related disorders are a group of overlapping disorders that generally involve intrusive, unpleasant thoughts and repetitive behaviours. Many of us

experience unwanted thoughts from time to time (e.g., craving double cheeseburgers when dieting), and many of us engage in repetitive behaviours on occasion (e.g., pacing when nervous). However, obsessive-compulsive and related disorders elevate the unwanted thoughts and repetitive behaviours to a status so intense that these cognitions and activities disrupt daily life. Included in this category are obsessive-compulsive disorder (OCD), body dysmorphic disorder, and hoarding disorder.

Obsessive-Compulsive Disorder

People with obsessive-compulsive disorder (OCD) experience thoughts and urges that are intrusive and unwanted (obsessions) and/or the need to engage in repetitive behaviours or mental acts (compulsions). A person with this disorder might, for example, spend hours each day washing his hands or constantly checking and rechecking to make sure that a stove, faucet, or light has been turned off.

Obsessions are more than just unwanted thoughts that seem to randomly jump into our head from time to time, such as recalling an insensitive remark a coworker made recently, and they are more significant than day-to-day worries we might have, such as justifiable concerns about being laid off from a job. Rather, obsessions are characterized as persistent, unintentional, and unwanted thoughts and urges that are highly intrusive, unpleasant, and distressing (APA, 2013). Common obsessions include concerns about germs and

contamination, doubts ("Did I turn the water off?"), order and symmetry ("I need all the spoons in the tray to be arranged a certain way"), and urges that are aggressive or lustful. Usually, the person knows that such thoughts and urges are irrational and thus tries to suppress or ignore them, but has an extremely difficult time doing so. These obsessive symptoms sometimes overlap, such that someone might have both contamination and aggressive obsessions (Abramowitz & Siqueland, 2013).

Compulsions are repetitive and ritualistic acts that are typically carried out primarily as a means to minimize the distress that obsessions trigger or to reduce the likelihood of a feared event (APA, 2013). Compulsions often include such behaviours as repeated and extensive hand washing, cleaning, checking (e.g., that a door is locked), and ordering (e.g., lining up all the pencils in a particular way), and they also include such mental acts as counting, praying, or reciting something to oneself (Figure PY.20). Compulsions characteristic of OCD are not performed out of pleasure, nor are they connected in a realistic way to the source of the distress or feared event. Approximately 2.3% of the U.S. population will experience OCD in their lifetime (Ruscio, Stein, Chiu, & Kessler, 2010) and, if left untreated, OCD tends to be a chronic condition creating lifelong interpersonal and psychological problems (Norberg, Calamari, Cohen, & Riemann, 2008).

Figure PY.20 Whereas behaviours like checking (e.g. that a door is locked) are more common, needing to wear the same lucky pair of socks, or avoiding cracks in the sidewalk are all examples of compulsions among those with obsessive-compulsive disorder. (credit: modification of work by Bradley Gordon; Shuttershock)

Body Dysmorphic Disorder

An individual with body dysmorphic disorder is preoccupied with a perceived flaw in physical appearance that is either nonexistent or barely noticeable to other people (APA, 2013). These perceived physical defects cause people to think they are unattractive, ugly, hideous, or deformed. These preoccupations can focus on any bodily area, but they typically involve the skin, face, or hair. The preoccupation with imagined physical flaws drives the person to engage in repetitive and ritualistic behavioural and mental acts, such as constantly looking in the mirror, trying to hide the offending body part, comparisons with others, and, in some extreme cases, cosmetic surgery (Phillips, 2005). An estimated 2.4% of the adults in the United States meet the criteria for body

dysmorphic disorder, with slightly higher rates in women than in men (APA, 2013).

Hoarding Disorder

Although hoarding was traditionally considered to be a symptom of OCD, considerable evidence suggests that hoarding represents an entirely different disorder (Mataix-Cols et al., 2010). People with hoarding disorder cannot bear to part with personal possessions, regardless of how valueless or useless these possessions are. As a result, these individuals accumulate excessive amounts of usually worthless items that clutter their living areas (Figure PY.21). Often, the quantity of cluttered items is so excessive that the person is unable use their kitchen, or sleep in their bed. People who suffer from this disorder have great difficulty parting with items because they believe the items might be of some later use, or because they form a sentimental attachment to the items (APA, 2013). Importantly, a diagnosis of hoarding disorder is made only if the hoarding is not caused by another medical condition and if the hoarding is not a symptom of another disorder (e.g., schizophrenia) (APA, 2013).

Figure PY.21 Those who suffer from hoarding disorder have great difficulty in discarding possessions, usually resulting in an accumulation of items that clutter living or work areas. (credit: "puuikibeach"/Flickr)

Causes of OCD

The results of family and twin studies suggest that OCD has a moderate genetic component. The disorder is five times more frequent in the first-degree relatives of people with OCD than in people without the disorder (Nestadt et al., 2000). Additionally, the concordance rate of OCD among identical twins is around 57%; however, the concordance rate for fraternal twins is 22% (Bolton, Rijsdijk, O'Connor, Perrin, & Eley, 2007). Studies have implicated about two dozen potential genes that may be involved in OCD; these genes regulate the function of three neurotransmitters: serotonin, dopamine,

and glutamate (Pauls, 2010). Many of these studies included small sample sizes and have yet to be replicated. Thus, additional research needs to be done in this area.

A brain region that is believed to play a critical role in OCD is the orbitofrontal cortex (Kopell & Greenberg, 2008), an area of the frontal lobe involved in learning and decision-making (Rushworth, Noonan, Boorman, Walton, & Behrens, 2011) (Figure PY.22). In people with OCD, the orbitofrontal cortex becomes especially hyperactive when they are provoked with tasks in which, for example, they are asked to look at a photo of a toilet or of pictures hanging crookedly on a wall (Simon, Kaufmann, Müsch, Kischkel, & Kathmann, 2010). The orbitofrontal cortex is part of a series of brain regions that, collectively, is called the OCD circuit; this circuit consists of several interconnected regions that influence the perceived emotional value of stimuli and the selection of both behavioural and cognitive responses (Graybiel & Rauch, 2000). As with the orbitofrontal cortex, other regions of the OCD circuit show heightened activity during symptom provocation (Rotge et al., 2008), which suggests that abnormalities in these regions may produce the symptoms of OCD (Saxena, Bota, & Brody, 2001). Consistent with this explanation, people with OCD show a substantially higher degree of connectivity of the orbitofrontal cortex and other regions of the OCD circuit than do those without OCD (Beucke et al., 2013).

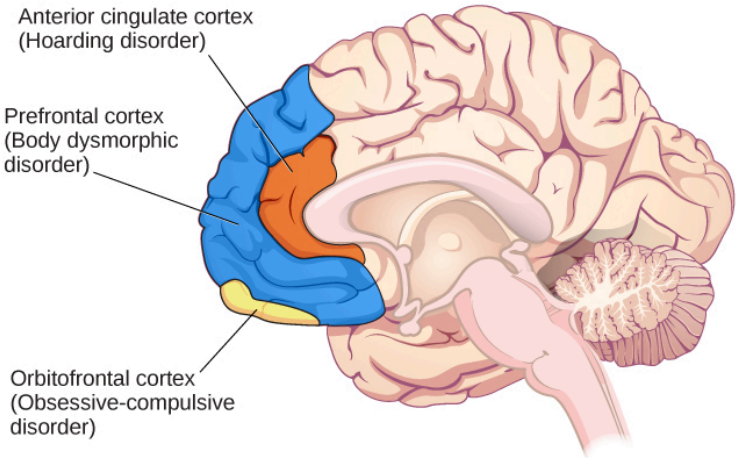

Figure PY.22 Different regions of the brain may be associated with different psychological disorders.

The findings discussed above were based on imaging studies, and they highlight the potential importance of brain dysfunction in OCD. However, one important limitation of these findings is the inability to explain differences in obsessions and compulsions. Another limitation is that the correlational relationship between neurological abnormalities and OCD symptoms cannot imply causation (Abramowitz & Siqueland, 2013).

What do you think?

Conditioning and OCD

The symptoms of OCD have been theorized to be learned responses, acquired and sustained as the result of a combination of two forms of learning: classical conditioning and operant conditioning (Mowrer, 1960; Steinmetz, Tracy, & Green, 2001). Specifically, the acquisition of OCD may occur first as the result of classical conditioning, whereby a neutral stimulus becomes associated with an unconditioned stimulus that provokes anxiety or distress. When an individual has acquired this association, subsequent encounters with the neutral stimulus trigger anxiety, including obsessive thoughts; the anxiety and obsessive thoughts (which are now a conditioned response) may persist until they identify some strategy to relieve it. Relief may take the form of a ritualistic behaviour or mental activity that, when enacted repeatedly, reduces the anxiety. Such efforts to relieve anxiety

constitute an example of negative reinforcement (a form of operant conditioning). Recall from the chapter on learning that negative reinforcement involves the strengthening of behaviour through its ability to remove something unpleasant or aversive. Hence, compulsive acts observed in OCD may be sustained because they are negatively reinforcing, in the sense that they reduce anxiety triggered by a conditioned stimulus.

Suppose an individual with OCD experiences obsessive thoughts about germs, contamination, and disease whenever she encounters a doorknob. What might have constituted a viable unconditioned stimulus? Also, what would constitute the conditioned stimulus, unconditioned response, and conditioned response? What kinds of compulsive behaviours might we expect, and how do they reinforce themselves? What is decreased? Additionally, and from the standpoint of learning theory, how might the symptoms of OCD be treated successfully?

139.

POST-TRAUMATIC STRESS DISORDER

Learning Objectives

By the end of this section, you will be able to:

- Describe the nature and symptoms of PTSD
- Identify the risk factors and protective factors linked to PTSD
- Identify and describe current treatment options for PTSD

In the following section, we will discuss **Post-Traumatic Stress Disorder (PTSD)**, a term used to describe a set of fear and arousal-related symptoms tied to a specific traumatic event

or events. In approaching this content, we acknowledge that some readers may have personal experience with these kinds of trauma, and may be negatively affected by this material.

If you, or someone you know, is dealing with PTSD, supports are available through Wellness Canada that may be helpful.

Originally, PTSD was identified in the military after combat exposure and was referred to as *shell shock*or *combat neurosis*, and was mainly diagnosed in male combat veterans. In *Waiting for First Light*, Canadian General Romeo Dallaire shares his continuing struggles with PTSD after witnessing atrocities during the genocide in Rwanda in 1993-94. As head of the United Nations peacekeeping force, his experience left a lasting impact on his mental health and led to his medical dismissal from the military several years later. He has devoted his life to mental health advocacy for veterans and fighting exploitation of child soldiers through the Dallaire Institute for Children, Peace, and Security at Dalhousie University. Although long recognized as a significant mental health concern, there is stigma surrounding PTSD in this population and effective treatments still remain inaccessible to many that need them.

The kinds of traumas that cause these symptoms vary widely and have the ability to affect anyone. It wasn't until the late 1970's that the broader medical community acknowledged that the same set of symptoms could be seen in people who experienced sexual assault, so the more general

term *post-traumatic stress disorder* was developed to include other kinds of psychological trauma (Herman, 1997).

A Broader Definition of PTSD

According to the DSM-5, PTSD is diagnosed when an individual who has had a traumatic experience develops a set of fear and arousal related symptoms that last at least a month. The individual may have been present for the traumatic event as a victim or a witness, or they may have second hand exposure to the event from someone who was present.

The symptoms of PTSD fall into four categories: Intrusion, Avoidance, Negative alterations in cognition and mood, and Alterations in arousal and reactivity. **Intrusion** symptoms occur when the traumatic event is re-experienced through memories, nightmares, flashbacks, and emotional or physical reactivity after exposure to stimuli associated with the trauma. Flashbacks occur when the individual relives the event, as if it is currently happening and can last from a few seconds to several days (APA, 2013a). **Avoidance** occurs when the individual avoids stimuli or thoughts and feelings associated with the trauma. **Alterations in cognitions and mood** involve pervasive negative mood, feelings of isolation, extreme negative beliefs about the self or the world, and problems with memory, often specific to trauma related memories. **Alterations in arousal and reactivity** include irritability or aggression,

increased risk-taking, hyper-vigilance, jumpiness, and difficulty with concentration or sleep (APA, 2013a).

Complex PTSD (C-PTSD) is a variant of PTSD included in the 11th revision of the International Classification of Diseases (ICD-11) but it has yet to be included in the DSM. Complex PTSD generally results from prolonged or repeated instances of trauma from which escape is difficult or impossible, like childhood neglect or domestic abuse. Diagnosis of C-PTSD requires the presence of intrusions, avoidance, and alterations in arousal and hyperactivity (three core features of PTSD), as well as extreme emotional dysregulation, persistent interpersonal difficulties, and negative self-concept (ICD-11, 2019). As a result of these differences, people with C-PTSD may often be misdiagnosed as having **Borderline Personality Disorder (BPD)**. There is a high rate of comorbidity between C-PTSD and BPD, however, research has supported the validity of C-PTSD as a distinct construct and different treatment courses are indicated (Cloitre et al, 2014).

Roughly 8% of adults in Canada meet the clinical criteria for PTSD, and of those close to 4 in 5 report barriers in accessing care. Among those who meet the criteria for PTSD, sexual assault is the most commonly reported cause (14%), followed by life threatening illness or injury (10%), situations involving sudden accidental death (6%), and physical assault (6%) (Statistics Canada, 2022). As mentioned above, some people may be at higher risk of experiencing trauma as a result of

their occupation but there are also identity factors that are associated with increased risk. People in these groups aren't less resilient, but they're more likely to experience traumatic events as a result of prejudice. Because of systemic factors, these groups may also be more likely to encounter barriers when seeking assistance (Asnaani & Clark-Hall, 2017).

Risk Factors For PTSD

Of course, not everyone who experiences a traumatic event will go on to develop PTSD. Trauma is complex, and a variety of factors have been identified as increasing one's risk of developing PTSD. Some of the risk factors for PTSD can be considered individual risk factors, involving the coping strategies and resources an individual has to deal with trauma. For example, people who experience trauma Individual factors like genetics and coping strategies are important in assessing risk for PTSD, but they also interact with environmental factors, which affect everyone in a shared environment. By considering how individual risk factors interact with environmental risk factors, we can investigate what allows some people to recover more quickly from trauma while others go on to develop PTSD. To understand risk factors in context, we will examine the impact of the Covid-19 pandemic on frontline healthcare workers (HCW's).

Even before the pandemic, HCW's were at a higher risk of exposure to traumatic events than the general population.

During the pandemic frontline workers were exposed to even higher rates of patient death and suffering, while hospital understaffing and an increased need for beds meant working long hours without rest. On top of this, many hospitals lacked sufficient supplies and as a result HCW's had to put themselves at risk with inadequate personal protective equipment during a time when the virus was not well understood. In some cases, HCW's had to improvise, using garbage bags to wear over scrubs, or reusing masks that were meant to be disposed after use (CIDRAP, 2020). One study estimates that the prevalence of PTSD among HCW's in China increased from 10.37% to 20.84% between June 2020 and June 2021, and combined data from 65 studies conducted across 21 countries during the pandemic reported that of 21.5% of HCW's involved met criteria for PTSD (Ouyang et al., 2022; Li et al., 2021).

So what factors predicted the development of PTSD in these populations? Risk factors that preceded traumatic experience were younger age and a lack of experience or training- younger, HCW's have had less time to develop and practice job-specific coping mechanisms than those who have been in the field for years. Risk factors that were present after trauma included heavy workload, an unsafe work environment, passive coping, and burnout. Passive coping strategies involve disengaging or distracting oneself from the source of stress, and burnout is a form of mental exhaustion from prolonged emotional, physical, and mental stress, and

is often work-related. Low social support was identified as a risk factor both before and after traumatic experience. In this context, an HCW who uses passive coping is more at risk of developing PTSD than coworkers with more effective coping strategies, even though they share the environmental risk factors like a heavy workload and an unsafe working environment. Many of these risk factors are also associated with poorer patient care. Since the pandemic, many suggestions have been made to prevent or reduce these poor outcomes, often including a ban on prolonged working hours, and better availability of counselling services (d'Ettorre et al., 2021).

Figure PY.23 Frontline medical workers experienced high rates of trauma during the Covid-19 pandemic, and have subsequently been at a heightened risk of developing symptoms of PTSD. In this image, Dr. Annalisa Silvestri sits on the floor in a hallway of San Salvatore Hospital in Italy, wearing full personal protective equipment. This image was taken at the end of a 12 hour day for Dr. Silvestri during which she was unable to take a break. This was a common experience for medical professionals globally throughout the pandemic. Image credits: Alberto Giuliani, wikimedia commons 2020.

Support For Sufferers of PTSD

Research has shown that social support following a traumatic event can reduce the likelihood of PTSD (Ozer, Best, Lipsey, & Weiss, 2003). Social support is often defined as the comfort, advice, and assistance received from relatives, friends, and neighbors. Social support can help individuals cope during

difficult times by allowing them to discuss feelings and experiences and providing a sense of being loved and appreciated. One study conducted with HCW's in Northern Italy during the height of the pandemic found that high social support was significantly correlated with recovery, even for people with higher than average levels of PTSD symptoms (Fino et al., 2001).

There are also a number of promising clinical treatments/psychotherapeutic strategies for PTSD, including **Exposure Therapy**, **Cognitive Behavioural Therapy (CBT)**, **Eye Movement Desensitization and Reprocessing (EMDR)**, and **Psychedelic Therapies**. These therapies all focus on the individual's experience of the traumatic memory and use different techniques to weaken the links between traumatic stimuli and extreme emotional and physiological reactions. Both exposure therapy and CBT can be understood by considering the **Learning and Cognitive Processing Model of PTSD**, which suggests that some symptoms are developed and maintained through classical conditioning. The traumatic event may act as an unconditioned stimulus that produces an unconditioned response of extreme fear and anxiety. Cognitive, emotional, physiological, and environmental cues related to the event are conditioned stimuli and so also become linked with the trauma. These traumatic reminders evoke conditioned fear and anxiety, similar to those caused by the event itself (Nader, 2001).

Exposure therapy works to retrain the autonomic nervous

system, the branch of the nervous system that activates the fight or flight response. Through this, exposure therapy aims to teach the traumatized individual how to remain calm in the face of trauma-related stimuli, weakening the conditioned response. Similarly, CBT aims to identify and alter thoughts, beliefs and behaviours triggered by trauma related stimuli, and it is sometimes combined with exposure therapy (Kar, 2011). For example, if one associates a certain song with an instance of trauma, exposure therapy might have the individual listen to snippets of the song while working to relax the nervous system. CBT could involve identifying negative thoughts that come up when the song is heard, so that those thoughts can be refuted and replaced with more positive ones.

EMDR and Psychedelic therapies are not as well established, but meta-analyses have indicated that EMDR can significantly reduce PTSD symptoms (Wilson et al., 2018), and early results in studies of psychedelic therapies are promising. These therapies can be understood through the **Adaptive Information Processing model of PTSD**, which suggests that past trauma can continue to cause emotional distress if the memory of that trauma is not fully processed (Solomon & Shapiro, 2008). If memories of traumatic events are fragmented and lacking in detail, the individual may be unable to remember the event in a way that gives it context and meaning. As a result, the fragmented memory stands out, resulting in intrusive thoughts. In this view, EMDR involves reprocessing the memory by talking through it with a therapist

while experiencing bilateral stimulation. This usually involves visually following a dot of light moving back and forth with the eyes, and has been correlated with a reduction of vividness and emotion associated with the memory (Maxfield et al., 2008). A number of clinical trials have found EMDR to be significantly more effective than placebo in reducing symptoms of PTSD, and in many cases this was comparable to, or greater than drug treatments or other forms of therapy (Wilson et al., 2018).

Psychedelic therapy involves reprocessing traumatic memories under the influence of hallucinogenic drugs with the guidance of therapeutic supervision. The mechanism of action depends on which drug is being used, but the idea is that these compounds alter certain neural networks so that memories can more easily be reprocessed. For example, MDMA has been shown to reduce the activity of the amygdala, a brain structure involved in the encoding of fearful memories. It also increases the activity of the prefrontal cortex, an area of the brain that has been shown to be less active in people with PTSD (Carhart-Harris et al., 2015). Classical psychedelic drugs, like LSD and psilocybin, have been shown to help weaken learned fear responses in animals and promote neural plasticity (Catlow et al., 2013; Ly et al., 2018), which theoretically allows the sufferer to alter the neural connections that underlie their traumatic memories . These psychedelic therapies are promising avenues for the future treatment of PTSD with the possibility of significant reductions in

symptoms after only a few sessions. Importantly, positive outcomes with these drugs are associated with guidance from professionals trained in psychedelic therapies. Psychedelic treatment without trained guidance can lead to negative outcomes, so it's important to ensure this treatment is conducted by specialists in the field (Krediet et al., 2020).

PTSD and trauma can have a massive effect on an individual's well- being and daily functioning. Moving forward it is important to continue refining treatments and working to make them accessible to everyone who needs them.

140.

DISSOCIATIVE DISORDERS

Learning Objectives

By the end of this section, you will be able to:

- Describe the essential nature of dissociative disorders
- Identify and differentiate the symptoms of psychogenic/dissociative amnesia, depersonalization/derealization disorder, and dissociative identity disorder
- Discuss the potential role of both social and psychological factors in dissociative identity disorder

Dissociative disorders are characterized by an individual becoming split off, or dissociated, from her core sense of self. Memory and identity become disturbed; these disturbances have a psychological rather than physical cause. Dissociative disorders listed in the DSM-5 include dissociative amnesia, depersonalization/derealization disorder, and dissociative identity disorder.

Psychogenic/Dissociative Amnesia

Amnesia refers to the partial or total forgetting of some experience or event. An individual with dissociative amnesia is unable to recall important personal information, usually following an extremely stressful or traumatic experience such as combat, natural disasters, or being the victim of violence. The memory impairments are not caused by ordinary forgetting. Some individuals with dissociative amnesia will also experience dissociative fugue (from the word "to flee" in French), whereby they suddenly wander away from their home, experience confusion about their identity, and sometimes even adopt a new identity (Cardeña & Gleaves, 2006). Most fugue episodes last only a few hours or days, but some can last longer. One study of residents in communities in upstate New York reported that about 1.8% experienced dissociative amnesia in the previous year (Johnson, Cohen, Kasen, & Brook, 2006).

Some have questioned the validity of dissociative amnesia

(Pope, Hudson, Bodkin, & Oliva, 1998); it has even been characterized as a "piece of psychiatric folklore devoid of convincing empirical support" (McNally, 2003, p. 275). Notably, scientific publications regarding dissociative amnesia rose during the 1980s and reached a peak in the mid-1990s, followed by an equally sharp decline by 2003; in fact, only 13 cases of individuals with dissociative amnesia worldwide could be found in the literature that same year (Pope, Barry, Bodkin, & Hudson, 2006). Further, no description of individuals showing dissociative amnesia following a trauma exists in any fictional or nonfictional work prior to 1800 (Pope, Poliakoff, Parker, Boynes, & Hudson, 2006). However, a study of 82 individuals who enrolled for treatment at a psychiatric outpatient hospital found that nearly 10% met the criteria for dissociative amnesia, perhaps suggesting that the condition is underdiagnosed, especially in psychiatric populations (Foote, Smolin, Kaplan, Legatt, & Lipschitz, 2006).

Depersonalization/Derealization Disorder

Depersonalization/derealization disorder is characterized by recurring episodes of depersonalization, derealization, or both. Depersonalization is defined as feelings of "unreality or detachment from, or unfamiliarity with, one's whole self or from aspects of the self" (APA, 2013, p. 302). Individuals who experience depersonalization might believe their thoughts and

feelings are not their own; they may feel robotic as though they lack control over their movements and speech; they may experience a distorted sense of time and, in extreme cases, they may sense an "out-of-body" experience in which they see themselves from the vantage point of another person. Derealization is conceptualized as a sense of "unreality or detachment from, or unfamiliarity with, the world, be it individuals, inanimate objects, or all surroundings" (APA, 2013, p. 303). A person who experiences derealization might feel as though he is in a fog or a dream, or that the surrounding world is somehow artificial and unreal. Individuals with depersonalization/derealization disorder often have difficulty describing their symptoms and may think they are going crazy (APA, 2013).

Dissociative Identity Disorder

By far, the most well-known dissociative disorder is dissociative identity disorder (formerly called multiple personality disorder). People with dissociative identity disorder exhibit two or more separate personalities or identities, each well-defined and distinct from one another. They also experience memory gaps for the time during which another identity is in charge (e.g., one might find unfamiliar items in her shopping bags or among her possessions), and in some cases may report hearing voices, such as a child's voice or the sound of somebody crying (APA, 2013). The study

of upstate New York residents mentioned above (Johnson et al., 2006) reported that 1.5% of their sample experienced symptoms consistent with dissociative identity disorder in the previous year.

Dissociative identity disorder (DID) is highly controversial. Some believe that people fake symptoms to avoid the consequences of illegal actions (e.g., "I am not responsible for shoplifting because it was my other personality"). In fact, it has been demonstrated that people are generally skilled at adopting the role of a person with different personalities when they believe it might be advantageous to do so. As an example, Kenneth Bianchi was an infamous serial killer who, along with his cousin, murdered over a dozen women around Los Angeles in the late 1970s. Eventually, he and his cousin were apprehended. At Bianchi's trial, he pled not guilty by reason of insanity, presenting himself as though he had DID and claiming that a different personality ("Steve Walker") committed the murders. When these claims were scrutinized, he admitted faking the symptoms and was found guilty (Schwartz, 1981).

A second reason DID is controversial is because rates of the disorder suddenly skyrocketed in the 1980s. More cases of DID were identified during the five years prior to 1986 than in the preceding two centuries (Putnam, Guroff, Silberman, Barban, & Post, 1986). Although this increase may be due to the development of more sophisticated diagnostic techniques, it is also possible that the popularization of DID—helped in

part by *Sybil*, a popular 1970s book (and later film) about a woman with 16 different personalities—may have prompted clinicians to overdiagnose the disorder (Piper & Merskey, 2004). Casting further scrutiny on the existence of multiple personalities or identities is the recent suggestion that the story of Sybil was largely fabricated, and the idea for the book might have been exaggerated (Nathan, 2011).

Despite its controversial nature, DID is clearly a legitimate and serious disorder, and although some people may fake symptoms, others suffer their entire lives with it. People with this disorder tend to report a history of childhood trauma, some cases having been corroborated through medical or legal records (Cardeña & Gleaves, 2006). Research by Ross et al. (1990) suggests that in one study about 95% of people with DID were physically and/or sexually abused as children. Of course, not all reports of childhood abuse can be expected to be valid or accurate. However, there is strong evidence that traumatic experiences can cause people to experience states of dissociation, suggesting that dissociative states—including the adoption of multiple personalities—may serve as a psychologically important coping mechanism for threat and danger (Dalenberg et al., 2012).

141.

PERSONALITY DISORDERS

Learning Objectives

By the end of this section, you will be able to:

- Describe the nature of personality disorders and how they differ from other disorders
- List and distinguish between the three clusters of personality disorders
- Identify the basic features of borderline personality disorder and antisocial personality disorder, and the factors that are important in the aetiology of both

The term *personality* refers loosely to one's stable, consistent, and distinctive way of thinking about, feeling, acting, and relating to the world. People with personality disorders exhibit a personality style that differs markedly from the expectations of their culture, is pervasive and inflexible, begins in adolescence or early adulthood, and causes distress or impairment (APA, 2013). Generally, individuals with these disorders exhibit enduring personality styles that are extremely troubling and often create problems for them and those with whom they come into contact. Their maladaptive personality styles frequently bring them into conflict with others, disrupt their ability to develop and maintain social relationships, and prevent them from accomplishing realistic life goals.

The DSM-5 recognizes 10 personality disorders, organized into 3 different clusters. Cluster A disorders include paranoid personality disorder, schizoid personality disorder, and schizotypal personality disorder. People with these disorders display a personality style that is odd or eccentric. Cluster B disorders include antisocial personality disorder, histrionic personality disorder, narcissistic personality disorder, and borderline personality disorder. People with these disorders usually are impulsive, overly dramatic, highly emotional, and erratic. Cluster C disorders include avoidant personality disorder, dependent personality disorder, and obsessive-compulsive personality disorder (which is not the same thing as obsessive-compulsive disorder). People with these disorders often appear to be

nervous and fearful. Table PD.2 provides a description of each of the DSM-5 personality disorders:

Table PY.2 DSM-5 Personality Disorders

DSM-5 Personality Disorder	Description	Cluster
Paranoid	harbours a pervasive and unjustifiable suspiciousness and mistrust of others; reluctant to confide in or become close to others; reads hidden demeaning or threatening meaning into benign remarks or events; takes offence easily and bears grudges; not due to schizophrenia or other psychotic disorders	A
Schizoid	lacks interest and desire to form relationships with others; aloof and shows emotional coldness and detachment; indifferent to approval or criticism of others; lacks close friends or confidants; not due to schizophrenia or other psychotic disorders, not an autism spectrum disorder	A
Schizotypal	exhibits eccentricities in thought, perception, emotion, speech, and behaviour; shows suspiciousness or paranoia; has unusual perceptual experiences; speech is often idiosyncratic; displays inappropriate emotions; lacks friends or confidants; not due to schizophrenia or other psychotic disorder, or to autism spectrum disorder	A

Table PY.2 DSM-5 Personality Disorders

DSM-5 Personality Disorder	Description	Cluster
Antisocial	continuously violates the rights of others; history of antisocial tendencies prior to age 15; often lies, fights, and has problems with the law; impulsive and fails to think ahead; can be deceitful and manipulative in order to gain profit or pleasure; irresponsible and often fails to hold down a job or pay financial debts; lacks feelings for others and remorse over misdeeds	B
Histrionic	excessively overdramatic, emotional, and theatrical; feels uncomfortable when not the centre of others' attention; behaviour is often inappropriately seductive or provocative; speech is highly emotional but often vague and diffuse; emotions are shallow and often shift rapidly; may alienate friends with demands for constant attention	B

Table PY.2 DSM-5 Personality Disorders

DSM-5 Personality Disorder	Description	Cluster
Narcissistic	overinflated and unjustified sense of self-importance and preoccupied with fantasies of success; believes he is entitled to special treatment from others; shows arrogant attitudes and behaviours; takes advantage of others; lacks empathy	B
Borderline	unstable in self-image, mood, and behaviour; cannot tolerate being alone and experiences chronic feelings of emptiness; unstable and intense relationships with others; behaviour is impulsive, unpredictable, and sometimes self-damaging; shows inappropriate and intense anger; makes suicidal gestures	B

Table PY.2 DSM-5 Personality Disorders

DSM-5 Personality Disorder	Description	Cluster
Avoidant	socially inhibited and oversensitive to negative evaluation; avoids occupations that involve interpersonal contact because of fears of criticism or rejection; avoids relationships with others unless guaranteed to be accepted unconditionally; feels inadequate and views self as socially inept and unappealing; unwilling to take risks or engage in new activities if they may prove embarrassing	C
Dependent	allows others to take over and run her life; is submissive, clingy, and fears separation; cannot make decisions without advice and reassurance from others; lacks self-confidence; cannot do things on her own; feels uncomfortable or helpless when alone	C

Table PY.2 DSM-5 Personality Disorders

DSM-5 Personality Disorder	Description	Cluster
Obsessive-Compulsive	pervasive need for perfectionism that interferes with the ability to complete tasks; preoccupied with details, rules, order, and schedules; excessively devoted to work at the expense of leisure and friendships; rigid, inflexible, and stubborn; insists things be done his way; miserly with money	C

Slightly over 9% of the U.S. population suffers from a personality disorder, with avoidant and schizoid personality disorders the most frequent (Lezenweger, Lane, Loranger, & Kessler, 2007). Two of these personality disorders, borderline personality disorder and antisocial personality disorder, are regarded by many as especially problematic.

Borderline Personality Disorder

The "borderline" in borderline personality disorder was originally coined in the late 1930s in an effort to describe patients who appeared anxious, but were prone to brief psychotic experiences—that is, patients who were thought to be literally on the borderline between anxiety and psychosis (Freeman, Stone, Martin, & Reinecke, 2005).

Today, borderline personality disorder has a completely different meaning. Borderline personality disorder is characterized chiefly by instability in interpersonal relationships, self-image, and mood, as well as marked impulsivity (APA, 2013). People with borderline personality disorder cannot tolerate the thought of being alone and will make frantic efforts (including making suicidal gestures and engaging in self-mutilation) to avoid abandonment or separation (whether real or imagined). Their relationships are intense and unstable; for example, a lover may be idealized early in a relationship, but then later vilified at the slightest sign she appears to no longer show interest. These individuals have an unstable view of self and, thus, might suddenly display a shift in personal attitudes, interests, career plans, and choice of friends. For example, a law school student may, despite having invested tens of thousands of dollars toward earning a law degree and despite having performed well in the program, consider dropping out and pursuing a career in another field. People with borderline personality disorder may be highly impulsive and may engage in reckless and self-destructive behaviours such as excessive gambling, spending money irresponsibly, substance abuse, engaging in unsafe sex, and reckless driving. They sometimes show intense and inappropriate anger that they have difficulty controlling, and they can be moody, sarcastic, bitter, and verbally abusive.

The prevalence of borderline personality disorder in the U.S. population is estimated to be around 1.4% (Lezenweger

et al., 2007), but the rates are higher among those who use mental health services; approximately 10% of mental health outpatients and 20% of psychiatric inpatients meet the criteria for diagnosis (APA, 2013). Additionally, borderline personality disorder is comorbid with anxiety, mood, and substance use disorders (Lezenweger et al., 2007).

Biological Basis for Borderline Personality Disorder

Genetic factors appear to be important in the development of borderline personality disorder. For example, core personality traits that characterize this disorder, such as impulsivity and emotional instability, show a high degree of heritability (Livesley, 2008). Also, the rates of borderline personality disorder among relatives of people with this disorder have been found to be as high as 24.9% (White, Gunderson, Zanarani, & Hudson, 2003). Individuals with borderline personality disorder report experiencing childhood physical, sexual, and/or emotional abuse at rates far greater than those observed in the general population (Afifi et al., 2010), indicating that environmental factors are also crucial. These findings would suggest that borderline personality disorder may be determined by an interaction between genetic factors and adverse environmental experiences. Consistent with this hypothesis, one study found that the highest rates of borderline personality disorder were among individuals with a borderline temperament (characterized by high novelty

seeking and high harm-avoidance) and those who experienced childhood abuse and/or neglect (Joyce et al., 2003).

Antisocial Personality Disorder

Most human beings live in accordance with a moral compass, a sense of right and wrong. Most individuals learn at a very young age that there are certain things that should not be done. We learn that we should not lie or cheat. We are taught that it is wrong to take things that do not belong to us, and that it is wrong to exploit others for personal gain. We also learn the importance of living up to our responsibilities, of doing what we say we will do. People with antisocial personality disorder, however, do not seem to have a moral compass. These individuals act as though they neither have a sense of nor care about right or wrong. Not surprisingly, these people represent a serious problem for others and for society in general.

According to the DSM-5, the individual with antisocial personality disorder shows no regard at all for other people's rights or feelings. This lack of regard is exhibited a number of ways and can include repeatedly performing illegal acts, lying to or conning others, impulsivity and recklessness, irritability and aggressiveness toward others, and failure to act in a responsible way (e.g., leaving debts unpaid) (APA, 2013). The worst part about antisocial personality disorder, however, is that people with this disorder have no remorse over their

misdeeds; these people will hurt, manipulate, exploit, and abuse others and not feel any guilt. Signs of this disorder can emerge early in life; however, a person must be at least 18 years old to be diagnosed with antisocial personality disorder.

People with antisocial personality disorder seem to view the world as self-serving and unkind. They seem to think that they should use whatever means necessary to get by in life. They tend to view others not as living, thinking, feeling beings, but rather as pawns to be used or abused for a specific purpose. They often have an over-inflated sense of themselves and can appear extremely arrogant. They frequently display superficial charm; for example, without really meaning it they might say exactly what they think another person wants to hear. They lack empathy: they are incapable of understanding the emotional point-of-view of others. People with this disorder may become involved in illegal enterprises, show cruelty toward others, leave their jobs with no plans to obtain another job, have multiple sexual partners, repeatedly get into fights with others, and show reckless disregard for themselves and others (e.g., repeated arrests for driving while intoxicated) (APA, 2013).

The DSM-5 has included an alternative model for conceptualizing personality disorders based on the traits identified in the Five Factor Model of personality. This model addresses the level of personality functioning such as impairments in self (identity or self-direction) and interpersonal (empathy or intimacy) functioning. In the case

of antisocial personality disorder, the DSM-5 identifies the predominant traits of antagonism (such as disregard for others' needs, manipulative or deceitful behaviour) and disinhibition (characterized by impulsivity, irresponsibility, and risk-taking) (Harwood, Schade, Krueger, Wright, & Markon, 2012). A psychopathology specifier is also included that emphasizes traits such as attention seeking and low anxiousness (lack of concern about negative consequences for risky or harmful behaviour) (Crego & Widiger, 2014).

Risk Factors for Antisocial Personality Disorder

Antisocial personality disorder is observed in about 3.6% of the population; the disorder is much more common among males, with a 3 to 1 ratio of men to women, and it is more likely to occur in men who are younger, widowed, separated, divorced, of lower socioeconomic status, who live in urban areas, and who live in the western United States (Compton, Conway, Stinson, Colliver, & Grant, 2005). Compared to men with antisocial personality disorder, women with the disorder are more likely to have experienced emotional neglect and sexual abuse during childhood, and they are more likely to have had parents who abused substances and who engaged in antisocial behaviours themselves (Alegria et al., 2013).

Table PY.3 shows some of the differences in the specific types of antisocial behaviours that men and women with antisocial personality disorder exhibit (Alegria et al., 2013).

Table PY.3 Gender Differences in Antisocial Personality Disorder

Men with antisocial personality disorder are more likely than women with antisocial personality disorder to	Women with antisocial personality disorder are more likely than men with antisocial personality to
• do things that could easily hurt themselves or others • receive three or more traffic tickets for reckless driving • have their driver's license suspended • destroy others' property • start a fire on purpose • make money illegally • do anything that could lead to arrest • hit someone hard enough to injure them • hurt an animal on purpose	• run away from home overnight • frequently miss school or work • lie frequently • forge someone's signature • get into a fight that comes to blows with an intimate partner • live with others besides the family for at least one month • harass, threaten, or blackmail someone

Family, twin, and adoption studies suggest that both genetic and environmental factors influence the development of antisocial personality disorder, as well as general antisocial behaviour (criminality, violence, aggressiveness) (Baker, Bezdjian, & Raine, 2006). Personality and temperament dimensions that are related to this disorder, including fearlessness, impulsive antisociality, and callousness, have a substantial genetic influence (Livesley & Jang, 2008).

Adoption studies clearly demonstrate that the development of antisocial behaviour is determined by the interaction of genetic factors and adverse environmental circumstances (Rhee & Waldman, 2002). For example, one investigation found that adoptees of biological parents with antisocial personality disorder were more likely to exhibit adolescent and adult antisocial behaviours if they were raised in adverse adoptive family environments (e.g., adoptive parents had marital problems, were divorced, used drugs, and had legal problems) than if they were raised in a more normal adoptive environment (Cadoret, Yates, Ed, Woodworth, & Stewart, 1995).

Researchers who are interested in the importance of environment in the development of antisocial personality disorder have directed their attention to such factors as the community, the structure and functioning of the family, and peer groups. Each of these factors influences the likelihood of antisocial behaviour. One longitudinal investigation of more than 800 Seattle-area youth measured risk factors for violence at 10, 14, 16, and 18 years of age (Herrenkohl et al., 2000). The risk factors examined included those involving the family, peers, and community. A portion of the findings from this study are provided in Figure PY.24.

Risk Factors During Adolescence That Predict Later Violence			
Risk factor	**Age 10 predictor (elementary school)**	**Age 14 predictor (middle school)**	**Age 16 predictor (high school)**
Family			
Parental violence		✕	
Parental criminality		✕	✕
Poof family management		✕	✕
Family conflict		✕	✕
Parental attitudes favorable to violence	✕		
Frequent moves			✕
Peer			
Peer delinquency	✕	✕	✕
Gang membership		✕	✕
Community			
Economic deprivation	✕		✕
Community disorganization		✕	✕
Availability of drugs	✕	✕	✕
Neighborhood adults involved in crime		✕	✕

Figure PY.24 Longitudinal studies have helped to identify risk factors for predicting violent behaviour.

Those with antisocial tendencies do not seem to experience emotions the way most other people do. These individuals fail to show fear in response to environment cues that signal

punishment, pain, or noxious stimulation. For instance, they show less skin conductance (sweatiness on hands) in anticipation of electric shock than do people without antisocial tendencies (Hare, 1965). Skin conductance is controlled by the sympathetic nervous system and is used to assess autonomic nervous system functioning. When the sympathetic nervous system is active, people become aroused and anxious, and sweat gland activity increases. Thus, increased sweat gland activity, as assessed through skin conductance, is taken as a sign of arousal or anxiety. For those with antisocial personality disorder, a lack of skin conductance may indicate the presence of characteristics such as emotional deficits and impulsivity that underlie the propensity for antisocial behaviour and negative social relationships (Fung et al., 2005).

Another example showing that those with antisocial personality disorder fail to respond to environmental cues comes from a recent study by Stuppy-Sullivan and Baskin-Sommers (2019). The researchers studied cognitive and reward factors associated with antisocial personality disorder dysfunction in 119 incarcerated males. Each subject was administered three tasks targeting different aspects of cognition and reward. High-magnitude rewards tended to impair perception in those with antisocial personality disorder, worsened executive function when they were consciously

aware of the high rewards, and worsened inhibition when the tasks placed high demand on working memory.

TRICKY TOPIC: MOOD DISORDERS VS. PERSONALITY DISORDERS

One or more interactive elements has been excluded from this version of the text. You can view them online here: https://caul-cbua.pressbooks.pub/intropsychneuro/?p=555#oembed-1

If the video above does not load, click here: https://youtu.be/HhrQvdoV7lQ
For a full transcript of this video, click here

142.

NEURODEGENERATIVE DISEASES

Learning Objectives

By the end of this section, you will be able to:

- Define neurodegenerative disease
- Describe some of the techniques used to diagnose neurodegenerative diseases
- Define Alzheimer's disease and describe the clinical features
- Compare and contrast the brains of those with Alzheimer's disease to those without

What is a Neurodegenerative Disease?

Neurodegenerative diseases vary in their causes, pathology, clinical symptoms, and treatment, which leads us to ask: What is considered a neurodegenerative disease? They are commonly characterized by gradual neuronal loss that can result in cognitive and motor impairments (Gao & Hong, 2008). Neurodegenerative diseases most often affect older individuals, and with an aging population these diseases will likely become more common (Brookmeyer et al., 2007). This section will describe the causes, clinical symptoms, and treatments of common neurodegenerative diseases including Alzheimer's, Parkinson's, Huntington's, multiple sclerosis (MS), and amyotrophic lateral sclerosis (ALS). But what specific evidence do we have that these neurodegenerative diseases even exist in the first place?

Evidence for Neurodegenerative Diseases

Early Evidence

Before the age of neuroimaging, physicians and researchers studied neurodegenerative diseases with a more 'manual' approach: post-mortem brain examinations. The basic idea was that if an individual showed pathological behaviour while they were living, observed abnormalities in their brain

structure after they died could reveal Constantin Tretiakoff (PY.24) was a young researcher working in France who made an important contribution to the understanding of Parkinson's disease using this strategy. Tretiakoff compared the brains of individuals with Parkinson's to healthy age-matched individuals, focussing on an area called the substantia nigra. Tretiakoff found that those with Parkinson's showed a loss of neurons in this area which he suspected to contribute to the observable symptoms of the disease (Parent & Parent, 2010). This finding paved the way for further research in Parkinson's by drawing a connection between observable symptoms and a specific region of the brain.

Figure PY.24 Russian neuropathologist Constantin Tretiakoff (credit: Creative Commons)

Modern Techniques

While post-mortem examinations are valuable in in studying neurodegenerative diseases, neuroimaging techniques such as functional magnetic resonance imaging (fMRI) and positron emission tomography (PET) are less invasive alternatives that can be performed on living people. Like post-mortem examinations, neuroimaging allows us to examine specific brain areas, but also allows for measurement of behaviour from living and conscious participants. A major benefit of neuroimaging techniques is that they can be used to monitor brain physiology throughout the course of a neurodegenerative disease to better understand how it progresses. For example, researchers used MRI to scan the brains of patients with multiple sclerosis (MS) to examine the potential relationship between the amount of grey matter in the cerebellum and scores on cognitive and motor tests. They found that low levels of grey matter in specific areas of the cerebellum were linked impairments in cognitive and motor test scores (PY.25; Grothe et al., 2017). This study shows how neuroimaging can be used to establish a connection between observable symptoms and specific brain areas, making it a valuable tool to understanding neurodegenerative diseases.

Alzheimer's Disease

Clinical Symptoms

Alzheimer's disease is associated with many symptoms that can appear at different stages for different individuals, but ultimately all become more severe as the disease progresses (Sheppard & Coleman, 2020). Memory impairment is the primary cognitive symptom of Alzheimer's, with some forms, like semantic memory, more severely affected than others, like procedural memory. Other symptoms include deficits in attention and language, loss of posture and facial expression control, and often a variety of sleep issues (Scarmeas et al., 2004; Sprecher et al., 2017). Sleep issues and memory deficits are some of the first signs of the disease, with symptoms becoming more prominent over time (Sprecher et al., 2017, Gold & Budson, 2008). Alzheimer's disease is diagnosed most frequently after the age of 60, potentially affecting up to 50% of people over the age of 85 (Schachter & Davis, 2000).

The clinical symptoms of Alzheimer's have strong financial implications, since many diagnosed with the disease require intensive assisted living at some stage (Brookmeyer et al., 2007). The Alzheimer Society of Canada projects national spending on Alzheimer's-related costs to surpass $20 billion in the next ten years (Alzheimer Society of Canada, 2018). In addition to financial strain, Alzheimer's disease can be stressful for caregivers. These people are often spouses or children who

must watch their loved ones gradually lose cognitive function as the disease progresses (Schachter & Davis, 2000). Primary caregivers for individuals with Alzheimer's are highly susceptible to depression, with women being disproportionately affected compared to men (Alqahtani et al., 2018; Chen et al., 2020).

Causes

A defining feature of Alzheimer's disease is the presence of extracellular **amyloid plaques** found between neurons and intracellular **tau tangles** found within neurons (Bloom, 2014). These are also found in the brains of people without cognitive symptoms, but at much lower levels and in anatomically distinct areas of the brain (Price et al., 1997; Nelson et al., 2007). So how do plaques and tangles cause problems in some individuals and not others?

When neurons express high levels of amyloid proteins, they clump together to form plaques between neurons in the medial temporal lobe (Sheppard & Coleman, 2020), while tau protein builds up to form tangles inside of the neurons. The build-up of these proteins (PY.26) affects primarily cholinergic neurons (neurons that transmit acetylcholine), causing synaptic dysfunction and neuronal death (Ferreira-Vieira et al., 2016). The neurotransmitter acetylcholine is important for cognitive functions such as memory and damage to the neurons that produce it is linked to cognitive impairment in Alzheimer's patients (Ferreira-Vieira et al., 2016).

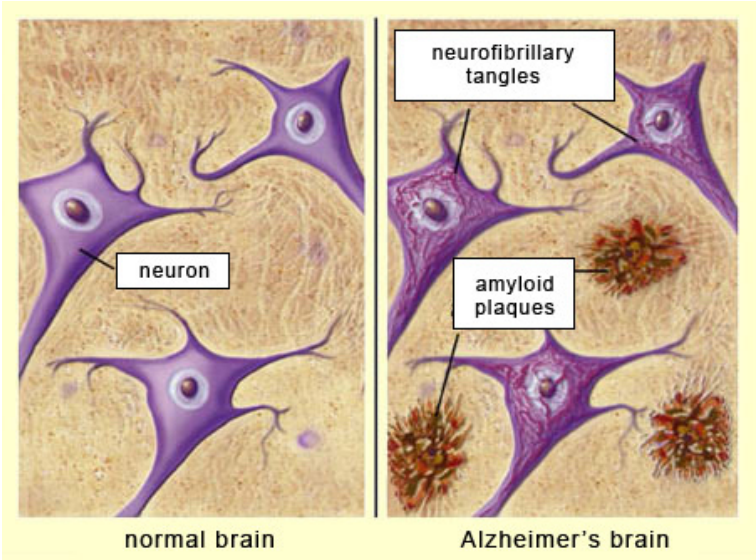

Figure PY.26 "Normal" brain shown on left with Alzheimer's patient on right. Alzheimer's brain shows intercellular tangles and extracellular plaques.

There are several genetic risk factors associated with developing Alzheimer's disease, especially the early onset type which tends to run in families (Shastry & Giblin, 1999). Having one or more copies of the APOE-e4 allele of the APOE gene makes a person more susceptible to developing the disease (National Institute on Aging, 2017). Some populations are more likely to possess copies of the APOE-e4 allele and show different vulnerabilities to developing symptoms. For example, people of African heritage who possess the APOE-e4 allele are less likely to be affected by it than those of European heritage (Serrano-Pozo et al., 2021). Although genes like

APOE-e4 appear to be involved in symptoms of early onset Alzheimer's disease, this accounts for less than 5% of cases (Shastry & Giblin, 1999). The majority of Alzheimer's cases are later onset and not as tightly linked to family history, so the role of inherited genes in these cases is less clear.

Some of the strongest predictors of Alzheimer's risk are related to environment and lifestyle, such as cognitive activity and verbal ability. One of the most surprising findings comes from the Nun Study on aging and Alzheimer's disease (Snowdon, 2001). Participants in this longitudinal study were Catholic nuns from the School Sisters of Notre Dame who completed annual physical and cognitive tests to monitor possible symptoms of dementia. They also generously agreed to donate their brains when they died for detection of Alzheimer's neuropathology, like plaques and tangles. Linguistic analysis of their writing as young adults when they entered the sisterhood, showed that "idea density", the average number of ideas expressed per ten words, predicted both cognitive impairment and neuropathology *50 years later* (Riley et al., 2005)! Although this research does not provide a direct causal link between cognitive activity as a protective factor, other research points to benefits of a busy brain. Another large-scale study showed that engaging in regular cognitive activity, like reading the newspaper, and doing crossword puzzles, was associated with a significantly reduced risk of Alzheimer's-type memory symptoms five years later (Wilson et al., 2022).

Dig Deeper

Earlier Detection of Alzheimer's Disease Using Biomarkers

Dr. Sultan Darvesh (PY.27) and his research group are developing ways to detect Alzheimer's disease in the early stages, by looking for on **biomarkers,** molecules produced during pathological processes. Plaques and tangles are present in most people's brains, but they only are linked to dysfunction in those who develop Alzheimer's disease (Freer et al., 2016). Identifying differences in proteins associated with known neuropathology is a promising strategy (National Cancer Institute). For years researchers have tried to find a reliable biomarker of Alzheimer's; recently, Darvesh and his team discovered that butylcholinesterase-associated plaques appear in the brains of individuals with Alzheimer's disease, but not in the brains of patients diagnosed with other neurodegenerative diseases. Butylcholinesterase is an enzyme responsible for

breaking down acetylcholine (which we know is negatively impacted in individuals with Alzheimer's disease). This may be the first step towards earlier diagnosis and treatments for those living with Alzheimer's.

Figure PY.27 Alzheimer's researcher, Dr. Sultan Darvesh from Dalhousie University (credit: Dalhousie University)

In recent years, Darvesh's group examined brains

with and without plaques, and brains from individuals with and without Alzheimer's. Researchers found butylcholinesterase plaques were present almost exclusively in the brains of individuals who had Alzheimer's, while amyloid plaques were found in the brains of those with and without Alzheimer's disease. Furthermore, butylcholinesterase plaques were not associated with any other neurodegenerative diseases, making them ideal biomarkers unique to Alzheimer's (MacDonald et al., 2017).

Many neuroimaging techniques (e.g., PET scans) use radioactive molecules to identify biomarkers in the brain. These radioactive molecules need to be able to bond to the biomarker of interest so that researchers and clinicians can visualize where these biomarkers might be in the brain. Darvesh and his team are currently working to develop this type of molecule to allow for a high-resolution visualization of plaques in the brains of Alzheimer's patients. The biomarker may allow for earlier detection and potentially become a reliable tool for diagnosis.

Link to Learning

Watch this interview with Dr. Sultan Darvesh, discussing his work on Alzheimer's disease, to learn more.

Treatment

A cure for Alzheimer's does not exist, meaning that those diagnosed will have the disease until death. However, there are drug-based and non-drug-based treatment options that can reduce some of the symptoms of the disease and aim to increase quality of life for Alzheimer's patients. are somewhat effective at reducing symptoms (e.g., memory loss, language difficulty).

Cholinesterase inhibitors are a popular drug-based treatment that aims to prevent the breakdown of acetylcholine, a neurotransmitter crucial to many cognitive processes including memory. The inhibitors allow acetylcholine to remain in the synapse for longer, enhancing its effects (Larik et al., 2018). Another drug-based option is

the use of NMDA antagonists which regulate the release of glutamate in the brain. In Alzheimer's patients, excessive amounts of glutamate can cause neuronal cell death which contributes to the symptoms of the disease (Liu et al., 2019). NMDA antagonists and cholinesterase inhibitors both work to reduce cognitive symptoms of Alzheimer's disease but in different ways; as such, patients are often prescribed a combination of both of these types of drugs.

Besides prescribed drugs, Alzheimer's disease can be managed through strong social support. Specifically, clinical psychologists recommend a psychosocial approach on its own, or in addition drug-based treatment. **Psychosocial interventions** can include cognitive training, group exercise, and art or music therapy (PY.28). Duan et al. (2018) conducted a meta-analysis on the effectiveness of several psychosocial interventions such as a walking program and group exercise. They looked at the effectiveness of these interventions on their own and when paired with cholinesterase inhibitors. A walking program, home-based exercise, and group exercise, among others, were found to improve the mental state of participants compared to those in the control condition. However, a combination of cholinesterase inhibitor and psychosocial intervention was found to be the most effective, more so either treatment on their own (Duan et al., 2018).

Figure PY. 28 Music therapy can improve the moods, autobiographical recall, and cognitive skills in individuals with Alzheimer's diease (Matziorinis & Koelsch, 2022; credit: Alzheimer's Society of Canada)

143.

KEY TERMS FOR PSYCHOPATHOLOGY

Adaptive information processing model of PTSD suggests that past trauma can continue to cause emotional distress if the memory of that trauma is not fully processed

ADHD-C

Attention deficit/hyperactivity disorder with a mix of symptoms in both inattentive and hyperactive/impulsive categories.

ADHD-HI

Attention deficit/hyperactivity disorder with symptoms that primarily fall into the hyperactivity and Impulsivity category. People with ADHD-HI have trouble with impulse control, may display a high level of activity and energy in inappropriate situations, and have relatively fewer symptoms in the inattentive category.

ADHD-PI

Attention deficit/hyperactivity disorder with symptoms that primarily fall into the inattentive category. People with

ADHD-PI have trouble maintaining attention, and have relatively fewer symptoms in the hyperactivity and impulsivity category.

agoraphobia

anxiety disorder characterized by intense fear, anxiety, and avoidance of situations in which it might be difficult to escape if one experiences symptoms of a panic attack

alexithymia

a condition that involves a reduced ability to identify and sense one's own emotions and the emotions of others

alterations in arousal and reactivity

one of the four categories of PTSD symptoms; include irritability or aggression, increased risk-taking, hyper-vigilance, jumpiness, and difficulty with concentration or sleep

amyloid-beta plaque

an extracellular accumulation of amyloid; thought to be the potential cause or by-product of Alzheimer's disease

antisocial personality disorder

characterized by a lack of regard for others' rights, impulsivity, deceitfulness, irresponsibility, and lack of remorse over misdeeds

anxiety disorder

characterized by excessive and persistent fear and anxiety, and by related disturbances in behaviour

applied behavioural analysis

a behavioural modification strategy that involves punishing

autistic traits and behaviours that are deemed maladaptive, while rewarding behaviours that are deemed appropriate; this therapy is not accepted by the broader autistic community

attention deficit/hyperactivity disorder

a neurotype characterized by differences and difficulties in attention and emotional and behavioural regulation. This neurotype is often also associated with differences in sensory processing and executive function.

atypical

describes behaviours or feelings that deviate from the norm

augmentative and alternative communication (AAC)

techniques and technologies meant to supplement or allow for communication when expressive speech or language is difficult or impossible. AAC includes but isn't limited to sign languages, text-to-speech devices, and image-based systems like picture cards and communication boards.

autistic burnout

a state resulting from prolonged stress and a mismatch of expectations and abilities without enough accommodation or support. This state is associated with long term fatigue, reduced function, loss of previously acquired skills, and an increase in sensory issues.

autistic meltdown

a response similar to fight or flight that autistic people experience when they are experiencing a level of stress and

overstimulation that they aren't able to manage. Meltdowns involve bursts of uncontrolled behaviour that may serve to externalize stress and reduce the level of internal tension the autistic person is experiencing.

autistic shutdown

a response to overwhelming stress and overstimulation in which an autistic person experiences dissociation or withdrawal from the current sensory environment. Shutdowns involve reduced responsiveness, loss of function, and fatigue, and may serve to reduce tension by decreasing the amount of stimulation the individual experiences

autism spectrum disorder

a neurotype characterized by difficulty in neurotypical social interaction and communication, and by restricted or repetitive patterns of thought and behaviour. This neurotype is also generally associated with differences in sensory processing.

avoidance symptoms

one of the four categories of PTSD; occur when the individual avoids stimuli or thoughts and feelings associated with the trauma

behavioural parent training

a kind of therapy designed to teach parents of people with ADHD how to manage emotions and communicate effectively so that they can support their children in forming habits and learning skills that suit their needs and neurotype.

biomarker

unique molecules produced during pathological processes that can be used to detect the presence of a disease

bipolar and related disorders

group of mood disorders in which mania is the defining feature

bipolar disorder

mood disorder characterized by mood states that vacillate between depression and mania

body dysmorphic disorder

involves excessive preoccupation with an imagined defect in physical appearance

borderline personality disorder

instability in interpersonal relationships, self-image, and mood, as well as impulsivity; key features include intolerance of being alone and fear of abandonment, unstable relationships, unpredictable behaviour and moods, and intense and inappropriate anger

catatonic behaviour

decreased reactivity to the environment; includes posturing and catatonic stupor

cognitive behavioural therapy (CBT)

a kind of therapy that aims to systematically identify maladaptive patterns of thought and behaviour so that they can be addressed and replaced with more effective strategies

comorbidity

co-occurrence of two disorders in the same individual

complex PTSD (C-PTSD)

a variant of PTSD included in the 11th revision of the International Classification of Diseases (ICD-11) but it has yet to be included in the DSM

delusion

belief that is contrary to reality and is firmly held, despite contradictory evidence

depersonalization/derealization disorder

dissociative disorder in which people feel detached from the self (depersonalization), and the world feels artificial and unreal (derealization)

depressive disorder

one of a group of mood disorders in which depression is the defining feature

diagnosis

determination of which disorder a set of symptoms represents

Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5)

authoritative index of mental disorders and the criteria for their diagnosis; published by the American Psychiatric Association (APA)

diathesis-stress model

suggests that people with a predisposition for a disorder (a diathesis) are more likely to develop the disorder when faced with stress; model of psychopathology

disorganized thinking

disjointed and incoherent thought processes, usually detected by what a person says

disorganized/abnormal motor behaviour
highly unusual behaviours and movements (such as child-like behaviours), repeated and purposeless movements, and displaying odd facial expressions and gestures

dissociative amnesia
dissociative disorder characterized by an inability to recall important personal information, usually following an extremely stressful or traumatic experience

dissociative disorders
group of DSM-5 disorders in which the primary feature is that a person becomes dissociated, or split off, from his or her core sense of self, resulting in disturbances in identity and memory

dissociative fugue
symptom of dissociative amnesia in which a person suddenly wanders away from one's home and experiences confusion about his or her identity

dissociative identity disorder
dissociative disorder (formerly known as multiple personality disorder) in which a person exhibits two or more distinct, well-defined personalities or identities and experiences memory gaps for the time during which another identity emerged

dopamine hypothesis
theory of schizophrenia that proposes that an overabundance of dopamine or dopamine receptors is responsible for the onset and maintenance of schizophrenia

etiology
cause or causes of a psychological disorder

executive functions

a set of cognitive skills that involve self-control, self-monitoring, planning and organization, and working memory

flashback

psychological state lasting from a few seconds to several days, during which one relives a traumatic event and behaves as though the event were occurring at that moment

flight of ideas

symptom of mania that involves an abruptly switching in conversation from one topic to another

generalized anxiety disorder

characterized by a continuous state of excessive, uncontrollable, and pointless worry and apprehension

global processing

processing the sum of parts, or the end product of a number of local details as they are combined; for example, processing the way a song sounds as a whole, rather than focusing on individual notes or instruments

grandiose delusion

characterized by beliefs that one holds special power, unique knowledge, or is extremely important

habituation

a reduction in the response of the nervous system to stimuli that is unchanging or consistently present

hallucination

perceptual experience that occurs in the absence of external

stimulation, such as the auditory hallucinations (hearing voices) common to schizophrenia

harmful dysfunction

model of psychological disorders resulting from the inability of an internal mechanism to perform its natural function

hoarding disorder

characterized by persistent difficulty in parting with possessions, regardless of their actual value or usefulness

hopelessness theory

cognitive theory of depression proposing that a style of thinking that perceives negative life events as having stable and global causes leads to a sense of hopelessness and then to depression

hyperfocus

an intense state of attention towards a particular subject, during which the individual may seem to ignore all other stimuli and may lose their sense of time; generally this occurs during tasks that are enjoyable

hyperlexia

the ability to read significantly above the expected level for one's age

hyperreactivity

a larger than average reaction to certain sensory stimuli

hyporeactivity

a smaller than average reaction to certain sensory stimuli or a lack of reaction to certain sensory stimuli

identity first language

a way to refer to people that uses their condition or neurotype as a noun. This is meant to acknowledge that the neurotype or condition is actually a part of the person's identity which cannot be separated from them. For example, referring to someone as an autistic person is a use of identity first language.

interoception

one's perception of sensations that come from inside the body, including heart beat, respiration, pain, sensations involved in digestion, and nervous system activity related to emotions

intrusion symptoms

one of the four categories of PTSD symptoms; occur when the traumatic event is re-experienced through memories, nightmares, flashbacks, and emotional or physical reactivity after exposure to stimuli associated with the trauma

International Classification of Diseases (ICD)

authoritative index of mental and physical diseases, including infectious diseases, and the criteria for their diagnosis; published by the World Health Organization (WHO)

Learning and Cognitive Processing Model of PTSD

suggests that some symptoms are developed and maintained through classical conditioning

local processing

processing local details, the individual details that make up a bigger picture; for example, processing the colours that are used in a painting rather than processing the painting as a whole

locus coeruleus

area of the brainstem that contains norepinephrine, a neurotransmitter that triggers the body's fight-or-flight response; has been implicated in panic disorder

major depressive disorder

commonly referred to as "depression" or "major depression," characterized by sadness or loss of pleasure in usual activities, as well other symptoms

mania

state of extreme elation and agitation

manic episode

period in which an individual experiences mania, characterized by extremely cheerful and euphoric mood, excessive talkativeness, irritability, increased activity levels, and other symptoms

masking

a strategy that involves learning and performing neurotypical behaviours, while suppressing and resisting autistic behaviours with the intent to blend in for safety, to avoid stigma, and to succeed in a neurotypical social context

medical model of disability

a model that identifies disability as a defect rather than a difference of needs. This model positions the disabled person as a victim of their disability and places responsibility on the individual. This model aims to prevent and eliminate disability.

mindfulness techniques and training

a kind of attention training therapy or technique that aims

teach participants to remain cognitively present and avoid internal distractions, like stressful thoughts or worries about the future, as well as external distractions, like ambient noise.

mood disorder

one of a group of disorders characterized by severe disturbances in mood and emotions; the categories of mood disorders listed in the DSM-5 are bipolar and related disorders and depressive disorders

negative alterations in cognitions and mood

one of the four categories of PTSD symptoms; involve pervasive negative mood, feelings of isolation, extreme negative beliefs about the self or the world, and problems with memory, often specific to trauma related memories

negative symptom

characterized by decreases and absences in certain normal behaviours, emotions, or drives, such as an expressionless face, lack of motivation to engage in activities, reduced speech, lack of social engagement, and inability to experience pleasure

neurodegenerative disease

a brain disorder characterized by the dysfunction and subsequent death of neurons

neurodevelopmental disorder

one of the disorders that are first diagnosed in childhood and involve developmental problems in academic, intellectual, social functioning

neurodiversity

the spectrum of brain organization and function that can occur in a population of healthy humans

neurotype

the kind of brain organization and function a person has, influencing the way they perceive, interpret, and respond to the world

neurotypical

a person who has a neurotype that functions similarly to the majority of people of the same age in their culture

neurodivergent

a person who has a neurotype that functions differently from the majority of people of the same age in their culture

obsessive-compulsive and related disorders

group of overlapping disorders listed in the DSM-5 that involves intrusive, unpleasant thoughts and/or repetitive behaviours

obsessive-compulsive disorder

characterized by the tendency to experience intrusive and unwanted thoughts and urges (obsession) and/or the need to engage in repetitive behaviours or mental acts (compulsions) in response to the unwanted thoughts and urges

occupational therapy

a form of therapy that aims to help individuals improve function in daily life, often by identifying barriers, developing strategies to address those barriers, and identifying relevant supports. For example, someone who has lost function in their hands may need an occupational therapist to identify exercises

that will help them regain function, and to help them find accommodations so that they can condition to engage in daily activities while they are recovering.

orbitofrontal cortex

area of the frontal lobe involved in learning and decision-making

panic attack

period of extreme fear or discomfort that develops abruptly; symptoms of panic attacks are both physiological and psychological

panic disorder

anxiety disorder characterized by unexpected panic attacks, along with at least one month of worry about panic attacks or self-defeating behaviour related to the attacks

paranoid delusion

characterized by beliefs that others are out to harm them

peripartum onset

subtype of depression that applies to those who experience an episode of major depression either during pregnancy or in the four weeks following childbirth

persistent depressive disorder

depressive disorder characterized by a chronically sad and melancholy mood

person-first language

a way to refer to people that uses their condition or neurotype as an adjective, with the intent to separate the person from the condition. This kind of language is meant to present the

condition or neurotype as separable from the person. For example, referring to someone as a person with ADHD is a use of person first language.

personality disorder

group of DSM-5 disorders characterized by an inflexible and pervasive personality style that differs markedly from the expectations of one's culture and causes distress and impairment; people with these disorders have a personality style that frequently brings them into conflict with others and disrupts their ability to develop and maintain social relationships

posttraumatic stress disorder (PTSD)

experiencing a profoundly traumatic event leads to a constellation of symptoms that include intrusive and distressing memories of the event, avoidance of stimuli connected to the event, negative emotional states, feelings of detachment from others, irritability, proneness toward outbursts, hypervigilance, and a tendency to startle easily; these symptoms must occur for at least one month

prodromal symptom

in schizophrenia, one of the early minor symptoms of psychosis

psychological disorder

condition characterized by abnormal thoughts, feelings, and behaviours

psychopathology

study of psychological disorders, including their symptoms,

causes, and treatment; manifestation of a psychological disorder

rumination

in depression, tendency to repetitively and passively dwell on one's depressed symptoms, their meanings, and their consequences

safety behaviour

mental and behaviour acts designed to reduce anxiety in social situations by reducing the chance of negative social outcomes; common in social anxiety disorder

schizophrenia

severe disorder characterized by major disturbances in thought, perception, emotion, and behaviour with symptoms that include hallucinations, delusions, disorganized thinking and behaviour, and negative symptoms

seasonal pattern

subtype of depression in which a person experiences the symptoms of major depressive disorder only during a particular time of year

social anxiety disorder

characterized by extreme and persistent fear or anxiety and avoidance of social situations in which one could potentially be evaluated negatively by others

social model of disability

a model that positions disability as a problem that results from barriers in society that disadvantage people who have different

needs. This model aims to improve rights and accessibility for disabled people.

social skills training

a therapy designed to teach autistic people to communicate and interact in more neurotypical-like ways; this therapy is controversial in the autistic community, as it is argued to devalue autistic social skills.

somatic delusion

belief that something highly unusual is happening to one's body or internal organs

specific phobia

anxiety disorder characterized by excessive, distressing, and persistent fear or anxiety about a specific object or situation

stimulant medication

drugs that increase the activity of certain parts of the nervous system. Certain stimulants are regularly prescribed for people with ADHD, as they can help promote activity in parts of the brain that are found to be under active, particularly the frontal lobe.

stims/stimming

repetitive body movements/behaviours or noises, which can help to regulate one's level of stimulation. During overstimulation, stimming can help to block out undesirable environmental stimuli. During under-stimulation, stimming can help to generate increased internal stimulation.

suicidal ideation

thoughts of death by suicide, thinking about or planning suicide, or making a suicide attempt

suicide

death caused by intentional, self-directed injurious behaviour

supernatural

describes a force beyond scientific understanding

tau fibrillary tangles

intracellular, string-like proteins thought to be the cause or by-product of Alzheimer's disease

ventricle

one of the fluid-filled cavities within the brain

working memory

a component of short-term memory responsible for holding and processing units of information that are in immediate use

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SUMMARY FOR PSYCHOLOGICAL DISORDERS

15.1What Are Psychological Disorders?

Psychological disorders are conditions characterized by abnormal thoughts, feelings, and behaviours. Although challenging, it is essential for psychologists and mental health professionals to agree on what kinds of inner experiences and behaviours constitute the presence of a psychological disorder. Inner experiences and behaviours that are atypical or violate social norms could signify the presence of a disorder; however, each of these criteria alone is inadequate. Harmful dysfunction describes the view that psychological disorders result from the inability of an internal mechanism to perform its natural function. Many of the features of harmful dysfunction conceptualization have been incorporated in the APA's formal definition of psychological disorders. According to this definition, the presence of a psychological disorder is signalled by significant disturbances in thoughts, feelings, and

behaviours; these disturbances must reflect some kind of dysfunction (biological, psychological, or developmental), must cause significant impairment in one's life, and must not reflect culturally expected reactions to certain life events.

15.2 Diagnosing and Classifying Psychological Disorders

The diagnosis and classification of psychological disorders is essential in studying and treating psychopathology. The classification system used by most U.S. professionals is the DSM-5. The first edition of the DSM was published in 1952, and has undergone numerous revisions. The 5th and most recent edition, the DSM-5, was published in 2013. The diagnostic manual includes a total of 237 specific diagnosable disorders, each described in detail, including its symptoms, prevalence, risk factors, and comorbidity. Over time, the number of diagnosable conditions listed in the DSM has grown steadily, prompting criticism from some. Nevertheless, the diagnostic criteria in the DSM are more explicit than that of any other system, which makes the DSM system highly desirable for both clinical diagnosis and research.

15.3 Perspectives on Psychological Disorders

Psychopathology is very complex, involving a plethora of

etiological theories and perspectives. For centuries, psychological disorders were viewed primarily from a supernatural perspective and thought to arise from divine forces or possession from spirits. Some cultures continue to hold this supernatural belief. Today, many who study psychopathology view mental illness from a biological perspective, whereby psychological disorders are thought to result largely from faulty biological processes. Indeed, scientific advances over the last several decades have provided a better understanding of the genetic, neurological, hormonal, and biochemical bases of psychopathology. The psychological perspective, in contrast, emphasizes the importance of psychological factors (e.g., stress and thoughts) and environmental factors in the development of psychological disorders. A contemporary, promising approach is to view disorders as originating from an integration of biological and psychosocial factors. The diathesis-stress model suggests that people with an underlying diathesis, or vulnerability, for a psychological disorder are more likely than those without the diathesis to develop the disorder when faced with stressful events.

15.4 Neurodevelopmental Disorders

Neurodevelopmental disorders are a group of disorders that are typically diagnosed during childhood and are characterized by developmental deficits in personal, social, academic, and

intellectual realms; these disorders include attention deficit/hyperactivity disorder (ADHD) and autism spectrum disorder. ADHD is characterized by a pervasive pattern of inattention and/or hyperactive and impulsive behaviour that interferes with normal functioning. Genetic and neurobiological factors contribute to the development of ADHD, which can persist well into adulthood and is often associated with poor long-term outcomes. The major features of autism spectrum disorder include deficits in social interaction and communication and repetitive movements or interests. As with ADHD, genetic factors appear to play a prominent role in the development of autism spectrum disorder; exposure to environmental pollutants such as mercury have also been linked to the development of this disorder. Although it is believed by some that autism is triggered by the MMR vaccination, evidence does not support this claim.

15.5 Schizophrenia

Schizophrenia is a severe disorder characterized by a complete breakdown in one's ability to function in life; it often requires hospitalization. People with schizophrenia experience hallucinations and delusions, and they have extreme difficulty regulating their emotions and behaviour. Thinking is incoherent and disorganized, behaviour is extremely bizarre,

emotions are flat, and motivation to engage in most basic life activities is lacking. Considerable evidence shows that genetic factors play a central role in schizophrenia; however, adoption studies have highlighted the additional importance of environmental factors. Neurotransmitter and brain abnormalities, which may be linked to environmental factors such as obstetric complications or exposure to influenza during the gestational period, have also been implicated. A promising new area of schizophrenia research involves identifying individuals who show prodromal symptoms and following them over time to determine which factors best predict the development of schizophrenia. Future research may enable us to pinpoint those especially at risk for developing schizophrenia and who may benefit from early intervention.

15.6 Mood Disorders

Mood disorders are those in which the person experiences severe disturbances in mood and emotion. They include depressive disorders and bipolar and related disorders. Depressive disorders include major depressive disorder, which is characterized by episodes of profound sadness and loss of interest or pleasure in usual activities and other associated features, and persistent depressive disorder, which marked by a chronic state of sadness. Bipolar disorder is characterized by mood states that vacillate between sadness and euphoria;

a diagnosis of bipolar disorder requires experiencing at least one manic episode, which is defined as a period of extreme euphoria, irritability, and increased activity. Mood disorders appear to have a genetic component, with genetic factors playing a more prominent role in bipolar disorder than in depression. Both biological and psychological factors are important in the development of depression.

15.7 Anxiety Disorders

Anxiety disorders are a group of disorders in which a person experiences excessive, persistent, and distressing fear and anxiety that interferes with normal functioning. Anxiety disorders include specific phobia: a specific unrealistic fear; social anxiety disorder: extreme fear and avoidance of social situations; panic disorder: suddenly overwhelmed by panic even though there is no apparent reason to be frightened; agoraphobia: an intense fear and avoidance of situations in which it might be difficult to escape; and generalized anxiety disorder: a relatively continuous state of tension, apprehension, and dread.

15.8 Obsessive-Compulsive and Related Disorders

Obsessive-compulsive and related disorders are a group of DSM-5 disorders that overlap somewhat in that they each

involve intrusive thoughts and/or repetitive behaviours. Perhaps the most recognized of these disorders is obsessive-compulsive disorder, in which a person is obsessed with unwanted, unpleasant thoughts and/or compulsively engages in repetitive behaviours or mental acts, perhaps as a way of coping with the obsessions. Body dysmorphic disorder is characterized by the individual becoming excessively preoccupied with one or more perceived flaws in his physical appearance that are either nonexistent or unnoticeable to others. Preoccupation with the perceived physical defects causes the person to experience significant anxiety regarding how he appears to others. Hoarding disorder is characterized by persistent difficulty in discarding or parting with objects, regardless of their actual value, often resulting in the accumulation of items that clutter and congest her living area.

15.9 Posttraumatic Stress Disorder

Posttraumatic stress disorder (PTSD) was described through much of the 20th century and was referred to as shell shock and combat neurosis in the belief that its symptoms were thought to emerge from the stress of active combat. Today, PTSD is defined as a disorder in which the experience of a traumatic or profoundly stressful event, such as combat, sexual assault, or natural disaster, produces a constellation of symptoms that must last for one month or more. These symptoms include intrusive and distressing memories of the

event, flashbacks, avoidance of stimuli or situations that are connected to the event, persistently negative emotional states, feeling detached from others, irritability, proneness toward outbursts, and a tendency to be easily startled. Not everyone who experiences a traumatic event will develop PTSD; a variety of risk factors associated with its development have been identified.

15.10 Dissociative Disorders

The main characteristic of dissociative disorders is that people become dissociated from their sense of self, resulting in memory and identity disturbances. Dissociative disorders listed in the DSM-5 include dissociative amnesia, depersonalization/derealization disorder, and dissociative identity disorder. A person with dissociative amnesia is unable to recall important personal information, often after a stressful or traumatic experience.

Depersonalization/derealization disorder is characterized by recurring episodes of depersonalization (i.e., detachment from or unfamiliarity with the self) and/or derealization (i.e., detachment from or unfamiliarity with the world). A person with dissociative identity disorder exhibits two or more well-defined and distinct personalities or identities, as well as memory gaps for the time during which another identity was present.

Dissociative identity disorder has generated controversy,

mainly because some believe its symptoms can be faked by patients if presenting its symptoms somehow benefits the patient in avoiding negative consequences or taking responsibility for one's actions. The diagnostic rates of this disorder have increased dramatically following its portrayal in popular culture. However, many people legitimately suffer over the course of a lifetime with this disorder.

15.11 Personality Disorders

Individuals with personality disorders exhibit a personality style that is inflexible, causes distress and impairment, and creates problems for themselves and others. The DSM-5 recognizes 10 personality disorders, organized into three clusters. The disorders in Cluster A include those characterized by a personality style that is odd and eccentric. Cluster B includes personality disorders characterized chiefly by a personality style that is impulsive, dramatic, highly emotional, and erratic, and those in Cluster C are characterized by a nervous and fearful personality style. Two Cluster B personality disorders, borderline personality disorder and antisocial personality disorder, are especially problematic. People with borderline personality disorder show marked instability in mood, behaviour, and self-image, as well as impulsivity. They cannot stand to be alone, are unpredictable, have a history of stormy relationships, and frequently display intense and inappropriate anger. Genetic

factors and adverse childhood experiences (e.g., sexual abuse) appear to be important in its development. People with antisocial personality display a lack of regard for the rights of others; they are impulsive, deceitful, irresponsible, and unburdened by any sense of guilt. Genetic factors and socialization both appear to be important in the origin of antisocial personality disorder. Research has also shown that those with this disorder do not experience emotions the way most other people do.

145.

REVIEW QUESTIONS FOR PSYCHOLOGICAL DISORDERS

Click here for Answer Key

Multiple Choice Questions

1. In the harmful dysfunction definition of psychological disorders, dysfunction involves _____.

a. the inability of an psychological mechanism to perform its function
b. the breakdown of social order in one's community
c. communication problems in one's immediate family
d. all the above

2. Patterns of inner experience and behaviour are thought to reflect the presence of a psychological disorder if they _____.

a. are highly atypical
b. lead to significant distress and impairment in one's life

c. embarrass one's friends and/or family
d. violate the norms of one's culture

3. The letters in the abbreviation DSM-5 stand for _____.

a. Diseases and Statistics Manual of Medicine
b. Diagnosable Standards Manual of Mental Disorders
c. Diseases and Symptoms Manual of Mental Disorders
d. Diagnostic and Statistical Manual of Mental Disorders

4. A study based on over 9,000 U. S. residents found that the most prevalent disorder was _____.

a. major depressive disorder
b. social anxiety disorder
c. obsessive-compulsive disorder
d. specific phobia

5. The diathesis-stress model presumes that psychopathology results from _____.

a. vulnerability and adverse experiences
b. biochemical factors
c. chemical imbalances and structural abnormalities in the brain
d. adverse childhood experiences

6. Dr. Anastasia believes that major depressive disorder is

caused by an over-secretion of cortisol. Dr. Anastasia's view on the cause of major depressive disorder reflects a _____ perspective.

a. psychological
b. supernatural
c. biological
d. diathesis-stress

7. In which of the following anxiety disorders is the person in a continuous state of excessive, pointless worry and apprehension?

a. panic disorder
b. generalized anxiety disorder
c. agoraphobia
d. social anxiety disorder

8. Which of the following would constitute a safety behaviour?

a. encountering a phobic stimulus in the company of other people
b. avoiding a field where snakes are likely to be present
c. avoiding eye contact
d. worrying as a distraction from painful memories

9. Which of the following best illustrates a compulsion?

a. mentally counting backward from 1,000
b. persistent fear of germs
c. thoughts of harming a neighbour
d. falsely believing that a spouse has been cheating

10. Research indicates that the symptoms of OCD _____.

a. are similar to the symptoms of panic disorder
b. are triggered by low levels of stress hormones
c. are related to hyperactivity in the orbitofrontal cortex
d. are reduced if people are asked to view photos of stimuli that trigger the symptoms

11. Symptoms of PTSD include all of the following *except* _____.

a. intrusive thoughts or memories of a traumatic event
b. avoidance of things that remind one of a traumatic event
c. jumpiness
d. physical complaints that cannot be explained medically

12. Which of the following elevates the risk for developing PTSD?

a. severity of the trauma
b. frequency of the trauma
c. high levels of intelligence

d. social support

13. Common symptoms of major depressive disorder include all of the following *except* _____.

a. periods of extreme elation and euphoria
b. difficulty concentrating and making decisions
c. loss of interest or pleasure in usual activities
d. psychomotor agitation and retardation

14. Clifford falsely believes that the police have planted secret cameras in his home to monitor their every movement. Clifford's belief is an example of _____.

a. a delusion
b. a hallucination
c. tangentiality
d. a negative symptom

15. A study of adoptees whose biological mothers had schizophrenia found that the adoptees were most likely to develop schizophrenia _____.

a. if their childhood friends later developed schizophrenia
b. if they abused drugs during adolescence
c. if they were raised in a disturbed adoptive home environment

d. regardless of whether they were raised in a healthy or disturbed home environment

16. Dissociative amnesia involves _____.

a. memory loss following head trauma
b. memory loss following stress
c. feeling detached from the self
d. feeling detached from the world

17. Dissociative identity disorder mainly involves _____.

a. depersonalization
b. derealization
c. schizophrenia
d. different personalities

18. Which of the following is *not* a primary characteristic of ADHD?

a. short attention span
b. difficulty concentrating and distractibility
c. restricted and fixated interest
d. excessive fidgeting and squirming

19. One of the primary characteristics of autism spectrum disorder is _____.

a. bed-wetting
b. difficulty relating to others
c. short attention span
d. intense and inappropriate interest in others

20. People with borderline personality disorder often _____.

a. try to be the centre of attention
b. are shy and withdrawn
c. are impulsive and unpredictable
d. tend to accomplish goals through cruelty

21. Antisocial personality disorder is associated with _____.

a. emotional deficits
b. memory deficits
c. parental overprotection
d. increased empathy

Critical Thinking Questions

22. Discuss why thoughts, feelings, or behaviours that are merely atypical or unusual would not necessarily signify the presence of a psychological disorder. Provide an example.

23. Describe the DSM-5. What is it, what kind of information

does it contain, and why is it important to the study and treatment of psychological disorders?

24. The International Classification of Diseases (ICD) and the DSM differ in various ways. What are some of the differences in these two classification systems?

25. Why is the perspective one uses in explaining a psychological disorder important?

26. Describe how cognitive theories of the etiology of anxiety disorders differ from learning theories.

27. Discuss the common elements of each of the three disorders covered in this section: obsessive-compulsive disorder, body dysmorphic disorder, and hoarding disorder.

28. List some of the risk factors associated with the development of PTSD following a traumatic event.

29. Why is research following individuals who show prodromal symptoms of schizophrenia so important?

30. The prevalence of most psychological disorders has increased since the 1980s. However, as discussed in this section, scientific publications regarding dissociative amnesia peaked in the mid-1990s but then declined steeply through 2003. In addition, no fictional or nonfictional description of individuals showing dissociative amnesia following a trauma

exists prior to 1800. How would you explain this phenomenon?

31. Compare the factors that are important in the development of ADHD with those that are important in the development of autism spectrum disorder.

32. Imagine that a child has a genetic vulnerability to antisocial personality disorder. How might this child's environment shape the likelihood of developing this personality disorder?

Personal Application Questions

33. Identify a behaviour that is considered unusual or abnormal in your own culture; however, it would be considered normal and expected in another culture.

34. Even today, some believe that certain occurrences have supernatural causes. Think of an event, recent or historical, for which others have provided supernatural explanation.

35. Think of someone you know who seems to have a tendency to make negative, self-defeating explanations for negative life events. How might this tendency lead to future problems? What steps do you think could be taken to change this thinking style?

36. Try to find an example (via a search engine) of a past instance in which a person committed a horrible crime, was

apprehended, and later claimed to have dissociative identity disorder during the trial. What was the outcome? Was the person revealed to be faking? If so, how was this determined?

37. Discuss the characteristics of autism spectrum disorder with a few of your friends or members of your family (choose friends or family members who know little about the disorder) and ask them if they think the cause is due to bad parenting or vaccinations. If they indicate that they believe either to be true, why do you think this might be the case? What would be your response?

146.

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Neurodiversity

In May 2022, Drs **Erin Mazerolle**, **Erin Austen**, and **Jesse Husk** (StFX University; with funding from Atlantic OER) organized an 'OER Sprint Hackathon' event in which students from across the Atlantic provinces reviewed portions of this textbook with Equity, Diversity, Inclusivity, and Accessibility in mind. Students provided comments, suggestions, concerns, and recommendations about ways to improve content. One section that received a great deal of attention was the formerly titled, Neurodevelopmental Disorders, section. Based on student feedback, this section was renamed Neurodiversity, and rewritten by **Max Dysart**. We'd like to specifically acknowledge the following students who contributed to the revisions of the Neurodiversity section:

- Angie Birt
- Brooke Tracy
- Chi Nguyen

- George Fazaa
- Laura Coon

PTSD

Max Dysart rewrote this section with a focus on health care workers, intersectionality, and meaningful experiences (rather than simply statistics).

Neurodegenerative Diseases

(COMING SOON) **Justin Field** organized a completely new section on neurodegenerative diseases and wrote a new introductory paragraph to the section and a sub-section on Alzheimer's Disease.

CHAPTER XV
TREATMENT

147.

INTRODUCTION TO TREATMENT

Chapter Outline

- Mental Health Treatment: Past and Present
- Types of Treatment
- Treatment Modalities
- Substance-Related and Addictive Disorders: A Special Case
- The Sociocultural Model and Therapy Utilization

T.1 Many forms of treatment have been developed to treat different issues. Increasingly, people are accessing the therapy they need via their phones.

What comes to mind when you think about therapy, psychologists, or treatment? You might picture someone lying on a couch talking about their childhood while the therapist sits and takes notes, à la Sigmund Freud. But can you envision a therapy session in which someone is wearing virtual reality headgear to conquer a fear of snakes?

In this chapter, you will see that approaches to therapy include both psychological and biological interventions, all with the goal of alleviating distress. Because psychological challenges can originate from various sources—biology, genetics, childhood experiences, conditioning, and sociocultural influences—psychologists have developed many

different therapeutic techniques and approaches. Therapy that is accessible online, via an app, is becoming increasingly popular; it allows individuals to access the care and support they need, at a time and place that is convenient to them. Tranquility is an app developed by co-founders Dr. Alissa Pencer (Clinical Psychologist) and Joel Muise that is now free to all Nova Scotian's 16+ who are experiencing mild-to-moderate anxiety and/or depression.

148.

MENTAL HEALTH TREATMENT: PAST AND PRESENT

Learning Objectives

By the end of this section, you will be able to:

- Explain how people with psychological disorders have been treated throughout the ages
- Discuss deinstitutionalization
- Discuss the ways in which mental health services are delivered today
- Distinguish between voluntary and

involuntary treatment

Treatment in the Past

For much of history, the mentally ill have been treated very poorly. It was believed that mental illness was caused by demonic possession, witchcraft, or an angry god (Szasz, 1960). For example, in medieval times, abnormal behaviours were viewed as a sign that a person was possessed by demons. If someone was considered to be possessed, there were several forms of treatment to release spirits from the individual. The most common treatment was exorcism, often conducted by priests or other religious figures: Incantations and prayers were said over the person's body, and she may have been given some medicinal drinks. Another form of treatment for extreme cases of mental illness was trephining: A small hole was made in the afflicted individual's skull to release spirits from the body. Most people treated in this manner died. In addition to exorcism and trephining, other practices involved execution or imprisonment of people with psychological disorders. Still others were left to be homeless beggars. Generally speaking, most people who exhibited strange behaviours were greatly misunderstood and treated cruelly. The prevailing theory of psychopathology in earlier history was the idea that mental

illness was the result of demonic possession by either an evil spirit or an evil god because early beliefs incorrectly attributed all unexplainable phenomena to deities deemed either good or evil.

From the late 1400s to the late 1600s, a common belief perpetuated by some religious organizations was that some people made pacts with the devil and committed horrible acts, such as eating babies (Blumberg, 2007). These people were considered to be witches and were tried and condemned by courts—they were often burned at the stake. Worldwide, it is estimated that tens of thousands of mentally ill people were killed after being accused of being witches or under the influence of witchcraft (Hemphill, 1966)

By the 18th century, people who were considered odd and unusual were placed in asylums (Figure T.2). Asylums were the first institutions created for the specific purpose of housing people with psychological disorders, but the focus was ostracizing them from society rather than treating their disorders. Often these people were kept in windowless dungeons, beaten, chained to their beds, and had little to no contact with caregivers.

Figure T.2 This painting by Francisco Goya, called The Madhouse, depicts a mental asylum and its inhabitants in the early 1800s. It portrays those with psychological disorders as victims.

In the late 1700s, a French physician, Philippe Pinel, argued for more humane treatment of the mentally ill. He suggested that they be unchained and talked to, and that's just what he did for patients at La Salpêtrière in Paris in 1795 (Figure T.3). Patients benefited from this more humane treatment, and many were able to leave the hospital.

Figure T.3 This painting by Tony Robert-Fleury depicts Dr. Philippe Pinel ordering the removal of chains from patients at the Salpêtrière asylum in Paris.

In the 19th century, Dorothea Dix led reform efforts for mental health care in the United States (Figure T.4). She investigated how those who are mentally ill and poor were cared for, and she discovered an underfunded and unregulated system that perpetuated abuse of this population (Tiffany, 1891). Horrified by her findings, Dix began lobbying various state legislatures and the U.S. Congress for change (Tiffany, 1891). Her efforts led to the creation of the first mental asylums in the United States.

Figure T.4 Dorothea Dix was a social reformer who became an advocate for the indigent insane and was instrumental in creating the first American mental asylum. She did this by relentlessly lobbying state legislatures and Congress to set up and fund such institutions.

Despite reformers' efforts, however, a typical asylum was filthy, offered very little treatment, and often kept people for

decades. At Willard Psychiatric Center in upstate New York, for example, one treatment was to submerge patients in cold baths for long periods of time. Electroshock treatment was also used, and the way the treatment was administered often broke patients' backs; in 1943, doctors at Willard administered 1,443 shock treatments (Willard Psychiatric Center, 2009). (Electroshock is now called electroconvulsive treatment, and the therapy is still used, but with safeguards and under anesthesia. A brief application of electric stimulus is used to produce a generalized seizure. Controversy continues over its effectiveness versus the side effects.) Many of the wards and rooms were so cold that a glass of water would be frozen by morning (Willard Psychiatric Center, 2009). Willard's doors were not closed until 1995. Conditions like these remained commonplace until well into the 20th century.

Starting in 1954 and gaining popularity in the 1960s, antipsychotic medications were introduced. These proved a tremendous help in controlling the symptoms of certain psychological disorders, such as psychosis. Psychosis was a common diagnosis of individuals in mental hospitals, and it was often evidenced by symptoms like hallucinations and delusions, indicating a loss of contact with reality. Then in 1963, Congress passed and John F. Kennedy signed the Mental Retardation Facilities and Community Mental Health Centers Construction Act, which provided federal support

and funding for community mental health centres (National Institutes of Health, 2013). This legislation changed how mental health services were delivered in the United States. It started the process of deinstitutionalization, the closing of large asylums, by providing for people to stay in their communities and be treated locally. In 1955, there were 558,239 severely mentally ill patients institutionalized at public hospitals (Torrey, 1997). By 1994, by percentage of the population, there were 92% fewer hospitalized individuals (Torrey, 1997).

Mental Health Treatment Today

Today, there are community mental health centres across the nation. They are located in neighbourhoods near the homes of clients, and they provide large numbers of people with mental health services of various kinds and for many kinds of problems. Unfortunately, part of what occurred with deinstitutionalization was that those released from institutions were supposed to go to newly created centres, but the system was not set up effectively. Centres were underfunded, staff was not trained to handle severe illnesses such as schizophrenia, there was high staff burnout, and no provision was made for the other services people needed, such as housing, food, and job training. Without these supports, those people released under deinstitutionalization often ended up homeless. Even today, a large portion of the homeless population is considered

to be mentally ill (Figure T.5). Statistics show that 26% of homeless adults living in shelters experience mental illness (U.S. Department of Housing and Urban Development [HUD], 2011).

(a) (b)

Figure T.5 (a) Of the homeless individuals in U.S. shelters, about one-quarter have a severe mental illness (HUD, 2011). (b) Correctional institutions also report a high number of individuals living with mental illness. (credit a: modification of work by "Carl Campbell"/Flickr; credit b: modification of work by Bart Everson)

Another group of the mentally ill population is involved in the corrections system. According to a 2006 special report by the Bureau of Justice Statistics (BJS), approximately 705,600 mentally ill adults were incarcerated in the state prison system, and another 78,800 were incarcerated in the federal prison system. A further 479,000 were in local jails. According to the study, "people with mental illnesses are overrepresented in probation and parole populations at estimated rates ranging

from two to four times the general population" (Prins & Draper, 2009, p. 23). The Treatment Advocacy Center reported that the growing number of mentally ill inmates has placed a burden on the correctional system (Torrey et al., 2014).

Today, instead of asylums, there are psychiatric hospitals run by state governments and local community hospitals focused on short-term care. In all types of hospitals, the emphasis is on short-term stays, with the average length of stay being less than two weeks and often only several days. This is partly due to the very high cost of psychiatric hospitalization, which can be about $800 to $1000 per night (Stensland, Watson, & Grazier, 2012). Therefore, insurance coverage often limits the length of time a person can be hospitalized for treatment. Usually individuals are hospitalized only if they are an imminent threat to themselves or others.

Most people suffering from mental illnesses are not hospitalized. If someone is feeling very depressed, complains of hearing voices, or feels anxious all the time, they might seek psychological treatment. A friend, spouse, or parent might refer someone for treatment. The individual might go see their primary care physician first and then be referred to a mental health practitioner.

Some people seek treatment because they are involved with the state's child protective services—that is, their children have been removed from their care due to abuse or neglect. The parents might be referred to psychiatric or substance abuse

facilities and the children would likely receive treatment for trauma. If the parents are interested in and capable of becoming better parents, the goal of treatment might be family reunification. For other children whose parents are unable to change—for example, the parent or parents who are heavily addicted to drugs and refuse to enter treatment—the goal of therapy might be to help the children adjust to foster care and/or adoption (Figure T.6).

Figure T.6 Therapy with children may involve play. (credit: modification of work by UNHCR Ukraine/Flickr)

Some people seek therapy because the criminal justice system referred them or required them to go. For some individuals, for example, attending weekly counselling sessions might be a condition of parole. If an individual is mandated to attend therapy, they are seeking services involuntarily. Involuntary treatment refers to therapy that is not the individual's choice. Other individuals might voluntarily seek treatment. Voluntary

treatment means the person chooses to attend therapy to obtain relief from symptoms.

Psychological treatment can occur in a variety of places. An individual might go to a community mental health centre or a practitioner in private or community practice. A child might see a school counsellor, school psychologist, or school social worker. An incarcerated person might receive group therapy in prison. There are many different types of treatment providers, and licensing requirements vary from state to state. Besides psychologists and psychiatrists, there are clinical social workers, marriage and family therapists, and trained religious personnel who also perform counselling and therapy.

A range of funding sources pay for mental health treatment: health insurance, government, and private pay. In the past, even when people had health insurance, the coverage would not always pay for mental health services. This changed with the Mental Health Parity and Addiction Equity Act of 2008, which requires group health plans and insurers to make sure there is parity of mental health services (U.S. Department of Labor, n.d.). This means that co-pays, total number of visits, and deductibles for mental health and substance abuse treatment need to be equal to and cannot be more restrictive or harsher than those for physical illnesses and medical/surgical problems.

Finding treatment sources is also not always easy: there may be limited options, especially in rural areas and low-income urban areas; waiting lists; poor quality of care available for

indigent patients; and financial obstacles such as co-pays, deductibles, and time off from work. Over 85% of the l,669 federally designated mental health professional shortage areas are rural; often primary care physicians and law enforcement are the first-line mental health providers (Ivey, Scheffler, & Zazzali, 1998), although they do not have the specialized training of a mental health professional, who often would be better equipped to provide care. Availability, accessibility, and acceptability (the stigma attached to mental illness) are all problems in rural areas. Approximately two-thirds of those with symptoms receive no care at all (U.S. Department of Health and Human Services, 2005; Wagenfeld, Murray, Mohatt, & DeBruiynb, 1994). At the end of 2013, the U.S. Department of Agriculture announced an investment of $50 million to help improve access and treatment for mental health problems as part of the Obama administration's effort to strengthen rural communities.

149.

TYPES OF TREATMENT

Learning Objectives

By the end of this section, you will be able to:

- Distinguish between psychological, biological and integrative approaches to treatment

One of the goals of therapy is to help a person stop repeating and reenacting destructive patterns and to start looking for better solutions to difficult situations. This goal is reflected in the following poem:

> *Autobiography in Five Short Chapters* by Portia Nelson (1993)
>
> Chapter One

I walk down the street.
There is a deep hole in the sidewalk.
I fall in.
I am lost. . . . I am helpless.
It isn't my fault.
It takes forever to find a way out.

Chapter Two
I walk down the same street.
There is a deep hole in the sidewalk.
I pretend I don't see it.
I fall in again.
I can't believe I am in this same place.
But, it isn't my fault.
It still takes a long time to get out.

Chapter Three
I walk down the same street.
There is a deep hole in the sidewalk.
I *see* it is there.
I still fall in . . . it's a habit . . . but,
my eyes are open.
I know where I am.
It is *my* fault.
I get out immediately.

Chapter Four
I walk down the same street.
There is a deep hole in the sidewalk.
I walk around it.

Chapter Five
I walk down another street.

Two types of therapy are psychotherapy and biomedical therapy. Both types of treatment help people with psychological disorders, such as depression, anxiety, and schizophrenia. Psychotherapy is a psychological treatment that employs various methods to help someone overcome personal problems, or to attain personal growth. In modern practice, it has evolved into what is known as psychodynamic therapy, which will be discussed later. Biomedical therapy involves medication and/or medical procedures to treat psychological disorders. First, we will explore the various psychotherapeutic orientations outlined in Table T.1 (many of these orientations were discussed in the Introduction chapter).

Table T.1 Various Psychotherapy Techniques

Type	Description	Example
Psychodynamic psychotherapy	Talk therapy based on belief that the unconscious and childhood conflicts impact behaviour	Patient talks about his past
Play therapy	Psychoanalytical therapy wherein interaction with toys is used instead of talk; used in child therapy	Patient (child) acts out family scenes with dolls
Behaviour therapy	Principles of learning applied to change undesirable behaviours	Patient learns to overcome fear of elevators through several stages of relaxation techniques
Cognitive therapy	Awareness of cognitive process helps patients eliminate thought patterns that lead to distress	Patient learns not to overgeneralize failure based on single failure
Cognitive-behavioural therapy	Work to change cognitive distortions and self-defeating behaviours	Patient learns to identify self-defeating behaviours to overcome an eating disorder

Table T.1 Various Psychotherapy Techniques

Type	Description	Example
Humanistic therapy	Increase self-awareness and acceptance through focus on conscious thoughts	Patient learns to articulate thoughts that keep her from achieving her goals

Biomedical Therapies

Individuals can be prescribed biologically based treatments or psychotropic medications that are used to treat mental disorders. While these are often used in combination with psychotherapy, they also are taken by individuals not in therapy. This is known as biomedical therapy. Medications used to treat psychological disorders are called psychotropic medications and are prescribed by medical doctors, including psychiatrists. In Louisiana and New Mexico, psychologists are able to prescribe some types of these medications (American Psychological Association, 2014).

Different types and classes of medications are prescribed for different disorders. An individual with depression might be given an antidepressant, an individual with bipolar disorder might be given a mood stabilizer, and an individual with schizophrenia might be given an antipsychotic. These medications treat the symptoms of a psychological disorder by altering the levels or effects of neurotransmitters. For example,

each type of antidepressant affects a different neurotransmitter, such as SSRI (selective serotonin reuptake inhibitor) antidepressants that increase the level of the neurotransmitter serotonin, and SNRI (serotonin-norepinephrine reuptake inhibitor) antidepressants that increase the levels of both serotonin and norepinephrine. They can help people feel better so that they can function on a daily basis, but they do not cure the disorder. Some people may only need to take a psychotropic medication for a short period of time. Others with severe disorders like bipolar disorder or schizophrenia may need to take psychotropic medication for a long time.

Psychotropic medications are a popular treatment option for many types of disorders, and research suggests that they are most effective when combined with psychotherapy. This is especially true for the most common mental disorders, such as depressive and anxiety disorders (Cuijpers et al, 2014). When considering adding medication as a treatment option, individuals should know that some psychotropic medications have very concerning side effects. Table T.2 shows the commonly prescribed types of medications, how they are used, and *some* of the potential side effects that may occur.

Table T.2 Some Commonly Prescribed Psychotropic Medications

Type of Medication	Used to Treat	Brand Names of Commonly Prescribed Medications	How They Work	S
Antipsychotics (developed in the 1950s)	Schizophrenia and other types of severe thought disorders	Haldol, Mellaril, Prolixin, Thorazine	Treat positive psychotic symptoms such as auditory and visual hallucinations, delusions, and paranoia by blocking the neurotransmitter dopamine	I c t c i r t t f r I t
Atypical Antipsychotics (developed in the late 1980s)	Schizophrenia and other types of severe thought disorders	Abilify, Risperdal, Clozaril	Treat the negative symptoms of schizophrenia, such as withdrawal and apathy, by targeting both dopamine and serotonin receptors; newer medications may treat both positive and negative symptoms	C t c c a c l c b c c

Table T.2 Some Commonly Prescribed Psychotropic Medications

Type of Medication	Used to Treat	Brand Names of Commonly Prescribed Medications	How They Work	S
Anti-depressants	Depression and increasingly for anxiety	Paxil, Prozac, Zoloft (selective serotonin reuptake inhibitors, [SSRIs]); Tofranil and Elavil (tricyclics)	Alter levels of neurotransmitters such as serotonin and norepinephrine	S h r g c r c T r c b c r c r
Anti-anxiety agents	Anxiety and agitation that occur in OCD, PTSD, panic disorder, and social phobia	Xanax, Valium, Ativan (Benzodiazepines) Buspar (non-Benzodiazepine)	Depress central nervous system activity	I c h f l
Mood Stabilizers	Bipolar disorder	Lithium, Depakote, Lamictal, Tegretol	Treat episodes of mania as well as depression	I i h i s r e r a

Table T.2 Some Commonly Prescribed Psychotropic Medications

Type of Medication	Used to Treat	Brand Names of Commonly Prescribed Medications	How They Work	S
Stimulants	ADHD	Adderall, Ritalin	Improve ability to focus on a task and maintain attention	I a c s s h

Another biologically based treatment that continues to be used, although infrequently, is electroconvulsive therapy (ECT) (formerly known by its unscientific name as electroshock therapy). It involves using an electrical current to induce seizures to help alleviate the effects of severe depression. The exact mechanism is unknown, although it does help alleviate symptoms for people with severe depression who have not responded to traditional drug therapy (Pagnin, de Queiroz, Pini, & Cassano, 2004). About 85% of people treated with ECT improve (Reti, n.d.). However, the memory loss associated with repeated administrations has led to it being implemented as a last resort (Donahue, 2000; Prudic, Peyser, & Sackeim, 2000). A more recent alternative is transcranial magnetic stimulation (TMS), a procedure approved by the FDA in 2008 that uses magnetic fields to stimulate nerve cells in the brain to improve depression symptoms; it is used when other treatments have

not worked (Mayo Clinic, 2012).

Integrative Approach to Treatment

To this point we have considered the different approaches to psychotherapy under the assumption that a therapist will use only one approach with a given patient. But this is not the case; the most commonly practised approach to therapy is an **integrative (eclectic) therapy**, an approach to treatment in which the therapist uses whichever techniques seem most useful and relevant for a given patient. For bipolar disorder, for instance, the therapist may use both psychological skills training to help the patient cope with the severe highs and lows, but may also suggest that the patient consider biomedical drug therapies (Newman, Leahy, Beck, Reilly-Harrington, & Gyulai, 2002). Treatment for major depressive disorder usually involves antidepressant drugs as well as CBT to help the patient deal with particular problems (McBride, Farvolden, & Swallow, 2007).

150.

PSYCHOLOGICAL APPROACHES TO TREATMENT

Learning Objectives

By the end of this section, you will be able to:

- Outline and differentiate the psychodynamic, humanistic, behavioural, and cognitive approaches to psychotherapy.
- Distinguish between cognitive therapy and cognitive behavioural therapy.

Treatment for psychological disorder begins when the

individual who is experiencing distress visits a counsellor or therapist, perhaps in a church, a community centre, a hospital, or a private practice. The therapist will begin by systematically learning about the patient's needs through a formal **psychological assessment**, which is an evaluation of the patient's psychological and mental health. During the assessment the psychologist may give personality tests such as the Minnesota Multiphasic Personal Inventory (MMPI-2), Millon Adolescent Clinical Inventory (MACI), or projective tests, and will conduct a thorough interview with the patient. The therapist may get more information from family members or school personnel.

In addition to the psychological assessment, the patient is usually seen by a physician to gain information about potential Axis III (physical) problems. In some cases of psychological disorder — and particularly for sexual problems — medical treatment is the preferred course of action. For instance, men who are experiencing erectile dysfunction disorder may need surgery to increase blood flow or local injections of muscle relaxants. Or they may be prescribed medications (Viagra, Cialis, or Levitra) that provide an increased blood supply to the penis, and are successful in increasing performance in about 70% of men who take them.

After the medical and psychological assessments are completed, the therapist will make a formal diagnosis using the detailed descriptions of the disorder provided in the *Diagnostic and Statistical Manual of Mental Disorders* (*DSM*). The

therapist will summarize the information about the patient on each of the five *DSM* axes, and the diagnosis will likely be sent to an insurance company to justify payment for the treatment.

If a diagnosis is made, the therapist will select a course of therapy that he or she feels will be most effective. One approach to treatment is **psychotherapy**, the professional treatment for psychological disorder through techniques designed to encourage communication of conflicts and insight. The fundamental aspect of psychotherapy is that the patient directly confronts the disorder and works with the therapist to help reduce it. Therapy includes assessing the patient's issues and problems, planning a course of treatment, setting goals for change, the treatment itself, and an evaluation of the patient's progress. Therapy is practised by thousands of psychologists and other trained practitioners in Canada and around the world, and is responsible for billions of dollars of the health budget.

To many people therapy involves a patient lying on a couch with a therapist sitting behind and nodding sagely as the patient speaks. Though this approach to therapy (known as *psychoanalysis*) is still practised, it is in the minority. It is estimated that there are over 400 different kinds of therapy practised by people in many fields, and the most important of these are psychodynamic, humanistic, cognitive behavioural therapy, and eclectic (i.e., a combination of therapies). The therapists who provide these treatments include psychiatrists (who have a medical degree and can prescribe drugs) and

clinical psychologists, as well as social workers, psychiatric nurses, and couples, marriage, and family therapists.

TRICKY TOPIC: PSYCHOLOGICAL TREATMENTS

One or more interactive elements has been excluded from this version of the text. You can view them online here: https://caul-cbua.pressbooks.pub/intropsychneuro/?p=563#oembed-1

If the video above does not load, click here: https://youtu.be/AH5guOM7vEs
For a full transcript of this video, click here

Psychodynamic Therapy

Psychodynamic therapy (psychoanalysis) is *a psychological treatment based on Freudian and neo-Freudian personality theories in which the therapist helps the patient explore the unconscious dynamics of personality*. The analyst engages with the patient, usually in one-on-one sessions, often with the patient lying on a couch and facing away. The goal of the

psychotherapy is for the patient to talk about their personal concerns and anxieties, allowing the therapist to try to understand the underlying unconscious problems that are causing the symptoms (the process of interpretation). The analyst may try out some interpretations on the patient and observe how he or she responds to them.

The patient may be asked to verbalize their thoughts through **free association**, in which the *therapist listens while the client talks about whatever comes to mind, without any censorship or filtering*. The client may also be asked to report on his or her dreams, and the therapist will use **dream analysis** to *analyze the symbolism of the dreams in an effort to probe the unconscious thoughts of the client and interpret their significance*. On the basis of the thoughts expressed by the patient, the analyst discovers the unconscious conflicts causing the patient's symptoms and interprets them for the patient.

The goal of psychotherapy is to help the patient develop **insight** — that is, *an understanding of the unconscious causes of the disorder* (Epstein, Stern, & Silbersweig, 2001; Lubarsky & Barrett, 2006), but the patient often shows resistance to these new understandings, *using defence mechanisms to avoid the painful feelings in his or her unconscious*. The patient might forget or miss appointments, or act out with hostile feelings toward the therapist. The therapist attempts to help the patient develop insight into the causes of the resistance. The sessions may also lead to **transference**, in which *the patient unconsciously redirects feelings experienced*

in an important personal relationship toward the therapist. For instance, the patient may transfer feelings of guilt that come from the father or mother to the therapist. Some therapists believe that transference should be encouraged, as it allows the client to resolve hidden conflicts and work through feelings that are present in the relationships.

One problem with traditional psychoanalysis is that the sessions may take place several times a week, go on for many years, and cost thousands of dollars. To help more people benefit, modern psychodynamic approaches frequently use shorter-term, focused, and goal-oriented approaches. In these brief psychodynamic therapies, the therapist helps the client determine the important issues to be discussed at the beginning of treatment and usually takes a more active role than in classic psychoanalysis (Levenson, 2010).

Humanistic Therapies

Just as psychoanalysis is based on the personality theories of Freud and the neo-Freudians, **humanistic therapy** is *a psychological treatment based on the personality theories of Carl Rogers and other humanistic psychologists*. Humanistic therapy is based on the idea that people develop psychological problems when they are burdened by limits and expectations placed on them by themselves and others, and the treatment emphasizes the person's capacity for self-realization and fulfillment. Humanistic therapies attempt to promote growth

and responsibility by helping clients consider their own situations and the world around them and how they can work to achieve their life goals.

Carl Rogers developed **person-centred therapy** (or client-centred therapy), *an approach to treatment in which the client is helped to grow and develop as the therapist provides a comfortable, nonjudgmental environment*. In his book *A Way of Being* (1980), Rogers argued that therapy was most productive when the therapist created a positive relationship with the client — a *therapeutic alliance*. The **therapeutic alliance** is *a relationship between the client and the therapist that is facilitated when the therapist is* genuine (i.e., he or she creates no barriers to free-flowing thoughts and feelings), when the therapist treats the client with unconditional positive regard (i.e., he or she values the client without any qualifications, displaying an accepting attitude toward whatever the client is feeling at the moment), and when the therapist develops empathy with the client (i.e., he or she actively listens to and accurately perceives the personal feelings that the client experiences).

The development of a positive therapeutic alliance has been found to be exceedingly important to successful therapy. The ideas of genuineness, empathy, and unconditional positive regard in a nurturing relationship in which the therapist actively listens to and reflects the feelings of the client is probably the most fundamental part of contemporary psychotherapy (Prochaska & Norcross, 2007).

Psychodynamic and humanistic therapies are recommended primarily for people suffering from generalized anxiety or mood disorders, and who desire to feel better about themselves overall. But the goals of people with other psychological disorders, such as phobias, sexual problems, and obsessive-compulsive disorder (OCD), are more specific. A person with a social phobia may want to be able to leave their house, a person with a sexual dysfunction may want to improve their sex life, and a person with OCD may want to learn to stop letting their obsessions or compulsions interfere with everyday activities. In these cases it is not necessary to revisit childhood experiences or consider our capacities for self-realization — we simply want to deal with what is happening in the present.

Psychotherapy: Play Therapy

Play therapy is often used with children since they are not likely to sit on a couch and recall their dreams or engage in traditional talk therapy. This technique uses a therapeutic process of play to "help clients prevent or resolve psychosocial difficulties and achieve optimal growth" (O'Connor, 2000, p. 7). The idea is that children play out their hopes, fantasies, and traumas while using dolls, stuffed animals, and sandbox figurines (Figure T.7). Play therapy can also be used to help a therapist make a diagnosis. The therapist observes how the child interacts with toys (e.g., dolls, animals, and home

settings) in an effort to understand the roots of the child's disturbed behaviour. Play therapy can be nondirective or directive. In nondirective play therapy, children are encouraged to work through their problems by playing freely while the therapist observes (LeBlanc & Ritchie, 2001). In directive play therapy, the therapist provides more structure and guidance in the play session by suggesting topics, asking questions, and even playing with the child (Harter, 1977).

Figure T.7 This type of play therapy is known as sandplay or sandtray therapy. Children can set up a three-dimensional world using various figures and objects that correspond to their inner state (Kalff, 1991). (credit: Kristina Walter)

Psychotherapy: Behaviour Therapy

In psychoanalysis, therapists help their patients look into their past to uncover repressed feelings. In behaviour therapy, a

therapist employs principles of learning to help clients change undesirable behaviours—rather than digging deeply into one's unconscious. Therapists with this orientation believe that dysfunctional behaviours, like phobias and bedwetting, can be changed by teaching clients new, more constructive behaviours. Behaviour therapy employs both classical and operant conditioning techniques to change behaviour.

One type of behaviour therapy utilizes classical conditioning techniques. Therapists using these techniques believe that dysfunctional behaviours are conditioned responses. Applying the conditioning principles developed by Ivan Pavlov, these therapists seek to recondition their clients and thus change their behaviour. For example:

Timothy is eight years old, and frequently wets his bed at night. Timothy's been invited to several sleepovers, but won't go because of this problem. Using a type of conditioning therapy, Timothy begins to sleep on a liquid-sensitive bed pad that is connected to a sound alarm. When moisture touches the pad, it causes the alarm to sound, waking up Timothy. When this process is repeated enough times, Timothy develops an association between urinary relaxation and waking up, and this leads to the discontinuation of the bedwetting. Timothy has now gone three weeks without wetting the bed and is looking forward to his first sleepover this weekend.

One commonly used classical conditioning therapeutic technique is counterconditioning: a client learns a new response to a stimulus that has previously elicited an

undesirable behaviour. Two counterconditioning techniques are aversive conditioning and exposure therapy. Aversive conditioning uses an unpleasant stimulus to stop an undesirable behaviour. Therapists apply this technique to eliminate addictive behaviours, such as smoking, nail biting, and drinking. In aversion therapy, clients will typically engage in a specific behaviour (such as nail biting) and at the same time are exposed to something unpleasant, such as a mild electric shock or a bad taste. After repeated associations between the unpleasant stimulus and the behaviour, the client can learn to stop the unwanted behaviour.

Aversion therapy has been used effectively for years in the treatment of alcoholism (Davidson, 1974; Elkins, 1991; Streeton & Whelan, 2001). One common way this occurs is through a chemically based substance known as Antabuse. When a person takes Antabuse and then consumes alcohol, uncomfortable side effects result including nausea, vomiting, increased heart rate, heart palpitations, severe headache, and shortness of breath. Antabuse is repeatedly paired with alcohol until the client associates alcohol with unpleasant feelings, which decreases the client's desire to consume alcohol. Antabuse creates a conditioned aversion to alcohol because it replaces the original pleasure response with an unpleasant one.

In exposure therapy, a therapist seeks to treat clients' fears or anxiety by presenting them with the object or situation that causes their problem, with the idea that they will eventually get used to it. This can be done via reality, imagination, or

virtual reality. Exposure therapy was first reported in 1924 by Mary Cover Jones, who is considered the mother of behaviour therapy. Jones worked with a boy named Peter who was afraid of rabbits. Her goal was to replace Peter's fear of rabbits with a conditioned response of relaxation, which is a response that is incompatible with fear (Figure T.8). How did she do it? Jones began by placing a caged rabbit on the other side of a room with Peter while he ate his afternoon snack. Over the course of several days, Jones moved the rabbit closer and closer to where Peter was seated with his snack. After two months of being exposed to the rabbit while relaxing with his snack, Peter was able to hold the rabbit and pet it while eating (Jones, 1924).

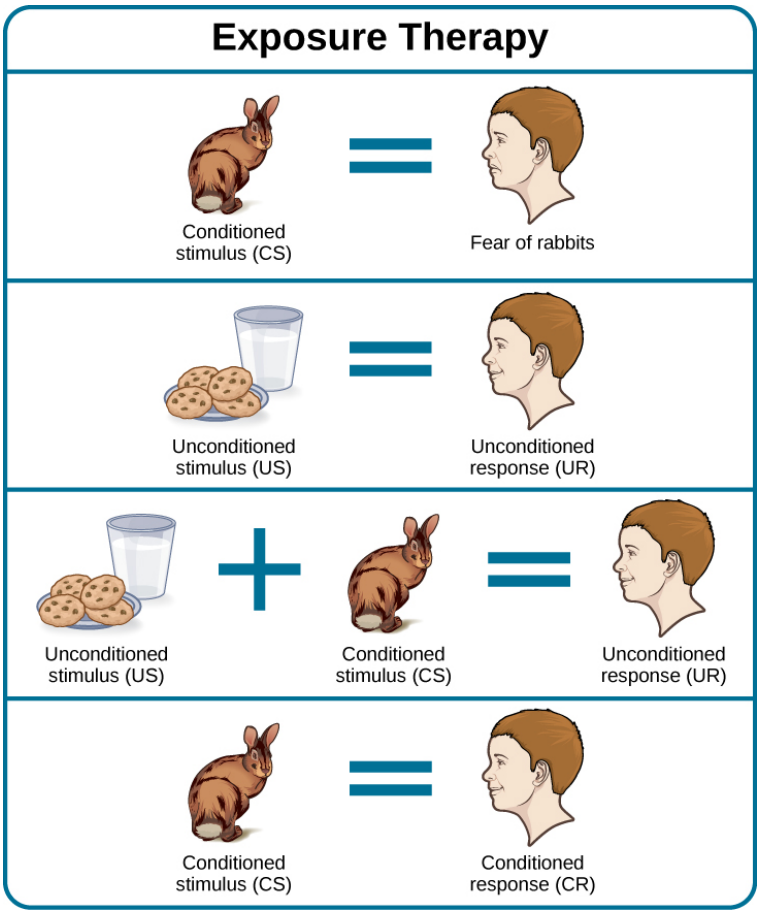

Figure T.8 Exposure therapy seeks to change the response to a conditioned stimulus (CS). An unconditioned stimulus is presented over and over just after the presentation of the conditioned stimulus. This figure shows conditioning as conducted in Mary Cover Jones' 1924 study.

Thirty years later, Joseph Wolpe (1958) refined Jones's techniques, giving us the behaviour therapy technique of exposure therapy that is used today. A popular form of

exposure therapy is systematic desensitization, wherein a calm and pleasant state is gradually associated with increasing levels of anxiety-inducing stimuli. The idea is that you can't be nervous and relaxed at the same time. Therefore, if you can learn to relax when you are facing environmental stimuli that make you nervous or fearful, you can eventually eliminate your unwanted fear response (Wolpe, 1958) (Figure T.9).

Figure T.9 This person suffers from arachnophobia (fear of spiders). Through exposure therapy he is learning how to face his fear in a controlled, therapeutic setting. (credit: "GollyGforce – Living My Worst Nightmare"/Flickr)

How does exposure therapy work? Jayden is terrified of elevators. Nothing bad has ever happened to Jayden on an elevator, but they're so afraid of elevators that they will always take the stairs. That wasn't a problem when Jayden worked on the second floor of an office building, but now they have

a new job—on the 29th floor of a skyscraper in downtown Los Angeles. Jayden knows they can't climb 29 flights of stairs in order to get to work each day, so they decided to see a behaviour therapist for help. The therapist asks Jayden to first construct a hierarchy of elevator-related situations that elicit fear and anxiety. They range from situations of mild anxiety such as being nervous around the other people in the elevator, to the fear of getting an arm caught in the door, to panic-provoking situations such as getting trapped or the cable snapping. Next, the therapist uses progressive relaxation, teaching Jayden how to relax each of their muscle groups so that they achieves a drowsy, relaxed, and comfortable state of mind. Once Jayden's in this state, the therapist asks Jayden to imagine a mildly anxiety-provoking situation. Jayden is standing in front of the elevator thinking about pressing the call button.

If this scenario causes Jayden anxiety, then they lift their finger. The therapist would then tell Jayden to forget the scene and return to their relaxed state. The therapist repeats this scenario over and over until Jayden can imagine pressing the call button without anxiety. Over time the therapist and Jayden use progressive relaxation and imagination to proceed through all of the situations on Jayden's hierarchy until they become desensitized to each one. After this, Jayden and the therapist begin to practice what Jayden only previously envisioned in therapy, gradually going from pressing the button to actually riding an elevator. The goal is that Jayden

will soon be able to take the elevator all the way up to the 29th floor of their office without feeling any anxiety.

Sometimes, it's too impractical, expensive, or embarrassing to re-create anxiety- producing situations, so a therapist might employ virtual reality exposure therapy by using a simulation to help conquer fears. Virtual reality exposure therapy has been used effectively to treat numerous anxiety disorders such as the fear of public speaking, claustrophobia (fear of enclosed spaces), aviophobia (fear of flying), and post-traumatic stress disorder (PTSD), a trauma and stressor-related disorder (Gerardi, Cukor, Difede, Rizzo, & Rothbaum, 2010).

Link to Learning

Watch this video from Global News that highlights work being done at York University using virtual reality with patients with dementia.

Some behaviour therapies employ operant conditioning. Recall what you learned about operant conditioning: We have a tendency to repeat behaviours that are reinforced. What happens to behaviours that are not reinforced? They become

extinguished. These principles, defined by Skinner as operant conditioning, can be applied to help people with a wide range of psychological problems. For instance, operant conditioning techniques designed to reinforce desirable behaviours and punish unwanted behaviours are effective behaviour modification tools to help children with autism (Lovaas, 1987, 2003; Sallows & Graupner, 2005; Wolf & Risley, 1967). This technique is called Applied Behavior Analysis (ABA). In this treatment, a child's behaviour is charted and analyzed. The ABA therapist, along with the caregivers, determines what reinforces the child, what sustains a behaviour to continue, and how best to manage a behaviour. For example, Nur may become overwhelmed and run out of the room when the classroom is too noisy. Whenever Nur runs out of the classroom, the teacher's aide chases after them and places Nur in a special room where they can relax. Going into the special room and getting the aide's attention are reinforcing for Nur. In order to change Nur's behaviour, Nur must be presented with other options before they become overwhelmed, and they cannot receive reinforcement for displaying maladaptive behaviours.

One popular operant conditioning intervention is called the token economy. This involves a controlled setting where individuals are reinforced for desirable behaviours with tokens, such as a poker chip, that can be exchanged for items or privileges. Token economies are often used in psychiatric hospitals to increase patient cooperation and activity levels.

Patients are rewarded with tokens when they engage in positive behaviours (e.g., making their beds, brushing their teeth, coming to the cafeteria on time, and socializing with other patients). They can later exchange the tokens for extra TV time, private rooms, visits to the canteen, and so on (Dickerson, Tenhula, & Green-Paden, 2005).

Psychotherapy: Cognitive Therapy

Cognitive therapy is a form of psychotherapy that focuses on how a person's thoughts lead to feelings of distress. The idea behind cognitive therapy is that how you think determines how you feel and act. Cognitive therapists help their clients change dysfunctional thoughts in order to relieve distress. They help a client see how they misinterpret a situation (cognitive distortion). For example, a client may overgeneralize. Because Rey failed one test in Psychology 101, Rey feels they are stupid and worthless. These thoughts then cause their mood to worsen. Therapists also help clients recognize when they blow things out of proportion. Because Rey failed their Psychology 101 test, they have concluded that they're going to fail the entire course and probably flunk out of college altogether. These errors in thinking have contributed to Rey's feelings of distress. Rey's therapist will help them challenge these irrational beliefs, focus on their illogical basis, and correct them with more logical and rational thoughts and beliefs.

Cognitive therapy was developed by psychiatrist Aaron Beck in the 1960s. His initial focus was on depression and how a client's self-defeating attitude served to maintain a depression despite positive factors in her life (Beck, Rush, Shaw, & Emery, 1979) (Figure T.10). Through questioning, a cognitive therapist can help a client recognize dysfunctional ideas, challenge catastrophizing thoughts about themselves and their situations, and find a more positive way to view things (Beck, 2011).

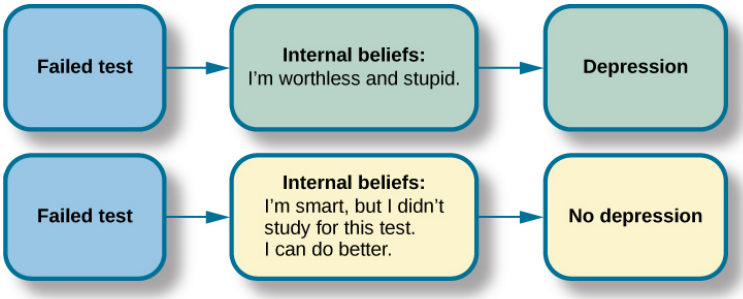

Figure T.10 Your emotional reactions are the result of your thoughts about the situation rather than the situation itself. For instance, if you consistently interpret events and emotions around the themes of loss and defeat, then you are likely to be depressed. Through therapy, you can learn more logical ways to interpret situations.

Link to Learning

Watch as Dr. Aaron Beck explains Cognitive Therapy and gives some examples of its use, to learn more.

Psychotherapy: Cognitive-Behavioural Therapy

Cognitive-behavioural therapists focus much more on present issues than on a patient's childhood or past, as in other forms of psychotherapy. One of the first forms of cognitive-behavioural therapy was rational emotive therapy (RET), which was founded by Albert Ellis and (like Beck's development of Cognitive Therapy) grew out of his dislike of Freudian psychoanalysis (Daniel, n.d.). Behaviourists such as Joseph Wolpe also influenced Ellis's therapeutic approach (National Association of Cognitive-Behavioural Therapists, 2009).

Cognitive-behavioural therapy (CBT) helps clients examine how their thoughts affect their behaviour. It aims to change cognitive distortions and self-defeating behaviours. In essence,

this approach is designed to change the way people think as well as how they act. It is similar to cognitive therapy in that CBT attempts to make individuals aware of their irrational and negative thoughts and helps people replace them with new, more positive ways of thinking. It is also similar to behaviour therapies in that CBT teaches people how to practice and engage in more positive and healthy approaches to daily situations. In total, hundreds of studies have shown the effectiveness of cognitive-behavioural therapy in the treatment of numerous psychological disorders such as depression, PTSD, anxiety disorders, eating disorders, bipolar disorder, and substance abuse (Beck Institute for Cognitive Behavior Therapy, n.d.). For example, CBT has been found to be effective in decreasing levels of hopelessness and suicidal thoughts in previously suicidal teenagers (Alavi, Sharifi, Ghanizadeh, & Dehbozorgi, 2013). Cognitive-behavioural therapy has also been effective in reducing PTSD in specific populations, such as transit workers (Lowinger & Rombom, 2012).

Cognitive-behavioural therapy aims to change cognitive distortions and self-defeating behaviours using techniques like the ABC model. With this model, there is an **A**ction (sometimes called an activating event), the **B**elief about the event, and the **C**onsequences of this belief. Let's say Jude and Zain both go to a party. Jude and Zain have each met someone new at the party and both of them spend a few hours chatting with their new acquaintances. At the end of the party, both

Jude and Zain ask the new person they've met for their phone number, but in both cases, the other person refuses. Both Jude and Zain are surprised, as they both thought things were going well. What might Jude and Zain tell themselves about why the person was not interested? Let's say Jude tells himself that he is a loser, or is ugly, or "has no game." Jude then gets depressed and decides not to go to another party, which starts a cycle that keeps him depressed. Zain, on the other hand, thinks that maybe it was bad breath and goes out and buys some breath mints, goes to another party, and meets someone new.

Jude's belief about what happened results in a consequence of further depression, whereas Zain's belief does not. Jude is internalizing the attribution or reason for the rebuffs, which triggers his depression. On the other hand, Zain is externalizing the cause, so their thinking does not contribute to feelings of depression. Cognitive-behavioural therapy examines specific maladaptive and automatic thoughts and cognitive distortions. Some examples of cognitive distortions are all-or-nothing thinking, overgeneralization, and jumping to conclusions. In overgeneralization, someone takes a small situation and makes it huge—for example, instead of saying, "This particular person was not interested in me," Jude says, "I am ugly, a loser, and no one is ever going to be interested in me."

All or nothing thinking, which is a common type of cognitive distortion for people suffering from depression, reflects extremes. In other words, everything is black or white.

After being turned down for a date, Jude begins to think, "No one will ever go out with me. I'm going to be alone forever." He then begins to feel anxious and sad as he contemplates his future.

The third kind of distortion involves jumping to conclusions—assuming that people are thinking negatively about you or reacting negatively to you, even though there is no evidence. Consider the example of Carrigan and Chao, who recently met at a party. They have a lot in common, and Carrigan thinks they could become friends. Carrigan calls Chao to invite Chao for coffee. Since Chao doesn't answer, Carrigan leaves a message. Several days go by and Carrigan never hears back from their potential new friend. Maybe Chao never received the message because they lost their phone or they are too busy to return the phone call. But if Carrigan believes that Chao didn't like them or didn't want to be their friend, then Carrigan is demonstrating the cognitive distortion of jumping to conclusions.

How effective is CBT? One client said this about his cognitive-behavioural therapy:

> I have had many painful episodes of depression in my life, and this has had a negative effect on my career and has put considerable strain on my friends and family. The treatments I have received, such as taking antidepressants and psychodynamic counselling, have helped [me] to cope with the symptoms and to get some insights into the roots of my problems. CBT has been by far the most useful approach I have found in tackling these mood problems.

> It has raised my awareness of how my thoughts impact on my moods. How the way I think about myself, about others and about the world can lead me into depression. It is a practical approach, which does not dwell so much on childhood experiences, whilst acknowledging that it was then that these patterns were learned. It looks at what is happening now, and gives tools to manage these moods on a daily basis. (Martin, 2007, n.p.)

Integrative (Eclectic) Approaches to Therapy

Consider this description, typical of the type of borderline patient who arrives at a therapist's office:

Even as an infant, it seemed that there was something different about Aadia. Aadia was an intense baby, easily upset and difficult to comfort. They had very severe separation anxiety — if their parent left the room, they would scream until the parent returned. In their early teens, Aadia became increasingly sullen and angry. They started acting out more and more — yelling at their parents and teachers and engaging in impulsive behaviour such as promiscuity and running away from home. At times, Aadia would have a close friend at school, but some conflict always developed and the friendship would end.

By the time Aadia turned 17, their mood changes were totally unpredictable. Aadia was fighting with their parents almost daily, and the fights often included violent behaviour

on Aadia's part. At times, they seemed terrified to be without their parent, but at other times they would leave the house in a fit of rage and not return for a few days. One day, Aadia's parent noticed scars on Aadia's arms. When confronted about them, Aadia said that one night they just got more and more lonely and nervous about a recent breakup until they finally stuck a lit cigarette into their arm. When asked why, Aadia said "I didn't really care for the relationship that much, but I had to do something dramatic."

When they were 18, Aadia rented a motel room where they took an overdose of sleeping pills. The suicide attempt was not successful, but the authorities required that Aadia seek psychological help.

Most therapists will deal with a case such as Aadia's using an eclectic approach. First, because Aadia's negative mood states are so severe, they will likely recommend that Aadia start taking antidepressant medications. These drugs are likely to help Aadia feel better and will reduce the possibility of another suicide attempt, but they will not change the underlying psychological problems. Therefore, the therapist will also provide psychotherapy.

The first sessions of the therapy will likely be based primarily on creating trust. Person-centred approaches will be used in which the therapist attempts to create a therapeutic alliance conducive to a frank and open exchange of information.

If the therapist is trained in a psychodynamic approach,

they will probably begin intensive face-to-face psychotherapy sessions at least three times a week. The therapist may focus on childhood experiences related to Aadia's attachment difficulties but will also focus in large part on the causes of the present behaviour. The therapist will understand that because Aadia does not have good relationships with other people, Aadia will likely seek a close bond with the therapist, but the therapist will probably not allow the transference relationship to develop fully. The therapist will also realize that Bethany will probably try to resist the work of the therapist.

Most likely the therapist will also use principles of CBT. For one, cognitive therapy will likely be used in an attempt to change Aadia's distortions of reality. Aadia feels that people are rejecting them, but they are probably bringing these rejections on themselves. If they can learn to better understand the meaning of other people's actions, they may feel better. And the therapist will likely begin using some techniques of behaviour therapy, for instance, by rewarding Aadia for successful social interactions and progress toward meeting their important goals.

The eclectic therapist will continue to monitor Aadia's behaviour as the therapy continues, bringing into play whatever therapeutic tools seem most beneficial. Hopefully, Aadia will stay in treatment long enough to make some real progress.

One example of an eclectic treatment approach that has been shown to be successful in treating BPD is *dialectical*

behavioural therapy (DBT) (Linehan & Dimeff, 2001). **DBT** is essentially *a cognitive therapy, but it includes a particular emphasis on attempting to enlist the help of the patient in their own treatment*. A dialectical behavioural therapist begins by attempting to develop a positive therapeutic alliance with the client, and then tries to encourage the patient to become part of the treatment process. In DBT the therapist aims to accept and validate the client's feelings at any given time while nonetheless informing the client that some feelings and behaviours are maladaptive, and showing the client better alternatives. The therapist will use both individual and group therapy, helping the patient work toward improving interpersonal effectiveness, emotion regulation, and distress tolerance skills.

151.

BIOLOGICAL APPROACHES TO TREATMENT

Learning Objectives

By the end of this section, you will be able to:

- Understand the mechanism of antidepressants (SSRI's) and anti-anxiety medications at the level of the synapse
- Describe the pros and cons to treating bipolar disorder with lithium
- Describe the effects of drugs used to treat schizophrenia

Like other medical problems, psychological disorders may in some cases be treated biologically. **Biomedical therapies** are treatments designed to reduce psychological disorder by influencing the action of the central nervous system. These therapies primarily involve the use of medications but also include direct methods of brain intervention, including electroconvulsive therapy (ECT), transcranial magnetic stimulation (TMS), and psychosurgery.

Drug Therapies

Psychologists understand that an appropriate balance of neurotransmitters in the brain is necessary for mental health. If there is a proper balance of chemicals, then the person's mental health will be acceptable, but psychological disorder will result if there is a chemical imbalance. The most frequently used biological treatments provide the patient with medication that influences the production and reuptake of neurotransmitters in the central nervous system (CNS). The use of these drugs is rapidly increasing, and drug therapy is now the most common approach to treatment of most psychological disorders.

Unlike some medical therapies that can be targeted toward specific symptoms, current psychological drug therapies are not so specific; they don't change particular behaviours or thought processes, and they don't really solve psychological disorders. However, although they cannot "cure" disorders,

drug therapies are nevertheless useful therapeutic approaches, particularly when combined with psychological therapy, in treating a variety of psychological disorders. The best drug combination for the individual patient is usually found through trial and error (Biedermann & Fleischhacker, 2009).

The major classes and brand names of drugs used to treat psychological disorders are shown in Table T.3.

Table T.3 Common Medications Used to Treat Psychological Disorders.

Class	Type	Brand names	Disorder	Notes
Psychostimulants		Ritalin, Adderall, Dexedrine	Attention-deficit/ hyperactivity disorder (ADHD)	Very eff cases, a short te reducin and ina
Antidepressants	Tricyclics	Elavil, Tofranil	Depression and anxiety disorders	Less fre prescrib are the reuptak (SSRIs)
	Monamine oxidase inhibitors (MAIOs)	Ensam, Nardil, Parnate, Marpaln	Depression and anxiety disorders	Less fre prescrib are the
	SSRIs	Prozac, Paxil, Zoloft	Depression and anxiety disorders	The mo prescrib antidep medica blockin of serot
	Other reuptake inhibitors	Effexor, Celexa, Wellbutrin	Depression and anxiety disorders	Prescrib cases; w blockin of serot norepin dopami
Mood stabilizers		Eskalith, Lithobid, Depakene	Bipolar disorder	Effectiv the mo associat bipolar

Table T.3 Common Medications Used to Treat Psychological Disorders.

Class	Type	Brand names	Disorder	Notes
Anti-anxiety drugs	Tranquilizers (benzodiazepines)	Valium, Xanax	Anxiety, panic, and mood disorders	Work b the acti neurotr GABA (gamm acid)
Anti-psychotics (neuroleptics)		Thorazine, Haldol, Clozaril, Risperdal, Zyprexa	Schizophrenia	Treat th to some negativ schizop reducin transmi dopami increasi transmi seroton

Using Stimulants to Treat ADHD

Attention-deficit/hyperactivity disorder (ADHD) is frequently treated with biomedical therapy, usually along with cognitive behavioural therapy (CBT). The most commonly prescribed drugs for ADHD are psychostimulants, including Ritalin, Adderall, and Dexedrine. Short-acting forms of the drugs are taken as pills and last between four and 12 hours, but some of the drugs are also available in long-acting forms (skin patches) that can be worn on the hip and last up to 12 hours.

The patch is placed on the child early in the morning and worn all day.

Stimulants improve the major symptoms of ADHD, including inattention, impulsivity, and hyperactivity, often dramatically, in about 75% of the children who take them (Greenhill, Halperin, & Abikof, 1999). But the effects of the drugs wear off quickly. Additionally, the best drug and best dosage varies from child to child, so it may take some time to find the correct combination.

It may seem surprising to you that a disorder that involves hyperactivity is treated with a psychostimulant, a drug that normally increases activity. The answer lies in the dosage. When large doses of stimulants are taken, they increase activity, but in smaller doses the same stimulants improve attention and decrease motor activity (Zahn, Rapoport, & Thompson, 1980).

The most common side effects of psychostimulants in children include decreased appetite, weight loss, sleeping problems, and irritability as the effect of the medication tapers off. Stimulant medications may also be associated with a slightly reduced growth rate in children, although in most cases growth isn't permanently affected (Spencer, Biederman, Harding, & O'Donnell, 1996).

Antidepressant Medications

Antidepressant medications are drugs designed to improve

moods. Although they are used primarily in the treatment of depression, they are also effective for patients who suffer from anxiety, phobias, and obsessive-compulsive disorders. Antidepressants work by influencing the production and reuptake of neurotransmitters that relate to emotion, including serotonin, norepinephrine, and dopamine. Although exactly why they work is not yet known, as the amount of the neurotransmitters in the CNS is increased through the action of the drugs, the person often experiences less depression.

The original antidepressants were the **tricyclic antidepressants**, with the brand names of Tofranil and Elavil, and the **monamine oxidase inhibitors (MAOIs)**. These medications work by increasing the amount of serotonin, norepinephrine, and dopamine at the synapses, but they also have severe side effects including potential increases in blood pressure and the need to follow particular diets.

The antidepressants most prescribed today are the **selective serotonin reuptake inhibitors (SSRIs)**, including Prozac, Paxil, and Zoloft, which are designed to selectively block the reuptake of serotonin at the synapse, thereby leaving more serotonin available in the CNS. SSRIs are safer and have fewer side effects than the tricyclics or the MAOIs (Fraser, 2000; Hollon, Thase, & Markowitz, 2002). SSRIs are effective, but patients taking them often suffer a variety of sometimes unpleasant side effects, including dry mouth, constipation,

blurred vision, headache, agitation, drowsiness, as well as a reduction in sexual enjoyment.

There has been concern that SSRIs may increase the risk of suicide among teens and young adults, probably because when the medications begin working they give patients more energy, which may lead them to commit the suicide that they had been planning but lacked the energy to go through with (Barbui, Esposito, & Cipriani, 2009). This concern has led doctors to be more selective about prescribing antidepressants to this age group (Healy & Whitaker, 2003; Simon, 2006; Simon, Savarino, Operskalski, & Wang, 2006).

Because the effects of antidepressants may take weeks or even months to develop, doctors usually work with each patient to determine which medications are most effective, and may frequently change medications over the course of therapy. In some cases other types of antidepressants may be used instead of or in addition to the SSRIs. These medications also work by blocking the reuptake of neurotransmitters, including serotonin, norepinephrine, and dopamine. Brand names of these medications include Effexor and Wellbutrin.

TRICKY TOPIC: BIOLOGICAL TREATMENTS OF PSYCHOLOGICAL DISORDERS

One or more interactive elements has been excluded from this version of the text. You can view them online here: https://caul-cbua.pressbooks.pub/intropsychneuro/?p=564#oembed-1

If the video above does not load, click here: https://youtu.be/FkooCxHTHng
For a full transcript of this video, click here

Lithium

Patients who are suffering from bipolar disorder are not helped by the SSRIs or other antidepressants because their disorder also involves the experience of overly positive moods. Treatment is more complicated for these patients, often involving a combination of antipsychotics and antidepressants along with mood stabilizing medications (McElroy & Keck, 2000). The most well-known mood stabilizer, lithium carbonate (or lithium), is used widely to treat mania associated

with bipolar disorder. Available in Canada for more than 60 years, the medication is used to treat acute manic episodes and as a long-term therapy to reduce their frequency and severity. Anticonvulsant medications can also be used as mood stabilizers. Another drug, Depakote, has also proven very effective, and some bipolar patients may do better with it than with lithium (Kowatch et al., 2000).

People who take lithium must have regular blood tests to be sure that the levels of the drug are in the appropriate range. Potential negative side effects of lithium are loss of coordination, slurred speech, frequent urination, and excessive thirst. Though side effects often cause patients to stop taking their medication, it is important that treatment be continuous, rather than intermittent. Recently, Health Canada updated safety information and treatment recommendations for lithium after finding that taking lithium carries a risk of high blood calcium, or hypercalcemia, and is sometimes associated with a hormone disorder known as hyperparathyroidism (Canadian Press, 2014). There is no cure for bipolar disorder, but drug therapy does help many people.

Antianxiety Medications

Antianxiety medications are drugs that help relieve fear or anxiety. They work by increasing the action of the neurotransmitter GABA. The increased level of GABA helps

inhibit the action of the sympathetic division of the autonomic nervous system, creating a calming experience.

The most common class of antianxiety medications is the tranquilizers, known as benzodiazepines. These drugs, which are prescribed millions of times a year, include Ativan, Valium, and Xanax. The benzodiazepines act within a few minutes to treat mild anxiety disorders but also have major side effects. They are addictive, frequently leading to tolerance, and they can cause drowsiness, dizziness, and unpleasant withdrawal symptoms including relapses into increased anxiety (Otto et al., 1993). Furthermore, because the effects of the benzodiazepines are very similar to those of alcohol, they are very dangerous when combined with it.

Antipsychotic Medications

Until the middle of the 20th century, schizophrenia was inevitably accompanied by the presence of positive symptoms, including bizarre, disruptive, and potentially dangerous behaviour. As a result, schizophrenics were locked in asylums to protect them from themselves and to protect society from them. In the 1950s, a drug called chlorpromazine (Thorazine) was discovered that could reduce many of the positive symptoms of schizophrenia. Chlorpromazine was the first of many antipsychotic drugs.

Antipsychotic drugs (neuroleptics) are drugs that treat the symptoms of schizophrenia and related psychotic

disorders. Today there are many antipsychotics, including Thorazine, Haldol, Clozaril, Risperdal, and Zyprexa. Some of these drugs treat the positive symptoms of schizophrenia, and some treat the positive, negative, and cognitive symptoms.

The discovery of chlorpromazine and its use in clinics has been described as the single greatest advance in psychiatric care, because it has dramatically improved the prognosis of patients in psychiatric hospitals worldwide. Using antipsychotic medications has allowed hundreds of thousands of people to move out of asylums into individual households or community mental health centres, and in many cases to live near-normal lives.

Antipsychotics reduce the positive symptoms of schizophrenia by reducing the transmission of dopamine at the synapses in the limbic system, and they improve negative symptoms by influencing levels of serotonin (Marangell, Silver, Goff, & Yudofsky, 2003). Despite their effectiveness, antipsychotics have some negative side effects, including restlessness, muscle spasms, dizziness, and blurred vision. In addition, their long-term use can cause permanent neurological damage, a condition called **tardive dyskinesia** that causes uncontrollable muscle movements, usually in the mouth area (National Institute of Mental Health, 2008). Newer antipsychotics treat more symptoms with fewer side effects than older medications do (Casey, 1996).

Direct Brain Intervention Therapies

In cases of severe disorder it may be desirable to directly influence brain activity through electrical activation of the brain or through brain surgery. **Electroconvulsive therapy (ECT)** is a medical procedure designed to alleviate psychological disorder in which electric currents are passed through the brain, deliberately triggering a brief seizure (Figure T.11). ECT has been used since the 1930s to treat severe depression.

When it was first developed, the procedure involved strapping the patient to a table before the electricity was administered. The patient was knocked out by the shock, went into severe convulsions, and awoke later, usually without any memory of what had happened. Today ECT is used only in the most severe cases when all other treatments have failed, and the practice is more humane. The patient is first given muscle relaxants and a general anesthesia, and precisely calculated electrical currents are used to achieve the most benefit with the fewest possible risks.

ECT is very effective; about 80% of people who undergo three sessions of ECT report dramatic relief from their depression. ECT reduces suicidal thoughts and is assumed to have prevented many suicides (Kellner et al., 2005). On the other hand, the positive effects of ECT do not always last; over one-half of patients who undergo ECT experience relapse

within one year, although antidepressant medication can help reduce this outcome (Sackheim et al., 2001). ECT may also cause short-term memory loss or cognitive impairment (Abrams, 1997; Sackheim et al., 2007).

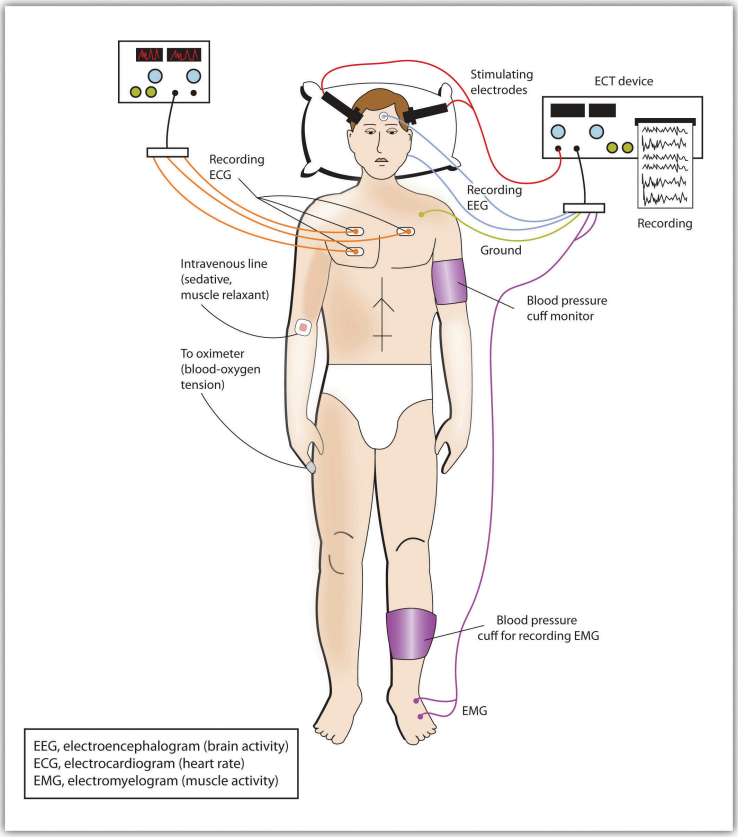

Figure T.11 Electroconvulsive Therapy (ECT). Today's ECT uses precisely calculated electrical currents to achieve the most benefit with the fewest possible risks.

Although ECT continues to be used, newer approaches to treating chronic depression are also being developed. A newer and gentler method of brain stimulation is **transcranial magnetic stimulation (TMS)**, a medical procedure designed to reduce psychological disorder that uses a pulsing magnetic coil to electrically stimulate the brain (Figure T.12). TMS seems to work by activating neural circuits in the prefrontal cortex, which is less active in people with depression, causing an elevation of mood. TMS can be performed without sedation, does not cause seizures or memory loss, and may be as effective as ECT (Loo, Schweitzer, & Pratt, 2006; Rado, Dowd, & Janicak, 2008). TMS has also been used in the treatment of Parkinson's disease and schizophrenia.

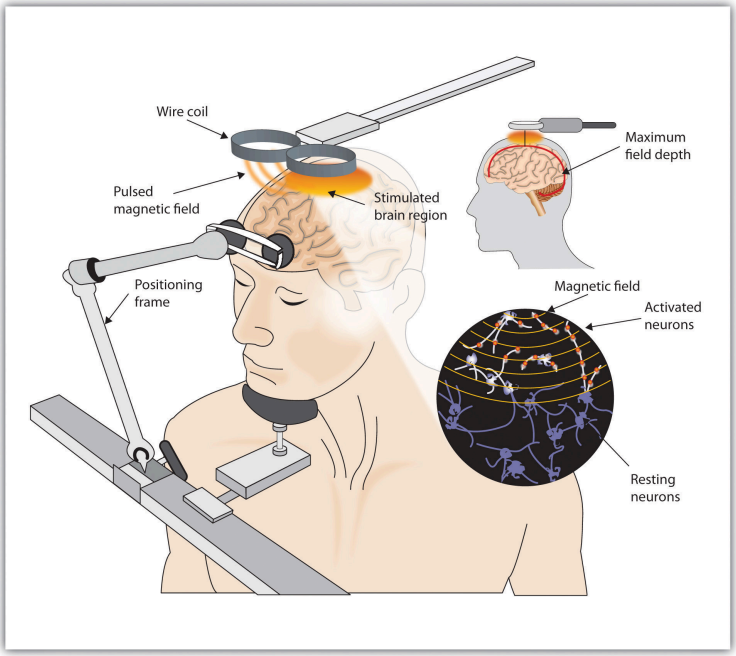

Figure T.12 Transcranial Magnetic Stimulation (TMS). TMS is a noninvasive procedure that uses a pulsing magnetic coil to electrically stimulate the brain. Recently, TMS has been used in the treatment of Parkinson's disease.

Still other biomedical therapies are being developed for people with severe depression that persists over years. One approach involves implanting a device in the chest that stimulates the vagus nerve, a major nerve that descends from the brain stem toward the heart (Corcoran, Thomas, Phillips, & O'Keane, 2006; Nemeroff et al., 2006). When the vagus nerve is

stimulated by the device, it activates brain structures that are less active in severely depressed people.

Psychosurgery, that is, surgery that removes or destroys brain tissue in the hope of improving disorder, is reserved for the most severe cases. The most well-known psychosurgery is the prefrontal lobotomy. Developed in 1935 by Nobel Prize winner Egas Moniz to treat severe phobias and anxiety, the procedure destroys the connections between the prefrontal cortex and the rest of the brain. Lobotomies were performed on thousands of patients. The procedure — which was never validated scientifically — left many patients in worse condition than before, subjecting the already suffering patients and their families to further heartbreak (Valenstein, 1986). Perhaps the most notable failure was the lobotomy performed on Rosemary Kennedy, the sister of U.S. President John F. Kennedy, which left her severely incapacitated.

There are very few centres that still conduct psychosurgery today, and when such surgeries are performed they are much more limited in nature and called cingulotomy (Dougherty et al., 2002). The ability to more accurately image and localize brain structures using modern neuroimaging techniques suggests that new, more accurate, and more beneficial developments in psychosurgery may soon be available (Sachdev & Chen, 2009).

152.

KEY TERMS FOR TREATMENT

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asylum
: institution created for the specific purpose of housing people with psychological disorders

aversive conditioning
: counterconditioning technique that pairs an unpleasant stimulant with an undesirable behaviour

behaviour therapy
: therapeutic orientation that employs principles of learning to help clients change undesirable behaviours

biomedical therapy
: treatment that involves medication and/or medical procedures to treat psychological disorders

cognitive therapy
: form of psychotherapy that focuses on how a person's thoughts lead to feelings of distress, with the aim of helping them change these irrational thoughts

cognitive-behavioural therapy
: form of psychotherapy that aims to change cognitive distortions and self-defeating behaviours

comorbid disorder

individual who has two or more diagnoses, which often includes a substance abuse diagnosis and another psychiatric diagnosis, such as depression, bipolar disorder, or schizophrenia

confidentiality

therapist cannot disclose confidential communications to any third party, unless mandated or permitted by law

counterconditioning

classical conditioning therapeutic technique in which a client learns a new response to a stimulus that has previously elicited an undesirable behaviour

couples therapy

two people in an intimate relationship who are having difficulties and are trying to resolve them with therapy

cultural competence

therapist's understanding and attention to issues of race, culture, and ethnicity in providing treatment

deinstitutionalization

process of closing large asylums and integrating people back into the community where they can be treated locally

dream analysis

technique in psychoanalysis in which patients recall their dreams and the psychoanalyst interprets them to reveal unconscious desires or struggles

electroconvulsive therapy (ECT)
type of biomedical therapy that involves using an electrical current to induce seizures in a person to help alleviate the effects of severe depression

exposure therapy
counterconditioning technique in which a therapist seeks to treat a client's fear or anxiety by presenting the feared object or situation with the idea that the person will eventually get used to it

family therapy
special form of group therapy consisting of one or more families

free association
technique in psychoanalysis in which the patient says whatever comes to mind at the moment

group therapy
treatment modality in which 5–10 people with the same issue or concern meet together with a trained clinician

humanistic therapy
therapeutic orientation aimed at helping people become more self-aware and accepting of themselves

individual therapy
treatment modality in which the client and clinician meet one-on-one

intake
therapist's first meeting with the client in which the therapist gathers specific information to address the

client's immediate needs

involuntary treatment

therapy that is mandated by the courts or other systems

nondirective therapy

therapeutic approach in which the therapist does not give advice or provide interpretations but helps the person identify conflicts and understand feelings

play therapy

therapeutic process, often used with children, that employs toys to help them resolve psychological problems

psychoanalysis

therapeutic orientation developed by Sigmund Freud that employs free association, dream analysis, and transference to uncover repressed feelings

psychotherapy

(also, psychodynamic psychotherapy) psychological treatment that employs various methods to help someone overcome personal problems, or to attain personal growth

rational emotive therapy (RET)

form of cognitive-behavioural therapy

relapse

repeated drug use and/or alcohol use after a period of improvement from substance abuse

Rogerian (client-centered therapy)

non-directive form of humanistic psychotherapy

developed by Carl Rogers that emphasizes unconditional positive regard and self-acceptance

strategic family therapy

therapist guides the therapy sessions and develops treatment plans for each family member for specific problems that can addressed in a short amount of time

structural family therapy

therapist examines and discusses with the family the boundaries and structure of the family: who makes the rules, who sleeps in the bed with whom, how decisions are made, and what are the boundaries within the family

systematic desensitization

form of exposure therapy used to treat phobias and anxiety disorders by exposing a person to the feared object or situation through a stimulus hierarchy

token economy

controlled setting where individuals are reinforced for desirable behaviours with tokens (e.g., poker chip) that be exchanged for items or privileges

transference

process in psychoanalysis in which the patient transfers all of the positive or negative emotions associated with the patient's other relationships to the psychoanalyst

unconditional positive regard

fundamental acceptance of a person regardless of what they say or do; term associated with humanistic psychology

virtual reality exposure therapy

uses a simulation rather than the actual feared object or situation to help people conquer their fears

voluntary treatment

therapy that a person chooses to attend in order to obtain relief from her symptoms

153.

SUMMARY FOR TREATMENT

16.1 Mental Health Treatment: Past and Present

It was once believed that people with psychological disorders, or those exhibiting strange behaviour, were possessed by demons. These people were forced to take part in exorcisms, were imprisoned, or executed. Later, asylums were built to house the mentally ill, but the patients received little to no treatment, and many of the methods used were cruel. Philippe Pinel and Dorothea Dix argued for more humane treatment of people with psychological disorders. In the mid-1960s, the deinstitutionalization movement gained support and asylums were closed, enabling people with mental illness to return home and receive treatment in their own communities. Some did go to their family homes, but many became homeless due to a lack of resources and support mechanisms.

Today, instead of asylums, there are psychiatric hospitals run by state governments and local community hospitals, with the emphasis on short-term stays. However, most people

suffering from mental illness are not hospitalized. A person suffering symptoms could speak with a primary care physician, who most likely would refer them to someone who specializes in therapy. The person can receive outpatient mental health services from a variety of sources, including psychologists, psychiatrists, marriage and family therapists, school counsellors, clinical social workers, and religious personnel. These therapy sessions would be covered through insurance, government funds, or private (self) pay.

16.2 Types of Treatment

Psychoanalysis was developed by Sigmund Freud. Freud's theory is that a person's psychological problems are the result of repressed impulses or childhood trauma. The goal of the therapist is to help a person uncover buried feelings by using techniques such as free association and dream analysis.

Play therapy is a psychodynamic therapy technique often used with children. The idea is that children play out their hopes, fantasies, and traumas, using dolls, stuffed animals, and sandbox figurines.

In behaviour therapy, a therapist employs principles of learning from classical and operant conditioning to help clients change undesirable behaviours. Counterconditioning is a commonly used therapeutic technique in which a client learns a new response to a stimulus that has previously elicited an undesirable behaviour via classical conditioning. Principles

of operant conditioning can be applied to help people deal with a wide range of psychological problems. Token economy is an example of a popular operant conditioning technique.

Cognitive therapy is a technique that focuses on how thoughts lead to feelings of distress. The idea behind cognitive therapy is that how you think determines how you feel and act. Cognitive therapists help clients change dysfunctional thoughts in order to relieve distress. Cognitive-behavioural therapy explores how our thoughts affect our behaviour. Cognitive-behavioural therapy aims to change cognitive distortions and self-defeating behaviours.

Humanistic therapy focuses on helping people achieve their potential. One form of humanistic therapy developed by Carl Rogers is known as client-centred or Rogerian therapy. Client-centred therapists use the techniques of active listening, unconditional positive regard, genuineness, and empathy to help clients become more accepting of themselves.

Often in combination with psychotherapy, people can be prescribed biologically based treatments such as psychotropic medications and/or other medical procedures such as electro-convulsive therapy.

16.3 Treatment Modalities

There are several modalities of treatment: individual therapy, group therapy, couples therapy, and family therapy are the most common. In an individual therapy session, a client works

one-on-one with a trained therapist. In group therapy, usually 5–10 people meet with a trained group therapist to discuss a common issue (e.g., divorce, grief, eating disorders, substance abuse, or anger management). Couples therapy involves two people in an intimate relationship who are having difficulties and are trying to resolve them. The couple may be dating, partnered, engaged, or married. The therapist helps them resolve their problems as well as implement strategies that will lead to a healthier and happier relationship. Family therapy is a special form of group therapy. The therapy group is made up of one or more families. The goal of this approach is to enhance the growth of each individual family member and the family as a whole.

16.4 Substance-Related and Addictive Disorders: A Special Case

Addiction is often viewed as a chronic disease that rewires the brain. This helps explain why relapse rates tend to be high, around 40%–60% (McLellan, Lewis, & O'Brien, & Kleber, 2000). The goal of treatment is to help an addict stop compulsive drug-seeking behaviours. Treatment usually includes behavioural therapy, which can take place individually or in a group setting. Treatment may also include medication. Sometimes a person has comorbid disorders, which usually means that they have a substance-related disorder diagnosis and another psychiatric diagnosis, such as

depression, bipolar disorder, or schizophrenia. The best treatment would address both problems simultaneously.

16.5 The Sociocultural Model and Therapy Utilization

The sociocultural perspective looks at you, your behaviours, and your symptoms in the context of your culture and background. Clinicians using this approach integrate cultural and religious beliefs into the therapeutic process. Research has shown that ethnic minorities are less likely to access mental health services than their White middle-class American counterparts. Barriers to treatment include lack of insurance, transportation, and time; cultural views that mental illness is a stigma; fears about treatment; and language barriers.

154.

REVIEW QUESTIONS FOR TREATMENT

Click here for Answer Key

Multiple Choice Questions

1. Who of the following does not support the humane and improved treatment of mentally ill persons?

a. Philippe Pinel
b. medieval priests
c. Dorothea Dix
d. All of the above

2. The process of closing large asylums and providing for people to stay in the community to be treated locally is known as _____.

a. deinstitutionalization
b. exorcism
c. deactivation
d. decentralization

3. Skylar was convicted of domestic violence. As part of their sentence, the judge has ordered that Skylar attend therapy for anger management. This is considered _____ treatment.

a. involuntary
b. voluntary
c. forced
d. mandatory

4. Today, most people with psychological problems are not hospitalized. Typically they are only hospitalized if they _____.

a. have schizophrenia
b. have insurance
c. are an imminent threat to themselves or others
d. require therapy

5. The idea behind _____ is that how you think determines how you feel and act.

a. cognitive therapy
b. cognitive-behavioural therapy
c. behaviour therapy
d. client-centred therapy

6. Mood stabilizers, such as lithium, are used to treat _____.

a. anxiety disorders
b. depression
c. bipolar disorder
d. ADHD

7. Clay is in a therapy session. The therapist asks them to relax and say whatever comes to their mind at the moment. This therapist is using _____, which is a technique of _____.

a. active listening; client-centred therapy
b. systematic desensitization; behaviour therapy
c. transference; psychoanalysis
d. free association; psychoanalysis

8. A treatment modality in which 5–10 people with the same issue or concern meet together with a trained clinician is known as _____.

a. family therapy
b. couples therapy
c. group therapy
d. self-help group

9. What happens during an intake?

a. The therapist gathers specific information to address the client's immediate needs such as the presenting problem, the client's support system, and insurance status. The therapist informs the client about confidentiality, fees, and what to expect in a therapy session.
b. The therapist guides what happens in the therapy session and designs a detailed approach to resolving each member's presenting problem.
c. The therapist meets with a couple to help them see how their individual backgrounds, beliefs, and actions are affecting their relationship.
d. The therapist examines and discusses with the family the boundaries and structure of the family: For example, who makes the rules, who sleeps in the bed with whom, and how decisions are made.

10. What is the minimum amount of time addicts should receive treatment if they are to achieve a desired outcome?

a. 3 months
b. 6 months
c. 9 months
d. 12 months

11. When an individual has two or more diagnoses, which

often includes a substance-related diagnosis and another psychiatric diagnosis, this is known as _____.

a. bipolar disorder
b. comorbid disorder
c. codependency
d. bi-morbid disorder

12. Gage was drug-free for almost six months. Then gage started hanging out with their addict friends again, and they have now started abusing drugs again. This is an example of _____.

a. release
b. reversion
c. re-addiction
d. relapse

13. The sociocultural perspective looks at you, your behaviours, and your symptoms in the context of your _____.

a. education
b. socioeconomic status
c. culture and background
d. age

14. Which of the following was *not* listed as a barrier to mental health treatment?

a. fears about treatment
b. language
c. transportation
d. being a member of the ethnic majority

Critical Thinking Questions

15. People with psychological disorders have been treated poorly throughout history. Describe some efforts to improve treatment, include explanations for the success or lack thereof.

16. Usually someone is hospitalized only if they are an imminent threat to themselves or others. Describe a situation that might meet these criteria.

17. Imagine that you are a psychiatrist. Your patient, Pat, comes to you with the following symptoms: anxiety and feelings of sadness. Which therapeutic approach would you recommend and why?

18. Compare and contrast individual and group therapies.

19. You are conducting an intake assessment. Your client is a 45-year-old single, employed male with cocaine dependence. He failed a drug screen at work and is mandated to treatment by his employer if he wants to keep his job. Your client admits

that he needs help. Why would you recommend group therapy for him?

20. Lashawn is a 24-year-old African American female. For years she has been struggling with bulimia. She knows she has a problem, but she is not willing to seek mental health services. What are some reasons why she may be hesitant to get help?

Personal Application Questions

21. Do you think there is a stigma associated with mentally ill persons today? Why or why not?

22. What are some places in your community that offer mental health services? Would you feel comfortable seeking assistance at one of these facilities? Why or why not?

23. If you were to choose a therapist practicing one of the techniques presented in this section, which kind of therapist would you choose and why?

24. Your best friend tells you that they are concerned about their cousin. The cousin—a teenager—is constantly coming home after curfew, and your friend suspects that their cousin been drinking. What treatment modality would you recommend to your friend and why?

25. What are some substance-related and addictive disorder treatment facilities in your community, and what types of

services do they provide? Would you recommend any of them to a friend or family member with a substance abuse problem? Why or why not?

26. What is your attitude toward mental health treatment? Would you seek treatment if you were experiencing symptoms or having trouble functioning in your life? Why or why not? In what ways do you think your cultural and/or religious beliefs influence your attitude toward psychological intervention?

155.

ACKNOWLEDGEMENTS & ATTRIBUTIONS

APPENDIX: TRICKY TOPIC TRANSCRIPTS

Tricky Topic Transcripts

In order of appearance:

Tricky Topics

Tricky Topic: Introduction to Research Design

Slide 1: Research Design (Introduction)
Research is the foundation of science, as such, understanding research design is essential for basic science literacy. Let's begin by discussing some of the basic components of research.

Slide 2: Basics
The first term you should be comfortable with is, "variable". Simply put, a variable is any factor that varies within a specified group or population; some examples are height, weight, caffeine intake, and blood pressure. So, if we're interested in

whether caffeine affects blood pressure, we might research this by measuring the variables: 1) daily caffeine intake and 2) blood pressure.

The second term that's important is population.

Click

In research design this refers to the entire group that we're interested in knowing more about. For example if we're interested in knowing whether sugar makes kids hyperactive, the group or population we're interested in are all children. If we're interested in Alzheimer's disease then the population would be all people with Alzheimer's disease. You can see that the population is dependent on the research question. As you can imagine, a population can be very large, for instance there are a LOT of children in the world, making it impossible to test them all, so to make things more manageable we can instead take a sample

Click

or subset of the population of interest. The important thing is to make sure that the sample is REPRESENTATIVE of the population,

Click

meaning that the sample has the same overall makeup as the larger population. You wouldn't want to ask a question about children and then only test females, because the population of children, of course, is made up of more than just girls. If we want results that are applicable to the population we're interested in, then we need our sample to match that

population.

Okay, Now that we have some of the basics under our belt, we can move on to specific types of research designs.

Slide 3: Types of Research Designs

In general we can divide research designs into three different categories. The first category is what's known as descriptive research.

Click

Descriptive research, as the name implies, involves describing phenomena like: how many hours of TV do most people watch per day, or what types of behaviours do children engage in on the playground, or what types of study habits do university students employ. These are all examples of questions that can be addressed with descriptive research.

Click

The next type of research design is what's known as correlational research. Correlational research involves looking at the relationships between variables

Click

for instance, how is X related to Y? When X goes up does Y also go up? Or when X goes up does Y go down?

Click

The third type of research design is what's known as an experimental design. Experimental design is considered the gold standard in the research world as it involves not just the measurement, but also the MANIPULATION of specific variables.

Click
This type of design allows us to make the strongest conclusions. In an experimental design what we're asking is whether or not something causes something else. For instance, does my new drug cause a decrease in depression like symptoms.

Slide 4: Research Design (Introduction)
That concludes our introductory look at the three types of research design: descriptive research; correlational research; and experimental research.

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Tricky Topic: Descriptive Research Design

Slide 1: Research Design (Descriptive Design)
(No Audio)

Slide 2: Types of Research Designs
Let's focus in on the first of the three research design types: descriptive design.

Slide 3: Types of Descriptive Designs
Descriptive designs can be further grouped into three different types.
Click
The first of the three types is a case study. In a case study,

researchers carefully observe or describe behaviour in a single individual, or in some cases, a very small group. This type of design tends to be used when focusing on a unique case like a rare disease, or an event, that only a small number of people experience. Based on the information collected from a case study, we cannot make any broad conclusions, however, information gathered from a case study can help us increase our understanding of unusual behaviours, which may be impossible to study otherwise.

Click

The second type of descriptive design is naturalistic observation. Naturalistic observation is observing an individual in their natural environment. For example, famous primatologist, Jane Goodall, used this method to first document tool use in chimpanzees.

Click

Although this method is most often used to describe animal behaviour, it can also been used to study human behaviour.

Click

For example, Canadian researchers Debra Pepler and Wendy Craig have used naturalistic observation to provide a rich description of bullying behaviours in school playgrounds.

Click

The third type of descriptive design involves interviews and surveys. Interviews and surveys can be done in person or via phone or online. Importantly, they can allow researchers to

collect vast amounts of information from many individuals, so they can be quite useful.

Slide 4: Research Design (Descriptive Design)
Taken together, descriptive research can be an excellent starting point – it allows us to better understand what's happening. However, because we are only describing what we are observing we cannot be sure what is actually causing an observed phenomenon to occur. For this reason, descriptive research is typically used to get the lay of the land before moving on to more complex research designs.

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Tricky Topic: Correlational Research Design

Slide 1: Research Design (Correlational Design)
Correlational designs take descriptive research one step further.

Slide 2: Types of Research Designs
Correlational designs seek to understand how variables are related to one another.

Slide 3: Correlational Designs
This relationship between variables is often expressed as a correlation coefficient. A correlation coefficient is a number that ranges between positive 1 and negative 1. The number

itself represents the strength of the relationship between two variables. So, as an example, a correlation coefficient of 0.8 would be a strong relationship whereas a correlation coefficient of 0.2 would be much weaker. The positive or negative of the correlation coefficient tells us the direction of the relationship: if it's positive, it means that as the value of one variable increases or decreases, then the second variable also increases or decreases in the same manner. If the correlation coefficient is a negative number, then as the value of one variable increases the other decreases (and vice versa). This is best illustrated with some examples.

Click

This figure shows a type of graph called a SCATTERPLOT. Each data point on the graph represents two variables for a single person. On the horizontal axis, also called the x-axis, we have height, and on the vertical axis, also called the y-axis, we have shoe size. By looking at the data points on this figure we can see as peoples height increases, so does their shoe size. Thus, the data points on this scatterplot show a positive relationship,

Click

because the values increase together in the same direction with a correlation coefficient of +0.93, which is a strong positive correlation since it's quite close to +1. This is not surprising since taller people tend to have larger feet than smaller people.

Click

This scatterplot is similar to the last one as the vertical y-axis

shows shoe size. However, notice that the horizontal x-axis is now different. The x-axis now shows a person's final grade in a course. The data points are scattered all over the place,
Click
which tells us, not surprisingly, that there is no relationship between shoe size and final exam score, the correlation coefficient is pretty close to 0.
Click
Finally, This last scatterplot shows final grades on the x-axis, and hours per day of watching Netflix on the y-axis. The data shows a clear negative relationship,
Click
so the more time spent watching Netflix, the LOWER the final grade in the course; this correlation coefficient is pretty close to -1.
As demonstrated, correlational designs can tell us a lot about the relationship between two variables and so are very useful and are frequently used in psychology. Let's focus in now on another example to help us see why psychologists might choose to address their research questions with a correlational design.

Slide 4: Using Correlational Designs

Imagine you are interested in whether the amount of screen time increases short-sightedness in children. Do you think as a researcher you would be able to take away all laptops and televisions from some children while imposing certain durations of screen time on others? Most definitely not! It's neither practical nor ethical to carry out this type of study.

However, what you could do is look at whether a child is short-sighted or not as well as the average amount of time they spend looking at a screen. So, in this way you would be looking at the relationship between screen time and short-sightedness without depriving or enforcing technology on children. For these reasons, correlational designs are often necessary and as a result are frequently used. Of course, it is also for these reasons that correlational designs come with limitations.

Slide 5: Limitations of Correlations

The biggest limitation of correlational designs is that they cannot determine causality. One reason for this is the directionality problem, meaning it's not possible to tell the direction of causation. For instance, let's say there is a strong correlation between sitting close to the TV and poor vision.

Click

You might conclude that sitting close to the screen CAUSES poor vision. But, it's also possible that poor vision leads people wanting to sit closer to the TV, so they can see. With a correlational design, we are not able to tell whether one variable causes the other, only that the variables are linked. Another reason why we can't determine causality from correlation is the third variable problem,

Click

which presents the possibility that the cause could be something else entirely. What if actually, sitting too close to the television and poor vision are both being caused by a third variable that wasn't measured, or in some case, not even

realized. For our current example, a third variable could be the amount of time spent indoors.
Click
It might be that spending time inside leads to both people spending more time watching TV as well as poor vision. In fact, a recent study in China showed that time spent indoors was a predictor of needing glasses in children, not screen time! So, directionality and third variables must be taken into consideration when interpreting correlations between variables.

Slide 6: Research Design (Correlational Design)
While correlational designs can illuminate strong relationships between variables, they must always be interpreted with caution. As we discussed, causation can never be inferred from correlation. To determine causation, experimental research design is required.

To return to video, click here

Tricky Topic: Experimental Research Design

Slide 1: Research Design (Experimental Design)
(No Audio)

Slide 2: Types of Research Designs

Unlike the other research designs, the experimental method allows for the manipulation of specific variables.

Slide 3: Experimental Design

Experimental design allows you to ask the question,

Click

does X cause Y? For example, does sugar cause hyperactivity in children? In an experiment, the researcher manipulates one or more variables, and measures others, while attempting to control for all other factors. By controlling the environment, it ensures that the only difference between the groups is a difference in the variable of interest. So, an experimental research design has two different types of variables,

Click

the independent variable, and dependent variable. The independent variable is the one that's manipulated and is the proposed cause in the research question. If we go back to the example of whether sugar causes hyperactivity in children, this would be sugar. The dependent variable is the one that's measured, and it's the proposed effect in the research question, so back to our question of whether sugar causes hyperactivity in children, this would be activity levels. Although an experiment can have many independent and dependent variables, the most basic experimental design has to have at least one independent variable and one dependent variable. Let's design a simple experiment to ask about the effect of sugar on the activity levels in children.

Slide 4: Designing an Experiment

In this experiment we're interested in the effect of sugar, so we're going to try to keep everything else the same. Then we can compare whether the group given sugar is more active than the group that did not receive sugar. If we design our experiment carefully, we can potentially conclude that a difference in activity is being caused by sugar or is not. So, first we recruit a sample of participants…

Click

In order to ensure that the groups are comparable before the we start the experimental manipulation, it's best to RANDOMLY assign our participants to groups.

Click

The first group receives sugar whereas the second group receives a sweet substance without sugar, in this case we'll use artificial sugar. The group that received the active ingredient, sugar, we call the experimental group,

Click

while the group that did not receive the active ingredient, but instead received artificial sugar, is known as the control group.

Click

At this point in our experimental design we've just manipulated our independent variable.

Click

Remember, our dependent variable measures the possible effect of the independent variable; it depends on the independent variable. So, in both of our two groups we are

going to measure activity levels.
Click
This will allow us to see whether or not the sugar is causing a change in the activity level. Now, if we see a difference in the activity level by statistically comparing the two groups
Click
and notice that the activity levels for the children in the experimental group (those that received sugar) are higher than the children in the control group (those that did not receive sugar), we can conclude that the sugar caused this effect. This is because we have theoretically controlled all other possible variables leaving the only change between the groups of whether or not they received sugar. Further, if we don't see a difference between the two groups then, we can conclude that the sugar did not contribute to an increase in activity.

Slide 5: Research Design (Experimental Design)
That concludes our look at experimental design. Unlike other types of designs, it is only with experimental designs that we can test causative relationships.

To return to video, click here

Tricky Topic: Statistical Measures

Slide 1: Statistical Measures
It's usually necessary to do some number crunching in order to make sense of data collected as part of a research study.

Statistics is the field of mathematics involved with collecting, analyzing, presenting, and interpreting data.
In this Tricky Topic, you'll become familiar with some commonly used statistical measures.

Slide 2: Statistics and Math

Math tends to be a polarizing topic – you either love it or hate it, kind of like olives or black liquorice. but it's necessary to embrace your inner mathematician if you want to understand how research findings are represented statistically. To do that, let's look at an example of some data you might be interested in, performance on a class quiz.

Slide 3: Quiz Performance Data

Let's say we have 19 students in our class who have just finished a quiz, graded out of 10. Looking at this list of numbers isn't the most efficient way to figure out how these students did overall. I mean we can see just with a quick scan that Mashoodh and Redden got the highest marks and Stamp got the lowest. If the class was much bigger than this, it would be really difficult and time-consuming to scan through the data by eye. One way to get a better sense of quiz performance is to arrange the grades from lowest to highest, rather than alphabetically.
Click
This gives us an even clearer picture of how the class did, for instance we can see that quite a few students got 7/10.

Slide 4: Displaying Frequency

Something else you can do is to display the data in a graph by plotting a frequency distribution. Basically you put your measure of interest on the x-axis on the bottom, in this case quiz scores, and the number of people who got each score on the y-axis on the left. Again, it's obvious that most people got a 7,

Click

but we can see the overall pattern of grades more easily in this figure compared to the table. A frequency distribution is a great way to eyeball your data, but it's not the only way. Researchers use a number of descriptive statistics to communicate findings in a data set.

Slide 5: Common Descriptive Statistics

Measures of central tendency produce a single value that is typical of the whole data set. These are handy because they relay information about the data without having to scan the whole collection. The most commonly reported measure of central tendency is the mean,

Click

which is the mathematical average, represented by the symbol x-bar. To calculate the mean, you have to add up or sum, shown by this symbol here,

Click

all of your values, which we affectionately refer to as x.

Click

Then we divide this sum by the number of observations we

have in total, which in stats-speak is referred to as n.
Click
The median is another measure of central tendency that is the midpoint value in your data set,
Click
while the mode is the most frequently occurring value. Let's look at these measures of central tendency in our quiz scores.

Slide 6: Measures of Central Tendency

By adding up all the numbers and dividing our n, the number of quizzes, our mean works out to 6.4.
Click
Note that not one of the students actually scored a 6.4, since it wasn't a possible value, but it does give us a sense of how the group did as a whole. The median is 7,
Click
because if you arrange the values from smallest to largest, 7 is in the middle: there are 9 values less than 7, and 9 values more than 7. The mode is also 7,
Click
because it's the most frequently occurring score, five students got a 7.
Click
This gives us a very similar idea to what we saw in the frequency distribution we saw earlier, which told us that the scores on this quiz centred around 7.

Slide 7: Common Descriptive Statistics

Other commonly used statistics are measures of variability, or spread of scores in a data set. The simplest measure of variability is the range,

Click

which is the span between the highest and lowest values.

Click

For our quiz, the highest score was a 9 and the lowest score was a 3, so the range is 6.

Click

The degree of spread in quiz performance can also be calculated in a similar way to how we determined the mean. One common measure is variance,

Click

represented as s2, a number that indicates how much the individual scores deviate from the mean, and is calculated using squares. Let me explain.

Click

Keep in mind that the mean for this quiz is 6.4 out of a possible max of 10. We can simply work out how much each value differs from the mean, so 3 minus 6.4 is -3.4, and 4 minus 6.4 equals -2.4, and so on. And then take the average deviation. Note that these data points give us negative values. After we've finished calculating each value's deviation, if we add all of these together in order to find the average, we run into a problem: the positives and negatives cancel each other out, so you end up with a grand total close to zero.

Click

Well that doesn't appear to tell us very much about the spread of data because it makes it seem like there's no variability at all, and there clearly is – we saw what the data looked like, and we also calculated a range of 6. There's a simple mathematical solution to this problem. What we can do is square the individual deviations.

Click

Like shown here, because a negative times a negative equals a positive, so that gives us a way to add these up. As long as we do the same thing to all of the values, this doesn't break any math rules. We add up these numbers to get our total squared deviation.

Click

Here is the variance equation.

Click

It's the sum of each observation (so each quiz) minus the mean, squared – to avoid numbers cancelling each other out – divided by n minus 1.

Click

Once we plug in our total deviation into our equation and divide by n minus 1, we get a mean squared deviation, or variance of 2.8. Values larger than this would indicate more spread in the values, and values less than this tell us that the scores are more closely clustered together. If you're wondering why it's n minus 1, don't worry about that for our purposes. Some clever statistician calculated that n minus 1 is more accurate to predict variability than just dividing by n like we

did for the mean. What you will see reported more often, however, is the standard deviation.
Click
This takes the square root of the variance, and the number we get is roughly 1.7,
Click
it's in the same form as the scores that we used to get the mean. Keep in mind you don't have to bother with squares or square roots to calculate the mean because the mean doesn't give us a mix of positive and negative values. The standard deviation is used a lot for other types of statistical calculations, so it's useful to know where it comes from. If you're a math-head, then you might find this interesting, but if you're math-phobic then you might be wondering when the heck you'll ever need to know this. Well, one area of research in psychology where standard deviation plays a big part is intelligence testing. Wechsler's IQ tests are the most widely used measures of intelligence, and the scoring system is calculated using standard deviation.

Slide 8: Distribution of IQ Scores

If we plot a frequency distribution of IQ scores in a population, it looks like this, with most people scoring 100 and a reliable spread of scores around this midpoint based on the standard deviation. This shows the number of standard deviations above and below the mean, each standard deviation corresponding to 15 points in the IQ score.
Click
About 68% of the population is within 1 standard deviation

above or below the mean of 100, which works out to a span of IQ scores from 85 to 115.
Click
About 95% of the population is within 2 standard deviations above or below the mean – so between 70 and 130 –
Click
while pretty well everyone falls within 3 standard deviations, so between 55 at the low end and 145 at the high end. So, one sensible conclusion that we can draw from this is that if someone's score places them at one of the extremes, say 160, we can be confident, in terms of IQ, that they are rare. Of course, this does not tell us that IQ is a valid measure of intelligence, that's a whole other debate, but what it does tell us is that IQ, as measured by modern intelligence testing, is fairly reliable. So far we've focused on descriptive statistics, or displays of data. We can also use data to make inferences or conclusions, which is called inferential statistics.

Slide 9: Inferential Statistics

Inferential statistics allow us to make inferences or predictions about a population, based on observations of a sample. The fact that inferential statistics enable predictions makes it very powerful but these aren't crystal ball predictions. Inferences are instead based upon mathematical calculations, which we won't get into in great detail but it's worth reviewing some important concepts. Basically, the idea underlying this is that we usually can't test absolutely everyone we're interested in. If we're interested in human beings in general, then we could try

and test all of the humans on planet earth, and the handful of people working on the international space station. That would give us everyone and we could be sure that our data represent humans as a whole. But for a bunch of obvious reasons, this isn't possible. There are just too darn many of us and we're all pretty busy. So what researchers do is to take a sample of the population to test, and then make inferences or predictions about the population as a whole. The term used most often to describe inferential statistical findings is statistical significance,
Click
a conclusion based on statistics that allows researchers to determine whether they can reject the null hypothesis. The null hypothesis is usually a statement that there's "no difference", and is typically the opposite of what the researcher hopes to find.
Click
Statistical significance is usually expressed as a p-value, and the conventional cut-off for a p-value is less than 0.05 or 5%. Let's look at an example to show how inferential statistics are used in psychology.

Slide 10: Using Inferential Statistics

This study done at the University of Manitoba tested the effect of attributional retraining on grades in a first year introductory psychology course. The intervention involved getting the students to practice rethinking how they explained academic failure, by shifting explanations from things that are difficult to change – I did badly on that quiz because I'm dumb –

to those that are possible to change – I did badly because I didn't study for that one, I'll do better next time. Control students were assigned to a business-as–usual condition, with no rethinking training while the others in the rethinking condition had two brief training sessions where they learned "healthy" ways to think about poor performance. The students were not treated differently in any other way. Although the researchers were hoping to see an improvement in course performance with this rethinking training,

Click

the statistical null hypothesis is the default position that there is no difference between these two groups.

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The dependent variable they used in this study to look at the effect was the percentage of students who failed or withdrew from the course. What they found was striking,

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far fewer students in the rethinking group failed the course. The researchers backed this up with statistical analysis that yielded a p-value of less than 0.05, which is usually indicated with an asterisk.

Click

This means they found support to reject the null hypothesis that there's no difference between the groups and so the authors can say with some confidence that their experimental manipulation did appear to improve overall course performance. If they designed their experiment well – which

in my opinion they did – and their sample of Intro Psych students is representative of all Intro Psych students, we can generalize these findings more widely to this population.
Take home message, if you are faced with an academic setback, try to think of some adaptive ways to think about poor performance. Research, back up with statistics, shows that it does seems to help.

Slide 11: Statistical Measures
There you have it, a very basic introduction to some statistical measures used in research.

To return to video, click here

Tricky Topic: Neuronal Structure

Slide 1: Neuronal Structure
Neurons are the building blocks of the nervous system, so a basic understanding of how they work is crucial to the study of thought, behaviour, and emotion.

Slide 2: Cells of the Nervous System
Before we talk about neurons, we'll first give a nod to another important cell type: glial cells.
Glia cells are the support cells of the nervous system.
Click
The word glia in Greek mean "Glue". This is because it was originally thought that glia were responsible for binding the

nervous system together.

Click

There are lots of different types of glia cells and they come in a variety of shapes and sizes.

Click

One type, called an astrocyte, gets its name from its star-like appearance.

Click

Astro is Latin for star. Astrocytes have widespread functions: they provide structural support, they're a source of glucose for neurons when they're hungry (and neurons are ALWAYS hungry), and they regulate ions and extracellular neurotransmitter levels (which are essential for signalling).

Click

Oligodendrocytes are another type of glia cells, however, their function is more limited than astrocytes. They make MYELIN, a fatty substance that wraps around and insulates a part of the neuron called the axon. Oligodendrocytes are the main myelinating glial type in the Central NS (so the brain and spinal cord) while

Click

Schwann cells serve the same function of wrapping around and insulating neuron axons, but in the Peripheral NS (so outside of the brain and spinal cord).

Click

Nerve cells are called neurons, and their job is to receive and send messages to both one another other as well as targets all

over the body, so they're our information processors.

Neurons are incredibly diverse in their shapes, functions, and communication targets. Generally speaking, neurons can first be categorized into two different types: first,

Click

those that project to distant targets outside of their local structure and second,

Click

those that project locally to targets within the same structure. Even further, neurons are vastly diverse within each of these general categories.

Click

Take for example three main structures of the nervous system: the cerebellum, the cerebral cortex, and the retina.

Click

In the top row you can see three major distant projecting neuron types: Purkinje neurons in the cerebellum; Pyramidal neurons in the cerebral cortex; and Retinal Ganglion Cells in the Retina.

Click

Now, take a look at the bottom row. Here are three examples of locally projecting neurons: Granule cells in the cerebellum, Basket cells in the cerebral cortex; and Bipolar cells in the Retina.

Understanding neuronal structure has been at the forefront of neuroscience research since it's very beginnings with the pioneering work of Ramon y Cajal in the late 1800s. Still to

this day, understanding neuronal structure serves as key factor in understanding the diversity and functions of the nervous system. Now that we understand the importance of neuronal shape, let's take a closer look at how we describe the cellular structure of a typical neuron.

Slide 3: Neuronal Structure

Despite their diversity in size and structure, neurons all share common features. The soma,

Click

also called the cell body, contains the nucleus, and other cellular machinery necessary for the housekeeping functions that all cells need to maintain.

Extending from the soma

Click

are highly branched structures called dendrites, whose main function is to receive messages from other neurons. As we saw in the last slide, dendritic complexity can differ a lot depending on the neuron type. Neurons with many dendrites will have large total dendritic surface areas, which means they can receive many inputs from many other neurons. Amazingly, some individual neurons have been shown to receive as many as 10 000 inputs on their dendrites.

Also extending from the soma is the neuron's axon,

Click

which can be thought of as the neuron's highway to its targets. In this case the target is another neuron, but it could also be a muscle or a gland.

When describing the connection between two neurons we refer to the neuron sending the signal as the presynaptic neuron

Click

while we refer to the neuron receiving the signal as the postsynaptic neuron.

Click

Neuronal signals, or messages, are most often passed on to the next neuron by neurotransmitters, which are chemical signals typically released at the axon terminals

Click

of the presynaptic neuron and received by receptors on the dendrites of the post-synaptic neuron. It is important to note, that while most axon terminals synapse on dendrites, like you see here, axon terminals can also synapse onto other parts of the neuron, such as the soma and axon.

The contact points between the presynaptic axon terminals and the postsynaptic dendrites are quite tiny, but if we zoom in a bit closer, we can see much more.

Click

At this magnification, we can see little bubbles called SYNAPTIC VESICLES,

Click

and inside these you can see neurotransmitter molecules.

If we focus in now at the tip of the axon terminal

Click

we see vesicles releasing their neurotransmitter contents into

the space between the terminal of the sending neuron and the dendrite of the receiving neuron.
Click
This space is called the synaptic cleft. The liberated neurotransmitter is then able to bind to receptors
Click
on the other side of the synapse and pass the message on to the next neuron.
Thus, the arrangement of neurons in relation to the synapse gives us the terminology to describe the direction of information flow.
Click
This is why we call the sending neuron, the presynaptic neuron, as it is found before synapse, and the receive neuron as the postsynaptic neuron, as it is found after the synapse. Although this seems fairly straightforward, so far we've been looking at simplified schematics; real synapses are a bit messier. Let's have a look.

Slide 4: Synaptic Structure

This image was taken with an electron microscope and shows the structure of the synapse in the fly brain. It was by Nancy Butcher, a former neuroscience student who completed her Bachelor's and Masters degrees at Dalhousie University. The synapse itself can be identified by the dark staining, representing high electron density.
Click
The arrow shows the location of the presynaptic neuron,

which is easy to locate because there are lots of little bubbles,
Click
which are the vesicles containing neurotransmitter. The asterixis show the postsynaptic contacts, and this example the presynaptic neuron makes synaptic contact with, not 1, not 2, not 3, not even 4, but FIVE separate dendrite branches. So even at a single terminal there can be lots of places for neurons to communicate with one another.

Slide 5: Three Types of Neurons

If we classify neurons based on their synaptic connections, it yields THREE different types.
Click
Sensory neurons receive their input from various stimuli in the environment. They tend to have very specialized shapes in order to capture sounds, sights, smells, and other types of information we get from our sensory world. For example, in this reflex arc
Click
we have cutaneous sensory neurons
Click
that transmit the sense of 'touch' from the skin into the spinal cord.
The second neuron type
Click
are interneurons, and they receive their input FROM and send their output TO, other neurons, so their communication is exclusively with other neurons.

Click

Interneurons are responsible for all the tasks that don't involve direct sensory input, or direct motor output. Back to our cutaneous reflex arc, interneurons are located in the spinal cord

Click

and receive inputs from the sensory neurons. They then make connections with other neurons in order for the sensory messages to get transmitted to the brain.

The final neuron type are

Click

motor neurons. Motor neurons receive innumerable inputs from neurons in the brain, spinal cord, and periphery. They are located within the central nervous system and send signals to both muscles and glands throughout the periphery.

Click

Thus, they function to regulate not just movement, but also hormone release.

Again, coming back to our example, Motor neurons are the final link in the reflex arc.

Click

They receive inputs from upstream interneurons and send signals to peripheral muscles. Thus, the effective communications between sensory neurons, interneurons and motor neurons allows our nervous systems to both sense and respond to our dynamic environments.

Slide 6: Neuronal Signalling: Dendrites to Axon

Terminals

So far, we have discussed how signals are chemically transmitted across the synaptic cleft from one neuron to another. Further we have discussed how to classify neurons based on their input and output targets. However, as you may have noticed, the distance between where a neuron might receive a signal, at its dendrites, and where it releases a signal, at its axon terminals, can be very large. In some cases, this distance can be over a meter! For example, think about motor neurons in your spinal cord.

Click

A single motor neuron may have its dendrites in the spinal cord

Click

and its axon terminals all the way down your leg signalling in your calf muscles.

Click

Thus, the question is raised, how are signals transmitted from a neuron's dendrites and soma to its axon terminals? The answer lies in the remarkable electrical properties of all neurons.

Slide 7: Electric Properties of Neurons

Neurons are different than most other cell types because they can transmit electrical signals along their membranes.

Electrical current in neurons is carried by ions, which are particles that carry a positive or a negative charge. Each Ions has a CONCENTRATION GRADIENT, which means that ion may have different concentrations on each side of the

neuronal cell membrane.

The difference in ion concentrations is made possible by ion pumps, which use energy to maintain the unequal distribution of ions on either side of the membrane. Because of the different concentrations of ions, there is also an ELECTRICAL GRADIENT, which is a term that refers to the difference in CHARGE across the neuronal membrane. If you stick an electrode into a typical neuron to measure the electrical properties at rest (when it's not active), you'd find that the inside is slightly more negative than the outside.

Click

This is called the resting potential and in a typical neuron is -70mV. Let's look at the concentration of different ions across the neuronal membrane.

Slide 8: Distribution of Ions

There are many ions in a neuron, but these are the major players involved with electrical signalling.

Click

First are large negatively charged proteins, which are represented by the symbol A- and are predominantly found inside the neuron.

Next, Chloride,

Click

or Cl- carries a negative charge and are located mostly outside the neuron.

Now let's look at some of the major positively charged ions. First, Potassium

Click

is a positively charged ion, represented by the symbol K+, and found mainly inside the neuron.

Unlike potassium, positively charged Sodium,

Click

represented by the symbol Na+ is found mostly outside the neuron.

Lastly, Calcium,

Click

or Ca2+, carries a DOUBLE positive charge, and are more abundant outside of the neuron.

This different distribution of ions is important for the electrochemical gradient, and that's necessary to provide the driving force for ion movement. Ion movement is ESSENTIAL for the two important jobs of neurons which enable the signaling from their postsynaptic receptors and then along their axons to their axon terminals…

Slide 9: Neurons have two important jobs:

The first job is to transmit a message from the presynaptic neuron, across the synaptic cleft, to the post synaptic neuron.

Click

This is achieved by converting a chemical neurotransmitter signal in the synaptic cleft, into an electrical signal in the neuron.

Click

This occurs at the location in the neuron where it receives synaptic inputs, which is usually in its dendrites.

Click

This is a type of signal called a graded potential.

Click

The second important job of neurons, after receiving a message, is to transmit that message along its length

Click

from its dendrites to its axon terminals. This happens via a type of electrical signal called an

Click

action potential.

Slide 10: Neuronal Communication

Our neurons are talking to each other all the time, by the millions and millions! Try and picture that – it's mind-boggling. Well, fear not,

Click

with this figure we'll outline the two types of electrical signalling, using a simplified circuit of just three neurons. Using this circuit well attempt to show the repetitive nature of the signalling processes. First, we'll start our signalling process with an action potential

Click

in the first neuron. This action potential propagates down the axon of the first neuron until it reaches the axon terminals. Once it has reached the axon terminals it initiates Neurotransmitter release

Click

into the synapse between the first neuron and the second

neuron. These neurotransmitters are then received by the dendrites of the second neuron producing GRADED Potentials.

Click

Once these grade potentials reach a certain threshold, they initiate another action potential, but this time it's in the second neuron.

Click

As we saw before, the action potential propagates down the axon of the second neuron

Click

until it reaches the axon terminals, again, initiating neurotransmitter release.

Click

Now, neurotransmitter is released into the synapse between the axon terminals of the second neuron and the dendrites of the third neuron, which again, initiates grade potentials, except this time in third neuron.

Click

This process then repeats

Click

onto 4th, 5th, 6th, and millions of other neurons.

Slide 11: Neuronal Structure

Knowing the structures of neurons and signalling types in neurons are important first steps in understanding their functions. Ultimately, the output of the nervous system, which governs our movements, thoughts, and behaviours, are

determined by how different neuron types send and receive signals with one another.

To return to video, click here

Tricky Topic: Synaptic Transmission

Slide 1: Synaptic Transmission
To understand how neurons communicate with one another, it is vital to understand the basics of synaptic transmission.

Slide 2: Neuronal Communication
The nervous system has billions of neurons, and each of them can have hundreds or thousands of contacts. These neurons are in constant communication, even when we're sleeping. This sheer amount of activity is truly remarkable. Despite this, neuronal communication is made possible by a couple of different types of electrical signals, which are linked by chemical messengers. Let's zoom in for a closer look.
Click
Neurons have two important jobs: One is to transmit a message to a target across a synapse,
Click
using neurotransmitters as messengers.
Click
The type of electrical signal resulting from this is called a GRADED POTENTIAL.
Click

If the graded potential is the right size and type then it allows the neuron to do its second important job, which to carry the message along the length of its axon to its target using a type of electrical signal called an ACTION POTENTIAL.
Click
When an action potential reaches the axon terminals
Click
it triggers neurotransmitter release,
Click
which continues the cycle of producing a graded potential and then an action potential in the next targeted neurons.
Click
This continuous cycle of communication is running all the time in your nervous system. For this Tricky Topic, we'll focus on the events at the synapse and learn how synaptic transmission plays a role in neuronal communication.

Slide 3: Pre- and Post- synaptic

We're going to start our journey to the synapse with a bird's eye view. The axon terminals
Click
of the neuron on the left, shown here in red, form synapses with the dendrites of the neuron on the right. Although most neuronal axon terminals synapse on dendrites, like you see here, keep in mind they can also form synapses on other parts of the targeted neuron, such as the soma and the axon. The sending neuron on the left is referred to as the presynaptic neuron

Click

and the receiving neuron on the right is referred to as the

Click

postsynaptic neuron. Keep in mind these are relative terms. Most neurons act as senders AND receivers of information, so they're both presynaptic and postsynaptic, depending on which event we're referring to. Let's pick this particular synapse and zoom in for a little more detail.

Click

At this magnification, we can see little bubbles called SYNAPTIC VESICLES,

Click

and inside these you can see neurotransmitter molecules.

Click

These vesicles here are releasing their neurotransmitter contents into the synaptic cleft. Once released into the synapse, the neurotransmitters can travel the short distance to the postsynaptic neuron.

Click

Once they reach the other side, neurotransmitters bind to receptors on the postsynaptic neurons.

Click

There are lots of different types of receptors, but the simplest ones are gated to ion channels, like shown here. Once the neurotransmitter binds, it opens the ion channel part of the receptor allowing certain ions to travel across the neuronal membrane along their electrochemical gradient.

Click

This influx of positive current, in the form of positive ions, is what generates GRADED POTENTIALS

Click

in the postsynaptic neuron. Thus, through the binding of postsynaptic ion-channel receptors, synaptic neurotransmitters initiate postsynaptic graded potentials.

Slide 4: Steps in Synaptic Transmission

Let's review the steps so far: First,

Click

neurotransmitter is released from the presynaptic terminal. Second, that neurotransmitter binds to the receptors

Click

opening up their ion channels on the postsynaptic side.

What happens next in the postsynaptic neuron depends on the type of ion channel receptor that is activated, as different receptors are permeable to different types of ions. The type of ion channel receptor that is activated will then determine the type of graded potential that is initiated.

If the channel opens and positive ions enter through the channel,

Click

then the inside of the neuron will become less negative. For example, the potential of the neuron might rise form its resting potential of -70 mv to -55 mv.

Click

This is referred to as a DEPOLARIZATION

Click

and is considered excitatory.

If instead negative ions enter through the channel, then the inside of the neuron will become more negative.

Click

For example, the potential of the neuron might decrease from its resting potential of -70 mv to -90 mv.

Click

This is referred to as a hyperpolarization

Click

and is considered inhibitory.

Let's look at some examples of different types of receptors which produce either excitatory or inhibitory graded potentials.

Slide 5: Depolarization (+)

First let's look at depolarization. A neurotransmitter that is always excitatory at its synapses is glutamate,

Click

so we can pretend that the orange diamonds are glutamate molecules, and the white circles in the synapse are sodium ions.

Click

When glutamate binds to its receptor

Click

the channel opens and sodium ions are driven by their electrochemical gradient to enter the neuron.

When sodium moves into the cell through the receptor ion channel, it brings its positive charge with it, making the cell

more positive,
Click
which is called a depolarization. If the channel remains open for longer, more sodium will flow in,
Click
making the cell even more positive.
Click
This type of graded potential is called an excitatory postsynaptic potential,
Click
or EPSP for short.

Slide 6: Hyperpolarization (-)

What about hyperpolarization? A neurotransmitter that's almost always inhibitory at its synapses is GABA,
Click
and its receptor channel is permeable to negatively charged chloride ions, shown here as black circles.
Click
When GABA binds to its receptor, the channel opens and chloride ions are driven into postsynaptic neuron because of their concentration gradient
Click
When chloride moves into the cell through the GABA receptor ion channel, it brings its negative charge with it, making the cell more negative, which is called a hyperpolarization.
Click

If the channel remains open for longer, more chloride will flow in,
Click
making the cell even more negative.
Click
This type of graded potential is called an inhibitory postsynaptic potential,
Click
or IPSP for short.
So why does this matter?

Slide 7: Steps in Synaptic Transmission

Well if the postsynaptic neuron adds up all of the EPSPs and IPSPs and the membrane potential reaches a threshold
Click
of -55mV, a different type of ion channel comes into play, one that is opened by a change in voltage.
Click
The ion channels we've learned about so far are opened by neurotransmitter binding, but these VOLTAGE-DEPENDENT sodium channels are sensitive to changes in charge. At resting conditions, say -70 mV,
Click
these channels are closed and Na+ ions cannot pass through them into the cell
Click
However, when the sum of all EPSPs and IPSPs raises the neurons potential above -55 mV,

Click

the voltage-dependent sodium channels open allowing Na ions into the cell

Click

When these voltage dependent sodium channels open, they create an action potential, which allows the neuron to send the message to its target.

Slide 8: Synaptic Transmission

Overall, synaptic transmission may seem quite tricky, but it's actually quite simple once you know the basics.

To return to video, click here

Tricky Topic: Action Potentials

Slide 1: Action Potentials

Neurons communicate with each other using the language of electrochemistry, and to appreciate how information is transmitted across large distances, in some cases over a meter, it's necessary to understand how action potentials work. But first let's review the basics of neuronal communication.

Slide 2: Neuronal Communication

Neurons have two important jobs.

One is to transmit a message to a target across a synapse

Click

and the other is to carry a message along the length of its axon

Click
to the next neuron. The first job
Click
is made possible by neurotransmitters released from the presynaptic neuron. They trigger graded potentials
Click
in the postsynaptic neuron, which come in two flavours, excitatory postsynaptic potentials (or EPSPs)
Click
and inhibitory postsynaptic potentials (or IPSPs)
Click
The neuron has the ongoing task of adding up all the EPSPs and IPSPs, to determine when to start the neuron's second job of carrying the message down the length of the axon. If the membrane potential reaches its threshold of -55mV,
Click
a type of electrical signal called an ACTION POTENTIAL
Click
is generated. The action potential then triggers neurotransmitter release once it reaches the terminal,
Click
and the process starts all over again in a new neuron

Slide 3: Action Potential Initiation

Although an action potential is first generated where the membrane potential reaches -55mV, which is usually in the axon initial segment right at the soma, we'll focus on the events in the axon, since their main job is to propagate the action

potentials to the neuron's targets at the terminals.

The firth step of an action potential is the opening of voltage-gate sodium channels. As a post-synaptic neuron receives Neurotransmitter signals, if the threshold of -55mV is reached, a special type of sodium channel, that's sensitive to electrical changes, gets open.

Let's take a quick look at how different receptor types distribute in the neuron.

Click

Unlike the receptor channels in the synapse

Click

that are neurotransmitter gated, that is, they open in response to specific neurotransmitter binding, voltage-dependent sodium channels,

Click

which are most densely located in the axon, open when the membrane potential is depolarized to -55 mV.

Click

In a resting neuron there are more sodium ions outside the neuron than inside, so there's a chemical AND electrical imbalance that promotes sodium movement INSIDE the cell.

Click

Thus, when voltage-dependent sodium channels open, sodium rushes into the neuron, bringing its positive charge, making the cell even more depolarized.

Slide 4: Action Potentials & Axon Structure

Once an action potential is initiated it propagates along the

axon to the terminals.
Click
If we think about the nervous system as a whole, hundreds of millions of action potentials are being fired on top of one another at all times. Thus, the nervous system must operate within a remarkably sensitive computational time frame. Indeed, some action potentials can travel at speeds up to 100m/s. One strategy the nervous system uses to increase action potential speed to as quick as possible is the surrounding of axon shafts with the fatty membranes of glia cells. In the central nervous system, oligodendrocytes form fatty Myelin Sheaths along axons,
Click
as seen here. This insulates the axon allowing electrical charge to quickly jump
Click
between Myelin within the axon. The spaces between the myelin Sheath are referred to as,
Click
Nodes of Ranvier. If we zoom into a Node of Ranvier,
Click
we can see this area is densely clustered with ions channels, which allow the passage of electric charge, in the form of ions, across the axon membrane in areas not covered by myelin.

Slide 5: Action Potential Spread

Let's now take a closer look at the mechanisms behind an action potentials travel down the axon away from the soma to

the axon terminals.
Click
Here we can see a neuron with its axon
Click
extending away from its soma. If we take a cross section
Click
along the length of its axon and zoom in we can start to appreciate what's happening inside the neurons axon. When the graded potentials at the synapse add up to -55mV
Click
this is detected by the voltage-dependent sodium channels
Click
which are found in large numbers along the axon. As the voltage gated sodium channels open, sodium rushes into the axon
Click
along its electrochemical gradient, bringing its positive charge into the neuron. This depolarization is then sensed by neighbouring sodium channels
Click
which also open when the membrane potential reaches -55 mV, having sodium ions and positive charge rush into the neighbouring region of the axon.
At this point, if we were to stick an electrode into the neuron
Click
we would see the membrane potential rise at the location where the sodium channels are opening. At this first time

point this location is proximal to the soma, that is, it is closer to the soma than the terminals.
The wave of depolarization makes its way down the axon,
Click
as neighbouring sodium channels along each part of the axon open allowing sodium to continue to flow in
Click
This depolarization wave travels in proximal to distal direction.
Click
At a time point, 2, if we were to again stick an electrode into the neuron
Click
the depolarization would be measured farther down the axon.
This process of sodium channels bringing positive charge, which then opens adjacent voltage-dependent sodium channels, works its way uninterrupted all the way down the length of the axon. So once an action potential gets started, it doesn't stop until it runs out of neuron.
Click

To be completed at a later date (updated to 6:44)

To return to video, click here

Tricky Topic: Cortical Anatomy

Slide 1: Cortical Anatomy

This image is easily recognizable as a human brain, but this is a

simplified, colour-coded version.
Click
The actual human brain is a little messier and looks a bit like this.
A huge amount is devoted to the cerebral cortex, which is most what you can see when you look at an intact human brain. Upon first glance it doesn't appear to have much in the way of organization.
Click
If you compare it to a street map of Edmonton, there certainly doesn't appear to be a lot of urban planning going on in the cortex. However, the cortex has been mapped and described in astonishing detail. At this point, the picture is still far from complete, but neuroscientists continue to piece it together.
For this Tricky Topic, we'll consider the arrangement of structures and connections in the cortex. Before diving in, it's first helpful to consider where this human cortex came from.

Slide 2: Human Brain Evolution

Some evidence for the origins of the human brain comes from comparisons to our early ancestors. Over on the far right
Click
is a skull of the Sahelanthropus tchadensis, which lived between 6 to 7 million years ago. Some argue this species might be our earliest ancestor.
Although their skulls resemble chimpanzees and their brains are estimated to be only a quarter of the size of modern humans, they share some anatomical features that suggest they

walked upright.
Click
A later human ancestor is the Australopithecus afarensis, who lived in Africa from 2 to 4 million years ago. The most famous member of this species is Lucy,
Click
a female whose remarkably intact remains survived until discovery in 1974. Her brain was a little larger than Sahelanthropus, about 1/3 the size of the modern human.
Homo erectus,
Click
who hung around on earth for a million and a half years or so, had an estimated brain capacity much larger than Lucy's.
Click
The more modern Homo Neanderthalensis, the species that most people think about when they picture cavemen, had a very large brain. Neanderthal skulls differed from other early humans in that they had a prominent ridge on their forehead
Click
shown here.
The brains of modern humans, Homo Sapiens, are actually thought to be a little bit smaller than those of Neanderthals but are amongst the largest of the hominids. Homo sapiens' behaviour is responsible for our biological success.
Click
We can choose to wear a hijab and drink a coffee while taking a selfie. Other animals don't do these things.

The flexibility and adaptability of human behaviour is driven by our large, unique brain. We can only estimate what the brains of our relatives looked like because we have remains of skulls, not actual neural tissue. We can get some sense about the anatomy and function of the human brain by comparing to other living species.

Slide 3: Comparing Species

At first glance, this rat brain on the far right looks much smoother than the chimpanzee and human brains, which appear more folded and wrinkly. This folding allows a large amount of brain to be scrunched together into a small space. You can see how this works for yourself if you take a sheet of paper and crumple it up.

Click

More brain folding is thought to represent more brain matter. Primates, like humans and chimps shown here, have large brains with lots of folding in the cortex, and this is thought to underly some of the fundamental differences in thought and behaviour.

Let's take a peek inside the human brain.

Slide 4: The Human Brain: A Peak Inside

Neuroscientists have been able to piece together an overall organization of the brain as shown in this cross section. This organization roughly divides the brain into three main regions,

Click

the hindbrain just above the spinal cord, the midbrain in the

middle, and the forebrain at the top. Clearly most of the brain is forebrain, and most of THAT is cortex, a structure that makes up about 80% of the human brain.
Click
Because the human cortex is so highly folded, it resembles a pile of worms.
Click
However, the word "cortex" actually means bark in Latin,
Click
since it covers the rest of the brain just like bark covers a tree.
So what does the cortex do? The cortex is responsible for all sorts of complex thought processes like
Click
perception, decision-making, and language. Let's take a look at the human cortex in more detail.

Slide 5: (No Title – Blue Brain on dark background)
The cortex is made up of two hemispheres: left and right.
We're looking at the left hemisphere right now, but
Click
if we rotate the brain, we can see that the right hemisphere is the same size and shape.

Slide 6: Anatomical Divisions
Each hemisphere has four lobes: the very front is the frontal lobe,
Click
behind it, the parietal lobe,

Click

in the back is the occipital lobe, and near the temple, resembling the thumb of a boxing glove is the temporal lobe.

Click

Of course, a real brain is not colour-coded,

Click

but it's still possible to identify these general areas.

Just looking at the cortex and its arrangement doesn't necessarily tell us what each of these areas actually do. Figuring out the functional divisions of the cortex requires different strategies.

Slide 7: Three Functional Divisions

There are three main functional divisions of the cortex.

Click

Primary sensory areas are the first bit of cortex that receive incoming information from our sensory organs.

Click

There is a primary sensory area in the cortex for each of our senses, and most of this is relayed through the thalamus,

Click

which sort of acts like a switchboard.

These primary sensory areas are important for categorizing and the integrating sensory information, which are the first steps in conscious perception.

Click

The primary motor area is the strip of cortex at the posterior or back end of the frontal lobe. It receives information from

surrounding areas and initiates a motor plan for voluntary movement

Click

by communicating with motor neurons in the brainstem and spinal cord.

Click

Association cortex, which makes up most of the cortical volume, has a less well-defined job description. It integrates information gathered from other areas to regulate complex thought processes

Click

such as problem-solving, decision-making and language.

Unlike the primary sensory and motor areas, electrical stimulation of association cortex does not produce movement or sensation. For this reason, it is sometimes referred to as "silent" cortex.

Now you might be thinking: under what circumstances would somebody sign up to have their brain stimulated in the first place? Well that's a good question, and the answer is that this happens in unusual circumstances.

Some medical procedures have allowed neurosurgeons to take a really intimate peek inside the brain.

Slide 8: A Deeper Peak Inside the Brain

From the 1930s to the 1950s,

Click

neuroscientist and neurosurgeon Wilder Penfield made incredibly detailed observations from awake, locally

anaesthetized patients undergoing surgery for epilepsy.
Click
Penfield tickled the neurons with a mild electric current
Click
and the patient then reported their sensations and movements which were recorded and mapped.

Slide 9: Electrical Stimulation in Epilepsy Patients

When Penfield stimulated the brain along the strip of the cortex shown in red,
Click
his patients reported movement on the opposite side of the body. When he stimulated the strip shown in green,
Click
they reported sensations of touch, again on the opposite side.
These careful observations allowed him to map the primary motor cortex and primary somatosensory cortex. Somato means 'body', so somatosensory is a fancy term for body sense, or touch.
Click
With repeated stimulation over many patients, Penfield notices the arrangement of body parts in these strips of cortex is the same as in the body itself
Click
The feet at one end and the head at the other but for the opposite or contralateral
Click
side of the body.

Slide 10: Primary Motor & Somatosensory Maps

If we take a slice from the primary motor area from one hemisphere you can see that the body map in the cortex is the same as in the actual body,

Click

with the feet at one end and the head at the other.

Click

If we look at the somatosensory cortex right next door, we can see a similar body map for touch. Note the disproportionate representation for some body parts like the hands and face.

Click

For instance, the fingers take up a lot of space compared to the legs.

Click

So the amount of brain devoted to a body part depends on its function rather than its physical size. We have much finer motor control of the muscles in our fingers compared to our legs, so the fingers get more real estate in the motor cortex. The same is true for touch sensitivity of these body parts, so they take up more of the somatosensory cortex.

Click

Some organs, such as the teeth, gums and genitals have representation in the somatosensory map but not the motor map. Of course, these areas have extreme touch sensitivity, but not much in the way of motor control.

Penfield's stimulation experiments reveal the organization of the motor and touch maps in incredible detail, but

opportunities for this type of research study are rare. Another way scientists learn about functions of the cortex is by making observations of people who have sustained some sort of damage, usually through disease or injury.

Slide 11: Learning from Injury

This image outlines what happened to 25-year old Phineas Gage, an American railroad construction foreman who suffered from an accident in 1848 in which a tamping iron, used to compact explosives into holes drilled in rock, set off a spark causing an explosion that sent the tamping iron through his head.

Click

He sustained extensive damage to his frontal lobes, especially his prefrontal cortex.

Click

After he recovered from the initial trauma, he showed profound behavioural changes and he became impulsive, impatient and disrespectful, using profanity, which is unlike him before the accident. He lost his job because the railroad felt he could no longer perform his duties.

This is one of the most famous case studies of brain injury and since then research has pointed to the frontal cortex, especially the prefrontal cortex, as being particularly important in planning and impulse control.

With these early attempts as well as more modern, and less invasive techniques such as neuroimaging, scientists have been

able to localize certain functional areas of the cortex to particular anatomical locations.

Slide 12: Cortical Lobes: Summary

As we learned from Phineas Gage,
Click
the frontal lobe is involved in attention, planning and impulse control, and has a large role in voluntary movement
Click
since it houses the primary motor area.
Click
The parietal is involved in sensation and perception of touch,
Click
since it's here you can find the primary somatosensory area.
Click
The occipital lobe in the back is strongly tied to vision
Click
and houses the primary visual cortex.
Click
The temporal lobe has a strong role in hearing,
Click
and is the location of the primary auditory cortex, which receives incoming information about sounds.

Slide 13: Cortical Anatomy

Keep in mind that this is a brief description of cortical anatomy and does not include all of the functions of the cortex, in fact we're still learning about it.

To return to video, click here

Tricky Topic: Hemispheric Lateralization

Slide 1: Cortical Lateralization

Although the left and right sides of the human cortex look almost identical, the hemispheres have specialized functions.

You might have heard that the left brain is analytical and logical while the right is more intuitive and creative.

The idea that people are either left-brained or right-brained is very popular, but it turns out, thankfully, that we use our whole brain, we just recruit the left and right hemispheres for different tasks, a phenomenon known as cortical lateralization.

Let's explore this in more detail.

Slide 2: Brain & Body Connections

This woman is facing us so her left is on our right, and vice versa.

Click

The primary motor cortex, which controls voluntary movement,

Click

is located roughly here.

Click

We know from work of German physiologist Eduard Hitzig in the 1860s, that this part of the brain has a CONTRALATERAL connection to the body parts it

controls, which means that it is connected to the OPPOSITE SIDE.
Click
Hitzig first noticed this while caring for wounded soldiers, he found that touching the surface of this specific strip of the cortex caused movement on the OPPOSITE side of the body.
Click
The various primary sensory areas also have this CONTRALATERAL organization such that incoming sensory information from the body is sent to the cortex on the opposite side.
The primary somatosensory cortex is located just behind the motor strip
Click
which is responsible for the perception of touch sensations,
Click
receives its information from sensory neurons whose axons cross over,
Click
so that the right side of the body talks to the left somatosensory strip, and the left side of the body talks to the right.
The connections of these primary sensory and motor areas of the cortex are also SYMMETRICAL,
Click
in that the left and right sides of the body have equal representation in their respective hemispheres.

Slide 3: The Visual Pathway

Let's consider the organization of information from the visual system to the cortex. Unlike the somatosensory system, which sends signals separately from each side of the body, the visual system is a little different because the left and right eyes capture images from BOTH the left and right sides of visual space, as shown in this figure.

For example, the outside part of the right eye

Click

and the inside part of the left eye

Click

detect stimuli in the left visual field, shown in red.

Click

The pathway from the inside part of the left eye crosses over at the optical chiasm, and the signals then get sent to the right hemisphere.

Click

The pathway from the outside part of the right eye stays on the same side,

Click

so ultimately the signals from left visual world ALL end up in the right hemisphere. If you follow the green lines you can see that this same arrangement is true for the right visual field.

In other words, the information from left and right visual space is sent to the primary visual cortex on the opposite side, in a way that conserves the symmetry of the visual scene.

Slide 4: Association Cortex

Unlike the primary sensory and motor areas, the association

cortex is asymmetrical
Click
because its functions differ between the left and right hemispheres. The left hemisphere appears to have a stronger role in processing language and logical based thought,
Click
while the right is involved in more holistic, spatial-type tasks.
Click
Most people, about 95% of right handers, and 85% of left handers, show this bias, although a small proportion of people have the opposite arrangement.

Slide 5: Corpus Callosum

Regardless of whether the lateralization is typical or reversed, ordinarily our hemispheres communicate with each other via a large bundle of axons called the corpus callosum
Click
located here in the middle of the brain.
Click
This highway allows for the exchange of information between the hemispheres.
But how do we know about association cortex asymmetry or the role of the corpus callosum?

Slide 6: Cortical Lateralization

The asymmetrical distribution of function in the association cortex is called cortical lateralization. A lot of what we know about lateralization comes from observations of people with

split brain syndrome
Click
who have had the corpus callosum cut. Believe it or not, this is a condition caused by surgeons, in extreme cases, as a last resort treatment for epilepsy.
Click
Epilepsy is characterized by excessive electrical activity in the brain,
Click
which can spread across large areas.
Click
Severing the corpus callosum can prevent the spread of troublesome electrical activity and confine the seizure to one area.
One consequence of split brain surgery is that stimuli from the various sensory systems can be sent separately to each hemisphere. Recall how sensory information is conserved in a CONTRALATERAL and SYMMETRICAL way. So in the visual system,
Click
the bits of the eye that capture left visual space are sent to the primary visual cortex in the right hemisphere
Click
and vice versa. Because the corpus callosum is cut in split brain patients, the hemispheres can't transfer information to each other.
So what happens to people who have this procedure? As it

turns out, people generally function just fine under everyday conditions.

Slide 7: Split Brain Syndrome

You can notice a difference in information processing under controlled laboratory conditions where the split brain patient keeps their head stationary and the researcher presents visual and tactile stimuli separately to each hemisphere.

What research has shown is that people with split brain syndrome,

Click

can easily verbally identify something presented in their right visual field, since this information travels to the language-intensive left hemisphere.

Click

However, when something appears in the left visual field,

Click

which travels to the spatial, non-verbal right hemisphere,

Click

they cannot name it.

Click

If instead they are given a SPATIAL identification task that is confined to the right hemisphere, such as identifying an object with their left hand by touch, they can easily retrieve it,

Click

even though they can't NAME what they just saw.

This demonstrates that the left and right hemispheres, if they can't talk to each other, are very limited in what they can do.

Slide 8: Brain Damage

Another source of information about cortical lateralization and asymmetry comes from studies of people who have sustained injury to particular regions of the association cortex. We can't cover all of the brain damage studies – there are simply too many – but we can look at some areas in particular in the left and right hemispheres whose damage results in specific types of impairments.

Two examples we'll consider are aphasias,

Click

which are impairments in language comprehension usually as a result of damage to the left association cortex,

Click

and agnosias,

Click

which are perceptual impairments resulting in difficulty in recognizing objects or people from their sensory features and are usually a result of damage to the right association cortex

Slide 9: Aphasias

Broca's aphasia, first described by the French physician Paul Broca,

Click

is characterized by difficulty producing speech although speech comprehension is mostly unaffected.

Click

Broca examined these patients' brains after they died and discovered damage to an area in the left frontal lobe,

Click
located near the primary motor cortex,
Click
which became known as Broca's area.
Click
Wernicke's aphasia, first described by German physician Carl Wernicke,
Click
is characterized by few problems producing the movements to speak, but speech doesn't make sense and patients have difficulty understanding others. Upon examination of their brains, they were found to have damage to an area in the left temporal lobe,
Click
quite near the primary auditory cortex,
Click
involved in hearing.
Click
This area became known as Wernicke's area.
Whereas aphasias are usually associated with damage to different parts of the left association cortex – often through injury or stroke – agnosias are most commonly found in people with damage to parts of the right association cortex.

Slide 10: Agnosias

Agnosias are very specific perceptual issues, unrelated to any problem with the eyes or with vision in general, but rather in dealing with processing incoming visual information and

making spatial sense out of it.

Click

Contralateral neglect is an unusual condition where people ignore the left side of their world. Dressing only the right side of the body or eating from only the right side of one's plate are common symptoms.

Keep in mind that the right association cortex is specialized in spatial tasks,

Click

and this disorder is linked to damage in the right parietal cortex.

Click

Prosopagnosia is an even more unusual condition, also known as FACE BLINDNESS.

Click

People with prosopagnosia have difficulty identifying specific faces, even though they have no trouble seeing faces.

Face recognition is a very specialized spatial task. Think about it. It is difficult to describe someone using our words, everyone has two eyes, a nose, couple of lips. It's the differences in size, shape, and position of these features that allows us to tell the difference between our best friend and stranger who has the same colouring and general features.

This disorder is associated with damage to an area of association cortex that spans the occipital and temporal lobes called the fusiform area,

Click
and is tucked in behind the cortex here.

Slide 11: Cortical Lateralization
So association areas in the left and right cortices often show a bias towards particular types of functions. Before the development of brain imaging technologies, discoveries about cortical lateralization were made possible by careful observations of people with brain damage.

To return to video, click here

Tricky Topic: Visual Transduction

Slide 1: Visual Transduction
Transduction refers to the conversion of one form of energy into another. In the nervous system, VISUAL transduction involves turning energy from photons of light into electrochemical neural signals. So let's first look a bit more closely at the properties of light.

Slide 2: Light & the Electromagnetic Spectrum
Light is one type of electromagnetic radiation, carried by tiny particles called photons that travel all around us in waves. Although we're not often aware of it,
Click
we're surrounded by all sorts of electromagnetic radiation that vary along a vast spectrum of sizes. These different types of

electromagnetic radiation have waves of different lengths so…
Click
…their size may be referred to as their wavelength. The largest waves are those that carry AC electricity
Click
which are about 1000m long, while the smallest are tiny gamma rays
Click
around 0.1 Angstroms, or one-100 billionth of a meter. Other waves between these two, such as radio and television waves, microwaves, and X-rays,
Click
are quite useful to us and are constantly around us throughout our lives. As you are probably aware though, we are unable to see any of these waves.
The reason that we humans can't see these waves is that our visual systems can only detect a very narrow band in the electromagnetic spectrum.
Click
Humans are only sensitive to the wavelengths from roughly 380 to 740nm
Click
and so we call this range "visible light."
We can see the components of white light if we separate the wavelengths with a prism,
Click
and within this range, we perceive different wavelengths as

different colours. For example, we perceive blue when we're presented with a 450nm wavelength, whereas we perceive red when we're presented with a 700nm wavelength.

Interestingly, some animals can see other wavelengths. Rattlesnakes are known to detect infrared light,

Click

which are longer wavelengths than the visible human range. Snakes use this ability to find suitable shelter, detect predators and to find vulnerable prey. Some birds on the other hand, such as the European starling, can detect wavelengths shorter than the human visible spectrum, in the ultraviolet range.

Click

Many birds have colouring on their plumage that is only visible under ultraviolet light, meaning that birds likely see very different markings on each other, compared to what we see on them.

Click

Okay, now that we understand some of the properties of light across the electromagnetic spectrum, let's look at what happens when the light enters your eye…

Slide 3: The Eye

This is a cross-section of the eye, so we're looking at it from the side, through its center.

Click

Light begins its journey at the CORNEA,

Click

which is the transparent protective layer over the outside of

the eye. Once light passes through the cornea it then travels through a small opening called the pupil,
Click
which is the dark circle in the center of the eye.
Click
The size of the pupil changes depending on how much light is in the environment: in dim light it dilates to become larger
Click
allowing more light in, while in bright light it constricts
Click
to let less light in. The opening of the pupil is adjusted by the iris,
Click
which gives the eye it's characteristic colour. Some of the most common eye colours are brown, blue, or green.
Click
Directly behind the pupil
Click
is the lens, which is responsible for bending light to focus the image onto the retina. The thickness of the lens can adjust depending on how much the eye needs to focus. For example, if you wanted to focus in the distance on a tree,
Click
the lens would focus the light reflecting off the tree into the back of your eye.
Click
To change the focus of the lens for different distances and sizes,

there are tiny muscles attached to either side of the lens that allow it to become either thicker or thinner depending the image.

Once the light has passed through the lens it then travels towards the back of the eye,

Click

it makes contact with the retina,

Click

which is a sheet consisting of a number of specialized neuronal cell types, which communicate with the rest of the brain via the Optic Nerve.

Click

It's here that transduction occurs, so let's look a little bit closer at the retina itself.

Slide 4: The Retina

If we zoom in on the retina, we can see it is composed of three different layers of cells. Although these cells are located in the eye, they're actually neurons. The rod and cone cells at the back of the retina are sensitive to light, so they're collectively known as PHOTORECEPTORS,

Click

and it's here that light signals are converted into an energy form that the nervous system can understand: an electrochemical signal. One odd thing about the arrangement of the photoreceptor layer is that photons entering the eye have to travel across several other cell layers

Click

before they meet the rods and cones that understand their message. Because the rods and cones are the first step in visual transduction, we'll first focus on what happens in these cells before introducing the other retina cell types.

Click

This is what rod and cone photoreceptor cells look like under an electron microscope. photoreceptors are a very specialized sensory cell. That is, they are designed to respond to specific incoming signals from the outside environment. So, in this case, these sensory receptors are specifically designed to respond to photons of light. When a light stimulus interacts with a sensory receptor it causes a change in the cell's permeability to particular ions, which then affects the release of neurotransmitters.

Click

Let's look more closely at these photoreceptors to see what happens INSIDE these cells when they interact with light.

If we focus in on the rod and cone cells

Click

we can see that although they have different shapes, they have very similar characteristics.

Both cells have terminals

Click

which synapse with the next layer of cells, a cell body

Click

containing the nucleus and other cell machinery, and an outer segment that contains discs of visual pigments

Click

This is the part of the rods and cones where photons of light begin the process of transduction.

If we look even more closely at the structure of these discs, we can see the chemicals that allow our eyes to convert light into neural signals.

Slide 5: Photoreceptors: Rods

In this rod cell

Click

the light-absorption happens in these discs.

Click

If we zoom in further to the lipid bilayer of the membrane

Click

we find a specialized membrane-bound protein known as opsin, shown here in colour.

Click

If you look in the centre of the opsin, you'll notice a dark coloured molecule called retinal.

Click

Collectively, the retinal and opsin structure is known as rhodopsin.

Click

In the dark, the retinal is bound to the opsin in a very specific conformation, however when a photon of light makes contact with these component molecules, rhodopsin changes its conformation

Click

This leads to a change in the membrane permeability allowing ions to enter into the photoreceptor cell, thus, creating an electrical signal.
Click
Let's remember that here, we are talking about specifically Rod photoreceptors and not cones.
Rods are sensitive to almost all colours within the visible light spectrum.
Click
Thus, Rods are very good at sensing white light, which is made up of the entire visible light range. On the other hand, this lack of specificity means that Rods can not sense different colours as they can not distinguish between different wavelengths. Sensing colour is achieved by the second type of photoreceptors; Cones…

Slide 6: Photoreceptors: Cones

Humans have three different types of cones, each with a distinct type of opsin sensitive to different ranges of wavelengths.
Click
The short cones respond to wavelengths in the blue end of the spectrum (CLICK), so are also referred to as blue cones.
Click
The medium cones respond to an overlapping but slightly longer range in the green portion of the visible spectrum,
Click
so they're also called green cones. Lastly,

Click

the long cones respond to longer wavelengths in the red end of the spectrum

Click

so as you can guess are also referred to as red cones.

Unlike rods, cones collectively convey information about colour. The colours we perceive depend on which types of cones respond and how much signal each sends to their targets.

Slide 7: Phototransduction: Retina – Brain

So as light enters through the eye

Click

it makes its way to the back layer of the retina

Click

reaching the discs in the outer part of the photoreceptors

Click

When the light reaches the photoreceptors it causes a conformational change in the light-sensitive rhodopsin molecules

Click

which in turn alters ion movement across the membrane initiating the release of neurotransmitters from the photoreceptor cells.

Once photoreceptors transduce light photons into electrochemical signals, they begin the process of transmitting visual information towards the visual cortex and other parts of the brain.

This process begins by photoreceptors releasing

neurotransmitter at synapses located at their terminals.
Click
Photoreceptors synapse with two distinct types of neurons – bipolar cells
Click
and horizontal cells
Click
The horizontal cells modulate the signal that is passed from the photoreceptors to the bipolar cells, which in turn pass the message on to the next layer in the retina. After the bipolar cells, the signal is sent to the next synaptic junction
Click
which involves two other cell types, the retinal ganglion cells
Click
and the amacrine cells.
Click
The amacrine cells, like the horizontal cells, modulate the activity in a sideways direction so it grooms the communication between the bipolar cells and ganglion cells. Finally, the axons of the ganglion cells, which make up the optic nerve
Click
carry the signal away from the retina and towards the brain.
Click
Therefore, the flow of neuronal information runs in this direction from the back of the retina to the front and then out of the eye via the optic nerve.

Slide 8: Visual Transduction

Taken together, the retina is one of our most vital sensory transduction sites. Light is funnelled and focused through the front of the eye to the retina. Once at the retina, specialized photoreceptors convert light signals in electrochemical signals that can be used and processed by the nervous system.

To return to video, click here

Tricky Topic: Binocular Depth Perception

Slide 1: Binocular Depth Perception

The ability to discriminate between what's near and what's far is known as depth perception. Depth Perception relies on two types of cues – monocular and binocular. Monocular cues allow us to judge depth with the use of one eye, but binocular cues require the use of BOTH eyes.

This tricky topic will focus on binocular depth cues.

Slide 2: 3D World from 2D Images

We can easily perceive height, width, and depth in our 3-dimensional world, but it may surprise you that the images that are projected onto the retina are only in two dimensions:

Click

height and width. So how are we able to perceive depth??

The biggest influence on our ability to perceive depth comes from binocular depth cues. That is information coming from

both eyes,
Click
which provides depth information to the brain.
To better visualize how images from the visual world travel from the eyes to the brain, let's look at a top-down view of the human visual pathway...

Slide 3: Visual Pathway

Information from our visual world enters both eyes, hitting each retina at a slightly different angle, so each eye gets a slightly different perspective of the visual scene.
We can divide our field of view into two parts: the left visual field and the right visual field. Light from the left visual field
Click
enters the inside part, contacting the retina, of the left eye
Click
and the outside part of the right
Click
After leaving the retina, the information from the left visual field then travels to the optic chiasm
Click
where the information from the LEFT eye crosses over to the right hemisphere while the information from the RIGHT eye REMAINS on the right side of the brain. The result is that all the information from the left visual field, which is picked up by both eyes, is in the right hemisphere
Click
The signal then travels to the thalamus

Click
and then finally to the visual cortex in the occipital lobe
Click
Similarly, the same sequence of events occurs for information from the right visual field
Click
which also travels to BOTH eyes,
Click
with the signal from the right eye crossing over at the optic chiasm
Click
so that all the information from the right visual field is in the left cortex
Click
which can then travel to the left thalamus
Click
and the left visual cortex in the occipital lobe
Click
Now that we understand how information from the visual fields enter the eyes, let's look at some visual stimuli to try and see how those two images (the one projected on the left eye and the one projected on the right eye) differ.

Slide 4: No Title (Image of mug)

Let's say you're looking at this coffee cup with both of your eyes open, it would look something like this.
If you close your right eye and keep your left eye open
Click

the view of the cup changes. The shift happens in the opposite direction when you close your left eye and open your right.
Click
Keep switching between your left and right eyes
Click
and you will see each views the cup at a slightly different angle. This means that a slightly different image is being projected on to your right and left retinas.
You can try this yourself by holding your finger out in front of your face…

Slide 5: No Title (Image of Pointer Finger – Binocular Disparity Title Appears as Animation)

As you open and close each eye
Click
you'll notice that not only does the view of your finger change, but so does the background – it also appears to shift.
Now, if you move your finger further away from your eyes
Click
and alternate between your left and your right eye open
Click
– what you should notice is that your finger, relative to the background, seems to shift LESS.
Your brain integrates the images from each eye, compares the relative differences between the two, and is able to interpret how far the item you're viewing is from your face. The more of a shift, the closer the object, the less of a shift, the further away the object must be.

This phenomenon, known as BINOCULAR DISPARITY,
Click
is what movie producers use to trick your brain into perceiving 3 dimensions when you are watching 3D movies. The glasses you wear allow your eyes to perceive two slightly different images which your brain integrates into one 3-dimensional image.
In addition to binocular disparity, your brain is also able to use the information from the muscles that allow your eyes to move around in their sockets... Put your finger in front of you at about arm's length. Now stare at your finger while moving it closer to your face...
Click

Slide 6: No Title (Image of Eyes)

As you move your finger towards your face, your eyes turn inward towards your nose to follow the path of your finger
Click
If you move your finger away again, your eyes turn away from your nose
Click
When your eyes move inward, this is known as CONVERGENCE.
Click
As your eyes converge, the muscles controlling the movement, contract. Your brain interprets this contraction and uses it to perceive distance.

Slide 7: Summary

So, to summarize, there are two binocular processes that contribute to depth perception.

Click

The first is, Binocular disparity, which is the comparison of the differences between left and right retinal images. Binocular disparity

Click

is useful for judging depth in the distance, beyond about 3m.

The second process that contributes to depth perception is, Convergence,

Click

which is the feedback from contraction of the eye muscles,

Click

this is best for judging the distances of objects within about 3m of the face.

Slide 8: Binocular Depth Perception

Binocular depth perception comes in two flavours, but what they have in common is that these two methods require the use of both eyes. Our ability to judge visual depth is critical for us to gauge the distances between objects, and thus, to maneuver with ease through our 3 dimensional worlds.

To return to video, click here

Tricky Topic: Auditory Transduction

Slide 1: Auditory Transduction

Hearing plays a vital role in how we interact with and navigate through our environments. Yet, how is it that we are able to detect and then transduce mechanical sound waves into electrochemical neural signals? As we'll soon see, it is the remarkable organization and complexity of the ear, which enables auditory transduction.

Slide 2: The Ear

The ear serves as the sensing and transducing organ of hearing. Let's begin by looking at the general organization of the ear. The ear consists of three anatomically and functionally distinct divisions:

Click

the outer ear; the middle ear; and the inner ear.

Click

The outer ear

Click

is on the outside of our heads. It's the part of ear we can see. There are two main parts of the outer ear. The first part, the

Pinna

Click

funnels sound waves

Click

into the second part, the auditory canal

Click

which then further funnels sound waves
Click
to the tympanic membrane (also known as the eardrum).
Click
The tympanic membrane is the division point between the outer and middle ear. When sound waves contact the tympanic membrane it vibrates at a rate proportional to the properties of those sound waves.
The middle ear
Click
is located on the other side of the tympanic membrane. It is an air-filled chamber consisting of three distinct bones (also called ossicles)
Click
which are connected to each other in series: The malleus (also known as the hammer)
Click
the incus (also known as the anvil)
Click
and the stapes (also known as the stirrup).
Click
This chain of ossicles links the tympanic membrane and the oval window.
Click
When sound waves hit the tympanic membrane, they are then amplified by the middle ear on their way to the oval window,
Click

thus, the middle ear serves as a signal amplifier.
Lastly, the oval window is the passage into the inner ear.
Click
The major structure we'll focus on in the inner ear is the cochlea.
Click
The cochlea consists of spiralling fluid-filled tubes and can be recognized by its characteristic snail-shell appearance. It is here where the transduction of sound waves into neural signals takes place. Specifically, this involves the conversion of mechanical stimuli into electrochemical signals, which then signal further to the brain via the auditory nerve.
Click
To understand transduction, we must focus deeper into the structure of the cochlea.

Slide 3: Cochlea

If we take a closer look at the cochlea, we see that just past the oval window, there are fluid filled membranous tubes that wrap around one another in a spiral. If we take a cross-section of a tube in that spiral
Click
we will be able to look inside
Click
Lets further focus in on the middle canal, also known as the cochlear duct
Click
which runs the length of the coiled-up cochlea. If we zoom in

even further

Click

we can see first, the basilar membrane

Click

which lines the bottom of the cochlear duct. Next, you may notice there is a group of cells embedded within the basilar membrane. The major cell type we'll focus on here, the Hair cells

Click

which are sensory receptor cells. These are specialized cells that are able to respond to outside stimuli and synapse with sensory neurons. Hair Cells don't look like "typical" neurons. However, changes in their membrane permeability, just as in neurons, leads to the release of neurotransmitters and graded potentials in the post-synaptic sensory neurons they synapse onto. The mechano-sensing ability of hair cells comes from the small protrusions on their top surfaces, called cilia

Click

These hair-like cilia structures are then directly attached to the tectorial membrane

Click

which is located in the middle of cochlear duct. Taken together, the basilar membrane, the embedded hair cells and their cilia, and the tectorial membrane enable auditory transduction.

Click

When sound waves reach the inner ear, they initiate vibrations

of the oval window, which then produces waves that travel through the fluid filled cochlear duct. You can image ocean waves closing in on shore or a wave pool where the wave generating engine is the oval window. As the wave is passing through the cochlear canal it initiates movements in the basilar membrane. The Basilar membrane is fairly flexible

Click

so it is able to move in response to wave propagation. On the other hand, the tectorial membrane is stiff

Click

and therefore is not able to move in response to wave propagation. Thus, in the presence of sound waves

Click

the basilar membrane moves up and down under the stationary tectorial membrane. Remember, the basilar and tectorial membranes are connected by the hair cell cilia, thus, as the basilar membrane moves up and down it causes bending of the hair cell cilia

Click

When the cilia bend, mechanosensitive channels open inducing electrochemical signals in the hair cells

Click

allowing for neurotransmitter release onto auditory sensory cells, which then signal via the auditory nerve

Click

to the brain.

Slide 4: Auditory Transduction

Taken together, the outer, middle and inner compartments of the ear allow for the amplification and transduction of the sound waves that travel through our auditory worlds into usable neural signals, which eventually travel to our brains to be perceived and interpreted.

To return to video, click here

Tricky Topic: Auditory Discrimination

Slide 1: Auditory Discrimination

Beyond detecting sound, how it is that we can detect different types of sound? How are we able to distinguish between the vast collection of sound waves we encounter throughout our lives?

Slide 2: Different Sounds?

What allows us to distinguish between a pop song on the radio, and say, our smoke detector alarm? At least in part, the answer lies in the cochlea. But before getting into how the cochlea achieves the discrimination of different sounds, lets briefly review the properties of sound waves.

Slide 3: Properties of Sound

For now, we'll focus on two of the major properties of sound: Frequency and Amplitude. Frequency, measured in Hz,
Click
refers to the number of wave cycles per second. For example,

here we can see a low frequency wave
Click
and a high frequency wave.
Click
The frequency of the sound wave determines its pitch
Click
or tone. So, a low frequency sound wave would be a low pitch. Think about the beating of large drum.
Click
In contrast, this high frequency wave would be a high pitch. Think about a referee blowing a whistle.
Click
The second property we'll look at is Amplitude
Click
which is a measurement of the intensity or the volume of a sound wave. The amplitude is a measure of the height of the wave. Two sounds of the same pitch can have different amplitudes. For example, this wave
Click
has a small amplitude and would be a soft sound.
Click
While this wave has a large amplitude
Click
and would be a loud sound
Click
So, now that we know sound waves come in different forms,

how does the cochlea distinguish between different types of sound waves?

Slide 4: Coding Pitch

Let's first focus on how the cochlea identifies pitch. Several theories have been proposed for pitch perception. Here, we'll focus in on the two main theories of pitch perception: the temporal theory and the place theory. First, the temporal theory

Click

states that Hair cells bend at a rate proportionate to the sound wave frequency

Click

and thus auditory neurons will fire action potentials phase locked with the frequency of the sound wave.

Click

However, there is a physiological limit to how quickly action potentials can be generated due to the absolute refractory period. This limit is approximately 1000 HZ. This presents a problem, as Humans can hear from 20 – 20000 HZ.

Click

Thus, phase locking only enables for a small range of frequencies that humans can hear.

Click

So, what mechanisms enables the sensing of wavelengths with frequencies greater than 1000 Hz?

Click

This is where the second theory comes in; place theory.

Click

Sound waves entering the cochlea will reach a peak in basilar membrane movement at different distances from the oval window. This distance is dependent on the frequency of the sound wave.

This is because the properties of basilar membrane vary along its length

Click

Closer to the oval window

Click

the basilar membrane is much more narrow and stiff

Click

while further away from the oval window, near the centre of the cochlear spiral, the basilar membrane is wider and more flexible

Click

These different properties of the basilar membrane determine how different locations of the basilar membrane react to different sound wave frequencies.

High frequency sound waves peak near the oval window.

Click

Low frequency sound waves will peak furthest away from oval window at the centre of the cochlea spiral.

Click

And medium frequency sound waves peak closer to the middle of cochlea.

Click

Thus, the cochlea can discriminate between different sound wave frequencies depending on where they induce peak movement in the basilar membrane.
Now that we've looked at pitch, what about amplitude?

Slide 5: Amplitude

Sound wave amplitude is coded by the extent of movement of the basilar membrane. The larger the amplitude of the sound wave
Click
the larger the displacement of the basilar membrane, and therefore, the more the hair cell cilia will bend
Click
With greater bending of the cilia, more mechanosensitive receptors will be activated, thus initiating larger electric signals, more neurotransmitter release, and more Action potentials in the auditory nerve
Click
traveling to the brain.

Slide 6: Auditory Discrimination

Not only is the cochlea able to sense sound waves, but it is able to distinguish between specific properties of sound, such as pitch and amplitude. This information then travels along the auditory nerve to the brain where it can be further processed and perceived.

To return to video, click here

Tricky Topic: Measuring Consciousness

Slide 1: Measuring Consciousness

This topic is tricky for a number of reasons. First, it's not easy to define consciousness, which makes it difficult to measure. Second, if we do take the plunge and define a concept as abstract as consciousness, we place boundaries around what is included and excluded. The public looks to science to settle issues about consciousness in order to address ethical questions such as determining the end of life. Critical evaluation of the evidence used to make these important distinctions requires information about the strengths and limitations of the methods used by psychologists, neuroscientists use to study consciousness. For this tricky topic I'd like you to take a moment to consider the broader implications of measuring consciousness.

Slide 2: Why Does This Matter?

Let's consider some famous cases. In 1995, Jean-Dominique Bauby, was almost completely paralyzed after a stroke. However, he had complete awareness of his surroundings and is shown here communicating by blinking his left eye. It was by this tedious method that he was able to write a book about his experiences, The Diving Bell & the Butterfly. Bauby died days after the publication of his book in 1997.

Click

Another famous medical case of abnormal consciousness was

highlighted by the life and death of American Terri Schiavo. Schiavo lived the last 15 years of her life in a persistent vegetative state, and her subsequent death in 2005 by removal of her feeding tube divided not just her family but also the opinions of a nation. Former Israeli prime minister Ariel Sharon

Click

was in a permanent vegetative state for 8 years following a stroke and died following health complications from kidney failure in January of 2014. Although he was most certainly alive, his non-responsiveness led the Israeli Cabinet to declare him permanently incapacitated and unable to rule. Defining consciousness is not just a scientific question, but also a legal and moral one since it is considered to be a key component to a full life.

Slide 3: Defining Consciousness

A perfect definition of consciousness does not exist, but for the purposes of this lesson we will use a working definition. Most theorists would agree that consciousness involves awareness of one's surroundings as well as the contents of one's mind. This type of awareness is key for a lot of the things our brains allow us to do, such as to feel, see, hear, and remember, but is also the cornerstone of the uniquely private experience of just being who we are. How do psychologists and neuroscientists objectively measure such a subjective state. Typically it involves assessing how awake and aware an individual is.

Slide 4: Two Dimensions of Consciousness

Psychologists and neuroscientists focus on two dimensions of consciousness in attempting to identify conscious states. Wakefulness represented along the bottom of this figure

Click

refers to degree of alertness, and distinguishes waking from sleeping.

Click

Awareness refers to the degree to which we monitor our outer and inner environments.

According to this view of consciousness, each dimension ranges from low to high and all states of consciousness exist somewhere within this two dimensional space. So for instance, coma represented in the bottom left of this graph here

Click

is characterized by low wakefulness and low awareness whereas conscious wakefulness in the top right

Click

is characterized by high wakefulness and high awareness. Lucid dreaming,

Click

happens when someone is having a dream and are fully aware, so this unusual state is characterized by low wakefulness (since the dreamer is sleeping) but high awareness. Although this model is not perfect, as we'll see shortly, it does help to point out some important components of consciousness. Let's take the low end of both dimensions of this 2 dimensional view.

Slide 5: Measuring Minimal Consciousness

Coma patients have very low awareness and wakefulness, but there are a range of mental states that could be considered comatose. The Glasgow Coma Scale developed by two neurology professors at the University of Glasgow's Institute of Neurological Sciences, is the most widely tool to measure consciousness in medicine. It uses three particular behaviours, eye opening, verbal response, and motor responses. This scale classifies patients as mild (score ≥ 13), moderate (8-12), or severe (< 8). Someone with a score of 3 would basically have no observable activity at all. In a vegetative state, one form of minimal consciousness, an individual is clearly awake, but does not appear to have much awareness, which appeared to have been the case with Terri Schaivo. On the other hand are individuals with locked-in syndrome, like Jean-Dominique Bauby who, though fully conscious, had very little control over his own voluntary movements. These cases of paralysis with intact cognition pose a significant challenge in medicine because it is difficult to determine the level of consciousness using the Glasgow Coma Scale.

Slide 6: Imaging the Conscious Brain

Conditions such as locked in syndrome have prompted efforts to find new ways to assess the level of conscious in patients with traumatic head injuries. Some recent findings using neuroimaging techniques have shown promise. In 2006 researchers at the University of Cambridge found evidence of consciousness in a patient in a vegetative state. Using

functional MRI,
Click
researchers found that her auditory areas in her temporal lobe
Click
were active when listening to speech.
Click
Furthermore, when asked to imagine certain actions, such as playing tennis or walking around her home, she showed the same brain activation as a control patient without head injury. The fact that she could respond with her own brain activity in an intentional, purposeful way allowed her to communicate despite her inability to make motor responses. Other neuroimaging techniques are based on EEG, which is measured from electrodes placed on the head.
Click
This technique has revealed that some patients undergo predictable changes in brain activity
Click
seen over a typical night's sleep. Event-related potentials,
Click
or ERPS, are particular patterns of EEG waves that signify brain reactions to particular stimuli or events. ERPs have been used to evaluate complex functions such as attention, memory, and language which makes this well-suited to assessing aspects of consciousness. The Halifax Consciousness Scanner is an EEG-based system developed by mindful scientific that uses a customized headset to record brain responses. What all of

these imaging techniques have in common is that they measure brain responses, rather than behaviours, and therefore can be used in patients with little to no motor control.

So far we have considered consciousness as having high and low levels, and that we can move up and down these levels.

Slide 7: Measuring Full Consciousness

What about when we are fully awake or aware? Are we "maxed out" during full consciousness? One view is that consciousness shifts to events or tasks that are most relevant. In other words, our conscious processes latch onto what happens to be meaningful to us at a particular moment. In other words, rather than asking how much consciousness someone is displaying, this perspective focuses on where conscious efforts are being spent. A lot of what we do in our everyday lives requires our conscious effort and attention, such as reading a chapter in a textbook. However, an awful lot of what we do happens beneath our level of awareness. Take the act of reading itself. Once learned as a child, our consciousness about the process of reading is no longer required so it happens automatically. In fact, once learned, it is difficult NOT to do (just try looking at the words on the screen WITHOUT reading them). The involvement of consciousness in our everyday lives is illustrated by an experiment by researchers at the UWO using the Ebbinghaus Illusion, shown here.

Click

Although the central circle on the left

Click

is the same size as the one on the right
Click
the one on the left appears larger. Our conscious visual perception produces the illusion of two differently sized objects. An interesting disconnect happened when the researchers asked participants to grasp the central circle. When grasping either central circle, participants held their fingers the SAME distance apart, indicating that motor responses are not fooled by the conscious visual illusion.
Click
Another example of the divided nature of consciousness comes from studies of attention. Selective attention is the ability to focus awareness on specific features in the environment while ignoring others. Ignoring unnecessary or irrelevant information is important, but it means that we often miss things. In this picture,
Click
participants had a difficult time noticing the person dressed in the gorilla suit if they were asked to keep track of people wearing white t-shirts. Selective attention can result in inattentional blindness or change blindness, whereby we miss things because we are selectively attending to something else.

Slide 8: Can We Measure Full Consciousness?

So can we measure full consciousness? Because full consciousness is not packaged neatly into levels, it may seem impossible.
Click

However, we can become aware of conditions when our consciousness shifts. For instance, imagine that you are at a crowded party

Click

having a conversation with a couple of friends. The background noise is largely ignored because you direct your attention to the conversation. However, if someone in the crowd says your name, your attention shifts to the background noise that you had previously blocked out. This ability to filter out sounds and then refocus attention when you hear your name is called the cocktail party effect. Tuning out information is not always a good thing,

Click

particularly when driving. Most Canadian provinces have banned the use of hand-held devices while driving, however the practice of talking and texting while driving is still widespread. Research has shown that talking on a phone while driving produces gaps in attention and perception, even while using a hands-free phone.

So although it might be difficult to directly measure full consciousness in the way that we measure coma states, we can certainly examine conditions under which full consciousness is interrupted.

Slide 9: Measuring Consciousness

Measuring consciousness is not straightforward, but understanding what we CAN measure helps us appreciate what types of questions we can ask.

To be updated to reflect new video at a later date

To return to video, click here

Tricky Topic: Rhythmic Nature of Sleep

Slide 1: The Rhythmic Nature of Sleep

As I'm sure you've noticed, your level of consciousness varies through daily waves of sleep and wakefulness. This rhythm is so predictable that we humans plan all of our activities to fit into this cycle. Although people differ in their sleep habits, since some people are early risers and others are night owls, everyone's sleep and activity patterns fit into the context the daily cycle of day and night.

Slide 2: Circadian Rhythms

In fact, all sorts of biological and psychological processes follow this daily, or circadian, rhythm,
Click
from the Latin for circa, meaning about or approximately and dian, meaning day. This figure,
Click
shows the typical, daily temperature rhythm for a human. The darker shaded blue region indicates night,
Click
when daily temperature starts to dip. With the return of the sun the next morning,
Click

body temperature starts to rise again, and the cycle repeats itself every day. Many hormones also follow daily patterns of rise and fall, this here

Click

shows the daily rhythm of melatonin, a hormone that promotes sleep. Its pattern is opposite to that of daily temperature; it rises just around the time we go to sleep and drops to very low levels during the day. Not surprisingly,

Click

self-reports of alertness also vary throughout the day, with highest alertness during the daytime and lowest levels in the middle of the night.

Although these rhythms appear to follow the external light-dark cycle, they are not slaves to the schedule of the sun. In fact, these rhythms are generated internally by a small collection of neurons in the brain.

Slide 3: Free-running Rhythms

When people live under conditions without the regular appearance of dawn and dusk, their temperature, hormone, activity, and sleep rhythms follow a pattern that is close to, but not exactly, 24 hours. These are called free-running rhythms and are ENDOGENOUS,

Click

meaning that they're internally generated by specialized areas of the brain. They've been extensively studied in hamsters

Click

living in constant dim light. Hamsters love to run on their

wheels when they first wake up, and because they are so dedicated, the beginning of their day's running is an excellent way to track these free-running rhythms. But how can we test free-running rhythms in humans? Most people wouldn't want to live in an environment without time cues, but several people volunteered to live for a period of months in underground bunkers

Click

as part of a research study. They woke up a little later every day and eventually their rhythms were disconnected from the day and night cycle. Results from this and similar studies reveal an endogenous rhythm of a close to 25 hours in humans. Free-running rhythms have also been documented in natural conditions of constant light or dark, such as in the Arctic, and in certain types of blindness.

Click

The reason that we don't free run is because our rhythms are reset each day by light, ensuring that our internally generated rhythms are synchronized to our environment. Shortening or lengthening our days by traveling across time zones

Click

or working shifts throws off this synchronization, and it takes time for the body to readjust to the new daily cycle.

Slide 4: Ultradian Rhythms

The last type of biological rhythm we'll consider are ultradian rhythms, that repeat on a cycle less than 24 hours. One example of an ultradian rhythm is the sleep cycle,

Click

when the brain and body undergo a pattern of changes about every 90 minutes. Some of this activity can be observed by simply watching someone sleep. Rapid eye movement, or REM, where the eyes move around underneath the eyelids

Click

occurs in bursts throughout a night's sleep. The amount of REM changes throughout the night

Click

but the frequency is fairly consistent, kicking in every 90 minutes. Other changes that occur during sleep, like dreams

Click

are not easy observed by watching from the outside, but we've all experienced weird and wonderful adventures inside our own heads when we sleep. Studies show that people are more likely to report dreams if they are woken up during an episode of REM than non-rapid eye movement sleep

Click

so REM sleep has a special relationship with dreaming

Click

Non-REM sleep

Click

is divided into four separate stages based upon the depth of sleep

Click

Sleep depth can be measured by determining how hard it is to wake someone up. Researchers do this by using the acoustic

arousal threshold, which is a fancy term for the amount of sound required to for awakening (EXAMPLE: *whisper* "Hey Michael, wake up." compared to *SHOUT* "HEY MICHEAL, WAKE UP!"). Stage 4 is the deepest level of sleep because it has the highest acoustic arousal thresholds.

Click

REM sleep usually follows Stage 4 sleep, but in many ways, it's more similar to waking. This is most obvious by comparing patterns of brain activity during the different stages.

Slide 5: EEG Rhythms During Sleep

For many years, it was assumed that the brain was fairly inactive during sleep. Since a major feature of sleep is a dramatic reduction in movement, early psychologists had few tools to study sleep. With EEG technology,

Click

scientists have learned that brain undergoes predictable changes with shifts in wakefulness and awareness.

Click

This shows brain activity for someone who went from a state of relaxed drowsiness, represented by the higher frequency alpha waves to the left of the arrow, to a light sleep, shown by the appearance of theta waves to the right of the arrow. Interestingly, alpha waves occur during REM sleep, but not during non-REM sleep stages. As levels of wakefulness change during non-REM, so do these brainwaves

Click

and has allowed sleep to be roughly divided into these four

stages of non-REM sleep. Stage 2 EEG somewhat resembles stage 1 whereas stages 3 and 4 show a lot of delta waves, large slow waves like these here.

Click

Since these stages of sleep have a large amount of these slow delta waves, they are often called slow wave sleep. Slow wave sleep is the deepest level of sleep, since that's when we're least responsive to the outside world.

Slide 6: Sleep Over the Lifespan

As this graph shows, infants and young children, shown on the left,

Click

sleep more than older children and adults. Not only is the amount of sleep greater, but they also spend significantly more time in REM sleep. During adolescence and adulthood, the amount of sleep that involves REM steadily decreases. The high degree REM during the beginning of life has led some to suggest that REM sleep might be important for supporting brain growth and development.

Slide 7: The Rhythmic Nature of Sleep

So hopefully you can appreciate the complicated nature of this strange activity that we engage in every single night.

To return to video, click here

Tricky Topic: Hypnosis

Slide 1: Hypnosis

Hypnosis is one of the most fascinating topics in the study of consciousness, and at times the most controversial. This tricky topic will outline different theories and research on this mysterious state of mind.

Slide 2: Hypnosis Defined

Hypnosis is tricky to define, since not everybody agrees on its characteristics. However, most would agree that it's a state of consciousness with extreme self focus and

Click

minimal attention to external stimuli.

Click

Under some circumstances hypnosis increases suggestibility,

Click

and (sometimes) suspension of critical thinking.

Click

Usually some sort of method is used to induce a hypnotic state,

Click

which typically involves fixating the eyes on a single object or area and having the person relax. It's important to make a distinction between different types of hypnosis.

Slide 3: Stage Hypnosis

Stage hypnosis is the entertainment side of this business, but is this real hypnosis? Is the volunteer showing focused attention,

suggestibility, lack of voluntary control, and suspension of critical thinking? If so, is this a special state of consciousness induced by the hypnotist, or is the apparently hypnotized person just playing along so as not to disappoint the large audience expecting to see a good show? Keep in mind that the subjects of the stage hypnotist are audience volunteers,
Click
who might be more obedient and compliant compared the majority of people who are sitting in their seats. What they see
Click
is the hypnotist inducing a trance-like state, and the volunteers obey any command. As a quick search of YouTube will show you, stage hypnotists command volunteers to engage in all sorts of silly acts such as dancing with an imaginary partner or barking like a dog. This ability to control others would make hypnotists incredibly powerful in the real world, sort of like a superhero wizard,
Click
so it seems unlikely that anyone is really that powerful.

Slide 4: Hypnotherapy

Stage hypnosis should not be confused with hypnotherapy, which uses hypnosis to achieve therapeutic changes in thoughts, feelings, and behaviour. This emerged prominently in medicine during Victorian times, when it was used to treat a variety of disorders,
Click
in fact, Freud used it to tap into the unconscious mind.

Click

Modern applications of hypnosis include treating pain during childbirth, dental procedures,

Click

and surgery.

Click

Furthermore, there has been some promise in the use of hypnosis for quitting smoking

Click

and reducing nausea associated with many cancer therapies as well as anxiety.

Slide 5: How? Two Perspectives

There are two broad perspectives on hypnosis.

Click

One explanation, suggested by Ernest Hilgard, is that hypnosis is a special state where there's a dissociation of the conscious mind from events happening during hypnosis. Hilgard described this as the hidden observer effect

Click

after he demonstrated that one aspect of a person's mind can remain aware of stimulation from the outside (such as the hypnotist's voice), while other parts of the mind are cut off from external input. To demonstrate this, Hilgard hypnotized a man and told him he was deaf. While in the hypnotic state, the man did not respond to sudden, loud noises nearby, which most of us do instinctively. Next, Hilgard told the man to raise a finger if he could hear him and the man immediately obeyed.

An alternative view,
Click
supported by Martin Orne and Nicholas Spanos, is that hypnotized people behave as they are expected, according to the social context and expectations, so they essentially play a role under hypnosis. Martin Orne's research revealed that most participants in psychological experiments are incredibly obedient, and would do tedious tasks (such as completing endless pages of math problems and then ripping them up) or even downright dangerous ones (such as picking up a snake they believe is poisonous). So this perspective suggests that obedience under hypnosis is not a special phenomenon, and does not require a special state. Needless to say, both sides of this debate argue with each other.
What they can both agree on, however, is that hypnosis has powerful effects on thought, emotion, and behaviour. So you might wonder, what's happening in the hypnotized brain?
One common approach to studying the brain during different states of consciousness is to use neuroimaging, such as fMRI.

Slide 6: Neuroscience of Hypnosis

In one experiment, researchers used a Stroop task to examine how the brain responds to hypnotic suggestion.
Click
The Stroop looks at the delay in reaction time with conflicting information, by measuring the difference in how long it takes to name the colour of text when the meaning of the word matches, compared to when it doesn't match. It sounds

confusing but is easily illustrated with an example. As fast as you can, name the colour of the text for these three words, ready?

Click

Now name the colour of the text for these three words, ready?

Click

The 2nd set of words is more difficult because we automatically read the word instead of focusing on the colour of the print, so it usually takes people longer. Before the task, the researchers hypnotized people

Click

and introduced a post-hypnotic suggestion: when they hear a certain voice, the words in the Stroop task are gibberish

Click

and completely incomprehensible, and on other trials they'll see actual words. In fact, none of the words were gibberish but they found that easily hypnotizable participants

Click

did not show a Stroop effect when they thought they were viewing gibberish words, while the less hypnotizable participants still showed the slowing of reaction time for the difficult condition.

Click

Hypnotizable people showed faster colour naming

Click

even when the words and colour were mismatched. Furthermore, they showed LESS activity

Click
in the areas of the brain that deal with conflicting information. Since the Stroop task is performance-based, it's hard to fake it, which argues against the role playing hypothesis. The fact that brain imaging showed reduced activity in certain areas suggests that the hypnotizable people are actually dissociating two brain processes, providing some support for the special state hypothesis.

Slide 7: Pain in the Brain

Another study, by Derbyshire and colleagues at the University of Birmingham, looked at the effect of hypnosis on pain perception, which is known to be strongly influenced by psychological factors.
Click
They recruited highly hypnotizable people and had them rate pain on the hand
Click
in one of three conditions:
Click
real physical pain by touching the hand with a hot metal probe,
Click
imagined pain,
Click
and pain induced by hypnosis. Mind you, it was not induced by a wizard, but one of the researchers.
Click
They measured two responses: self-rating of pain and brain

activity. What they found was that the self-reported pain ratings
Click
were highest for real physical pain
Click
followed by hypnotic pain while those who imagined pain did not report any REAL pain at all.
Click
Also, the pattern of brain activity was almost identical for real and hypnotic pain, compared to imagined pain.

Slide 8: Summary

So what can we take from this? In summary,
Click
it's clear that hypnosis has powerful effects.
Click
There is some evidence for the special state hypothesis, both in studies of cognition with the Stroop task as well as pain perception.
Click
Brain imaging shows that the brains of hypnotizable people sometimes respond differently (in terms of the Stroop task) or similarly (in terms of pain) compared to controls, so the effect of hypnosis is far from straightforward.
Click
One final word of caution: these studies described all used participants who were easily hypnotised, and therefore these findings might not apply to everybody.

Slide 9: Hypnosis

Although there no clear consensus on how hypnosis works, for some people at least, it can influence thought and behaviour in potentially therapeutic ways.

To return to video, click here

Tricky Topic: Atkinson-Shiffrin Model of Memory

Slide 1: Memory: Atkinson-Shiffrin Model

How are memories formed, rehearsed, and retrieved? How do the aspects of memory interact with and complement one another? One model that has been proposed to answer these questions is the Atkinson-Shiffrin Model.

Slide 2: Atkinson-Shiffrin Model

Think about going for a nature walk. During that walk you are constantly receiving a stream of sensory input into your sensory memory.

Click

The Atkinson-Shiffrin Model for memory starts with all the sensory information from your environment being received and coming into your sensory memory.

Click

In order to retain information in your sensory memory, you need to pay attention to it. Thus, information is filtered and select from our sensory memory to our Short-Term Memory

by our attention.

Click

Not to confuse yourself, Short-term memory is often interchangeably referred to as working memory. Information within your Sensory memory that you do not pay attention to is lost.

Click

Let's come back to our nature walk. You would not remember every moment of the walk and all aspects of the trail you saw and heard. This is because the majority of the sensory input into your sensory memory is lost because you don't pay attention to it. However, the specific sensory inputs you do pay attention to will be passed into your Short-term Memory. For example, let's say you love flowers and you notice a beautiful yellow wildflower as you start your walk,

Click

this will then get passed into your short-term memory.

Once in your short term memory, information is further filtered and selected for depending on how much you rehearse, and thus, maintain that memory.

Click

Information at this point that is not rehearsed, will also be lost.

Click

Think again back to the nature walk. Imagine around your next turn you see an even more beautiful purple flower.

Click

Now, as you continue on your walk you are thinking of the

more beautiful Purple flower and no longer about the yellow flower. Thus, you are rehearsing and maintaining the memory of the purple flower, while the memory of the yellow flower may be lost due to a lack or rehearsal.

Click

Finally, if information in your short-term working memory is ENCODED, then it can be stored in your long term memory.

Click

Once this information is stored, it may be retrieved and brought back into your short-term memory at a later time point.

Click

Again, back to your nature walk example, you likely will not continuously think about the purple flower for the rest of the day

Click

– it may leave your short-term memory – but later than evening if someone asked about your walk, you might easily retrieve the memory of the purple flower from your long-term memory.

Click

However, if you were asked about that walk in 10 years, it's possible that you wouldn't recall anything about the purple flower,

Click

or potentially even the walk! This is because some information is lost over time from your long-term memory.

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If we take a bit of a closer look at each of the three memory stages, we can see that each stage has a unique information capacity and retention duration.

First, sensory memory

Click

has a large capacity and a very short duration (usually seconds or less).

Click

Think about all stimuli coming in from the environment at any given time.

Second, short-term memory

Click

has both a small capacity as well as a relatively short duration.

Click

Remember, this is the memory stage that allows you to think about present sensory information and work on problems in the immediate moment. Working memory may last about 18-20 seconds.

Finally, Long-term memory

Click

has both a huge capacity and a very long duration.

Click

In fact, there are no known limits to long term memory and certain memories may last for the entirety of a person's lifetime.

Slide 3: Memory: Atkinson-Shiffrin Model

The Atkinson-Shiffrin Model presents a way to interpret how our memories are formed, worked on, and later retrieved. While it is important to understand that this model is a working hypothesis, it provides a strong rubric for how we might interpret and better understand memory.

To return to video, click here

Tricky Topic: Baddeley's Model of Working Memory

Slide 1: Memory: Baddeley Model

Let's consider working memory, which is often interchangeably referred to as short-term memory. This is the memory that actively works on information, where we think about and process things; it is a very active place.

Slide 2: Baddely Working Memory Model

Dr. Alan Baddeley, a memory researcher, proposed a way to think about how working memory functions. There are 4 key components to his model: the Phonological Loop, the Visuospatial sketch pad, the episodic buffer, and the central executive.

The first component we'll focus on

Click

is the Phonological loop

Click

This is the auditory part of your working memory. It is what

is being used when you're saying things to yourself or listening to what someone else said over and over in your mind.

The next part is the visuo-spatial sketchpad

Click

This is the component of working memory that enables you to picture things in your mind and work on them. This is also how you are able to have mental maps of things – picture in your head the streets and locations of things.

The third component is the episodic buffer.

Click

This is the area of your working memory where you are temporarily storing information you've brought up from your long-term memory.

Click

Finally, there is the central executive

Click

– this is the part that is in control of everything. It decides how much attention to pay to each of the parts of working memory, brings info from long-term memory and puts things together.

Keep in mind that this is just a concept of how working memory works. There are no specific brain structures that are designated for these processes, although, the central executive is considered to be something fairly concrete and is thought to be mainly processes in the prefrontal cortex.

Let's take a quick look at how this working memory model might apply to a real example. Let's say you are asked to add 87 plus 36. As you are asked to perform this calculation your

Phonological loop is hearing the numbers and then repeating them in your mind allowing you to remember then. Next, you may use your episodic buffer and visuospatial sketch pad to recall and then picture the addition strategy you learned back in grade school
Click
Finally, your central executive would integrate these three aspects of your working memory to solve the equation, 123

Slide 3: Memory: Baddeley Model
As working memories are in constant use, they require the integration of both new sensory inputs and old long-term memories. The Baddeley Working Memory model offers a hypothesis for how we are able to integrate these two information streams and solve problems moment to moment throughout our daily lives.

To return to video, click here

Tricky Topic: Spatial Memory

Slide 1: Spatial Memory
Remembering the locations of objects and events is critical for many cognitive activities. For instance, personal memories are strongly linked to the spaces where experiences happen. This Tricky Topic well explore the characteristics of spatial memory by looking at some research in both humans and non-human animals

Slide 2: Map-making

Spatial memory requires a symbolic representation of the places we visit, and there is evidence that the brain achieves this by creating maps. Traditionally we think of maps as two-dimensional, represented on a flat surface, of course smaller than the original space being depicted. (CLICK) So how is this information coded in the brain? By using simple, but clever strategies, researchers have discovered the existence of mental maps in laboratory rats.

Slide 3: Mental Maps & Latent Learning

The existence of mental maps in rats was demonstrated by Edward Tolman and colleagues using strategically timed rewards in this complex maze. Food restricted rats will run around this maze, turning around at blind alleys until they find goal box at the end. Maze performance is measured by completion time and number of blind alley visits, with repeated trials rats become faster and make fewer mistakes as shown in this figure on the right. Tolman tested rats daily for three weeks under one of three conditions: (CLICK) one group had food placed in the goal box every day so were rewarded on every trial and the number of errors (represented on the y-axis on the left) declined predictably with training. (CLICK) Another group was given NO food reward, so had no reason to search for the food box, not surprisingly they made many blind alley visits. (CLICK) The most interesting group was allowed to wander the maze for 10 days without reward, (CLICK) then food was introduced from day 11

onward. If they hadn't learned the layout of the maze during those 10 non-food days, their errors should be similar to the rats that never got rewarded at all. However, their performance from day 12 onward was comparable to the rats who were rewarded every day, suggested that they did learn about the space, but had no reason to use this information until food was available, a phenomenon Tolman called "latent learning".

This study was influential because it demonstrated that rats make mental maps of space, so this sparked more research on spatial learning and memory.

Slide 4: Morris Water Maze

The most commonly used measure of spatial memory in laboratory rodents is the Morris Water Maze, developed by neuroscientist Richard Morris (while at the University of St. Andrews in Scotland). It's basically a pool filled with opaque water with a hidden platform and a camera positioned above to record behaviour. Rodents are naturally motivated to escape since they don't like swimming, so they search for a way out and eventually find the hidden platform. After repeated trials they will typically swim straight to the location of the platform, because they've created a map of space like Tolman's rats. A number of measures can be taken to assess spatial learning, such escape time or path length, both of which decrease with better performance.

(CLICK) This study looked at the effect of housing conditions on water maze performance in mice. (CLICK) Half of the mice were group housed in standard laboratory

conditions at the time which included clean , food, and water. (CLICK) The enriched mice were also group housed with food and water but had a larger cage, more cagemates, nesting material, paper and plastic tubes, a running wheel and treats like apple, cheese, crackers and popcorn.

The enriched environment resulted in a shorter swim path than control conditions, an effect that was most pronounced during the first 3 days of training. This study and others using the water maze highlighted the importance of housing conditions on laboratory animal behaviour and has resulted in changes to the way we house animals.

Image source: Kempermann et al, 1997

Slide 5: Hebb Williams Maze

Although the watermaze is useful for looking at spatial memory in non-human animals, it's not feasible for testing spatial memory in humans. The Hebb Williams maze shown here is a standardized set of progressively difficult mazes that can be used in both since there is a virtual version available for humans.

Slide 6: Hebb Williams Maze #11

These traces show the paths taken by undergraduate students over repeated trials on Maze 11, females shown in red in the top panel and males in blue on the bottom; the black dots represent pauses while navigating the maze. (CLICK) Both men and women made many mistakes on the first two trials, but overall women completed the maze less efficiently than men, h more pauses and blind alleys (CLICK) evident here in

trials 3 and 4 wit. (CLICK) However, by the 5th trial these gender differences disappeared.

Slide 7: Species Comparison

This study also tested C57 black 6J mice, a commonly used strain in behavioural studies, and compared performance to the virtual maze used in humans. They combined speed and #errors into a single performance efficiency score, with LOWER values indicating better performance (CLICK). The pattern of spatial learning is remarkably similar between species, including the differences between males and females.

Slide 8: Spatial Memory

The similarity in spatial learning and memory suggests this is a fundamental skill for all species. It also allows non-human animals to be used as models of human spatial memory, which has been invaluable in identifying factors that help and hinder memory. Animal models are also used for studying disorders of memory such as Alzheimer's disease and other types of dementia.

Tricky Topic: Biological Basis of Memory

Slide 1: Biological Basis of Memory

We have many different types of memory, and in turn, many different brain areas that are involved in working together to allow us to interact and remember skills, events, our

environment, and so on.

Let's take a closer look at some of the areas of the brain associated with memory. As we will soon see, memory involves many areas of the brain working together.

Slide 2: Sensory Memory

The cerebral cortex

Click

is believed to be where the majority of sensory information is processed – that is what you are seeing, hearing, where you are, and what that information all means. As sensory information ascending to your brain it first is sent to the thalamus. From there, signals from different sensory modalities are sent to and processed by different areas of the cerebral cortex depending on the sense.

Vision is primarily processed in the occipital lobe

Click

Audition, as might make sense, is processed in the temporal lobe right next to the ears

Click

Touch is processed in the somatosensory cortex which lies in the parietal lobe

Click

Taste is processed in the frontal and temporal lobes

Click

And lastly, smell or olfaction, is processed in the olfactory bulbs, which are actually not apart of the cerebral cortex but lie just above the cribiform plate

Slide 3: Working Memory

It is important to note that different sensory modalities are constantly being processed at the same time in your working memory. As we just learned, all of these different processes are taking place in different parts of the brain. As such, distinct aspects of Working Memory Models can be hypothesized to be occurring in distinct cortices of the brain.

Let's consider the Baddeley Working Memory Model.

Click

When you are picturing images in your mind, you're engaging your visuospatial sketchpad, and you are using your occipital lobe

Click

Repeating things (or talking to yourself in your head), is the act of engaging the phonological loop, which activates parts of the cortex involved with hearing, speech, and language in the Frontal and Temporal lobes

Click

And then finally the central executive, that plans and organizes your thoughts, is localized in your prefrontal cortex

Slide 4: Memory Consolidation

If we move from sensory memory to working memory, and then finally to long-term memory, we must acknowledge the role of the mighty hippocampus, which sits inside the cerebral cortices. The hippocampus can be visualized in this 3D representation

Click

or by taking a sagittal section down the midline of the brain looking at it from a medial view.
Click
The act of consolidating memory, or moving memories from temporary to long-term storage, is carried out by the hippocampus.
Let's look at a simple example of how the hippocampus interacts with the cortex in memory processing.
Let's say visual Information,
Click
processes by the eye, is sent to the thalamus,
Click
then to the corresponding visual cortex in the occipital lobe.
Click
This visual information in the occipital lobe can be sent to the hippocampus for consolidation.
Click
Information can then be sent back from the hippocampus to the cortex for long-term storage.
Click
This is why, when we are experiencing something – for example, seeing someone's face – our visual cortex is activated, but it's also activated when we THINK about a person's face in their absence.

Slide 5: Long-Term Memory

What about long-term memory? First, before exploring the brain structures associated with long term-memory we just

should distinguish between the two general types of memory: Explicit memory and Implicit memory. Let's begin with explicit memory,

Click

which refers to information about events and facts that you are conscious of. As we just saw, explicit memory is processed by the hippocampus and then sent for long-term storage in the cortical area that corresponds to the specific information type. For example, Visual information is sent from the hippocampus after consolidation, to the visual cortex in the occipital lobe.

Click

Auditory information is sent from the hippocampus to the auditory cortex in the temporal lobe,

Click

somatosensory information is sent from the hippocampus to the somatosensory cortex in the parietal lobe,

Click

and so on.

Click

But, what about memories like how to ride a bicycle or tie your shoes or why you could drool every time you hear a bell ring?

Slide 6: Long-Term Memory (*Implicit Memory*)

Implicit memories, those memories for procedural things like playing a musical instrument, habits, and skills tend to be stored in structures below the cortex, known as the subcortex. The striatum,

Click

which is part of the basal ganglia, is responsible for procedural memories like sport skills and physical habits.
Memories for precise movements like playing a musical instrument involve the cerebellum
Click
And finally, the amygdala
Click
is responsible for the associations we have between emotions and events, such as graduation! In fact, our amygdala is what is responsible for our tendency to remember emotional stimuli better than neutral stimuli.

Slide 7: Biological Basis of Memory
As it may now be clear, the formation, consolidation and retrieval of memories requires ongoing and dynamic processes of numerous structures throughout the brain. Hopefully by now you can appreciate the immense brain complexity underlying everything from your most precious to your most mundane memories.

To return to video, click here

Tricky Topic: Classical Conditioning

Slide 1: Classical Conditioning
Classical conditioning, also called Pavlovian conditioning,

after its founder Ivan Pavlov shown here, is the focus of this Tricky Topic.

Slide 2: Operant Conditioning Defined

Classical conditioning is one type of associative learning, where an individual makes a connection between two different stimuli or events. More specifically, classical conditioning occurs when a neutral stimulus becomes associated with a meaningful one, something that triggers an automatic response.

Click

So the types of behaviours involved in classical conditioning are involuntary responses, and psychologists often refer to these as "reflexive" behaviours.

What are some examples of reflexive behaviours? One is pain withdrawal. Say you happen upon this iron

Click

because you have to iron a shirt for a job interview later. Perhaps your roommate left it out for you, how considerate! You reach to grab it and discover it's REALLY HOT, so you pull your hand away. That's a reflexive behaviour in response to pain. The next time just the sight of an iron might automatically trigger an avoidance reaction because of your past experience.

Emotional responses are considered to be mainly involuntary, which is one of the reasons that emotions are often so difficult to control. For instance, if you hear a sudden loud noise,

Click

it will probably trigger an automatic startle response
Click
because it provokes fear. As you will learn in this tricky topic, sometimes it's advantageous to know when something important is going to happen, so classical conditioning is all about attaching meaning,
Click
so that you can predict when things are going to happen, rather than passively responding to events in the environment.

Slide 3: Ivan Pavlov

You can't get far in learning about classical conditioning without learning about Ivan Pavlov. He was a Russian physiologist who was awarded the Nobel Prize in Physiology or Medicine 1904, not for his work on associative learning, but for his research on saliva and digestion.
Click
He measured salivation in dogs when given different types of food, like meat powder. He noticed that, over time, the dogs would start drooling before they were given the meat powder, when the technician made noise assembling the equipment to measure their saliva.
Click
He hypothesized that the dogs made an association between the noise of preparing the equipment and the food that always followed. Rather than see this as a nuisance to his digestion research,
Click

he decided to investigate further and ask whether the dogs could learn to salivate to other sounds.

Slide 4: Pavlov's Experiment: Before Conditioning

So this is what he did to test his hypothesis. Before conditioning, he found that the dogs would drool in response to meat, of course, because dogs find meat delicious. This is referred to as the unconditioned stimulus, called the US

Click

and the dog's response is called the unconditioned response, or UR.

Click

These are both referred to as unconditioned because this response is reflexive, or unlearned. Before conditioning, a neutral stimulus, such as a non-delicious bell,

Click

does not produce salivation.

Click

He did all that in the beginning to make sure that dogs don't respond to bells with drooling (this is an example of careful science.

Slide 5: Pavlov's Experiment: During Conditioning

During conditioning, the neutral stimulus,

Click

is presented just before the US,

Click

and as expected, the dog salivates,

Click
just as it did when the US was presented alone. If this pairing is repeated enough times,
Click

Slide 6: Pavlov's Experiment: After Conditioning

...then the dog now salivates upon hearing the bell, so this has now become a conditioned stimulus, or CS
Click
and the dog's response to this new learned cue is called the conditioned response (CR)

Slide 7: Two Fundamental Rules

Through many, many careful experiments, Pavlov and his research group worked out two fundamental rules of classical conditioning.
Click
First, multiple pairings of the US (or natural stimulus) and the CS (or neutral stimulus) are necessary in order for the CS to take on the association.
Click
Second, the CS and US must be presented close together in time, and works best when the CS occurs just before the US, so it can act as a predictor.
Classical conditioning can change once it is established, in ways that can tell us something about what is going on in the mind of the learner.

Slide 8: Stimulus Generalization

For instance, stimulus generalization occurs when stimuli that are similar to the CS will also trigger the learned behaviour, even though these specific stimuli have NOT been previously paired with the US. It can reveal the types of things an individual finds similar. This is actually really handy in determining the sensory abilities of individuals who cannot speak, such as animals and babies.

Slide 9: Stimulus Discrimination

Stimulus discrimination training tells us what individuals consider different and it's the first step in training animals. Dogs are trained to communicate with us about smells they are able to detect, like drugs and explosives. It's an amazing collaboration. Without any fancy technology, using just treats, patience and knowledge of classical conditioning dogs are able to tell us about dangers that are invisible to us

Slide 10: Classical Conditioning in Action

An organization called Apopo has trained African giant pouched rats to clear huge area of Tanzania of landmines. They've been called HERO rats and this one shown here was specifically detect the smell of explosives. Their sense of smell is as good or even better than dogs, and because they're smaller they're unlikely to set off hidden landmines.

Slide 11: Extinction

Extinction is the disappearance of CR, when CS and US are

no longer paired.
This happens when the CS appears repeatedly on its own,
Click
without the meaningful US,
Click
and the CR eventually stops happening.

Slide 12: Spontaneous Recovery

So the conditioned response doesn't hang around forever when the CS is presented alone. This figure shows the strength of the CR on the y-axis, here,
Click
and what happens during training
Click
and during extinction
Click
when the CS is presented alone. When extinction is complete, it's almost as if the learning never happened at all. However, Pavlov showed that if the CS is presented alone again after a delay the CR will spontaneously recover,
Click
although the size of the response is generally weaker. Therefore it's likely that extinction suppresses learning but does not erase it.
Pavlov's findings sparked all sorts of research on classical conditioning. American psychologist John Watson felt so strongly that he set out to test whether classical conditioning could be used to shape human behaviour.

Slide 13: Classical Conditioning in Real Life

In his now notorious study of Little Albert (1920), Watson and colleague Rosemary Raynor conditioned a baby to fear a tame lab rat by presenting it just before a sudden loud noise. Little Albert learned to fear the rat, as well as other fluffy white objects. This showed that his conditioned fear generalized to other stimuli. Little Albert did not undergo deconditioning so this research sparked a lot of ethical controversy. However, Watson showed that fear can be learned, and many successful treatments for anxiety problems such as phobias,
Click
are based upon unlearning conditioned fear responses.

Slide 14: Classical Conditioning

The knowledge of classical conditioning has revealed how our minds link events in a way to act as predictors

To return to video, click here

Tricky Topic: Conditioned Taste Aversion

Slide 1: Conditioned Taste Aversion

Conditioned taste aversion is the rebel of classical conditioning, since it breaks some well-established rules. Let's start with a real-life example.

Slide 2: Learned Food Aversions

For many people this pizza,
Click
probably triggers thoughts of yumminess but for other people, like Sherry, it provokes strong feelings of nausea.
Click
Why does Sherry feel this way about pizza? Many years ago, she had some pizza for lunch, and later on that day suffered from a nasty stomach bug and ended up spending the next 24 hours in the bathroom. Even though it wasn't the pizza that caused this illness, she now has a life-long aversion to it, she hasn't eaten pizza since. This experience is also common in people who've experienced gastrointestinal illness from food poisoning. This incredibly strong, LEARNED association between illness and food is known as conditioned taste aversion.

Slide 3: Conditioned Taste Aversion

Conditioned taste aversion is a learned avoidance of a particular taste, specifically when nausea occurs after food is eaten. If we compare what happened in Pavlov's original experiments with Sherry's learned aversion to pizza, we can see similarities.
Click
In both situations, there's a stimulus that automatically triggers an involuntary response,
Click
meat makes dogs drool, and stomach bugs make us barf. In Pavlovian terms, these are the unconditioned stimuli

Click
and unconditioned responses.
Click
In both types of learning, there's a stimulus that occurs before the US,
Click
which on their own shouldn't trigger these responses. The PAIRING of these stimuli (the bell and the pizza) with the US results in them taking on new meaning, and they can then trigger the responses on their own.
Click
In Pavlovian terms, these newly learned triggers are called conditioned stimuli,
Click
and these learned reactions are called conditioned responses.
Click
Let's take a moment to review Pavlov's fundamental rules of classical conditioning.

Slide 4: Pavlov's Fundamental Rules

First, multiple pairings of the CS with the US are necessary in order for the CS to take on the association.
Click
Second, the CS and US must be presented close together in time. These rules are based upon a mountain of laboratory research observed in meticulous experiments under tightly controlled lab conditions by Pavlov and others. However, Sherry's conditioned taste aversion to pizza did not appear to

require multiple pairings,
Click
in fact there was only one time when the pizza was paired with illness. Also,
Click
Sherry ate the pizza hours before the nausea set in. So conditioned taste aversion appears not to fit neatly with research on classical Pavlovian conditioning. Of course, Sherry's learning happened in messy real life with a slice of pizza and a tummy bug, so it's useful to look at this phenomenon in a laboratory setting. Conditioned taste aversion is also referred to as the Garcia effect, after John Garcia, whose classic research first investigated this.

Slide 5: John Garcia's Research

Garcia accidentally stumbled upon his now famous research studying the effects of radiation exposure.
Click
He noticed that rats responded to low levels of radiation with reduced feeding as a result of gastrointestinal upset. Therefore he set out to ask two questions:
Click
Can rats be conditioned to avoid a sweet taste (which rats ordinarily love) if it's paired with radiation, which makes them sick? And if so,
Click
how long does this food aversion last?

Slide 6: Garcia's Experiment

So this is what he did to test his hypothesis. There were six groups of rats, exposed to one of three radiation conditions
Click
a no radiation control group, low radiation, and high radiation for a period of 6hr. For the 6hr irradiation period, rats were either given access to regular water,
Click
or water with the artificial sweetener saccharin.
Click
Keep in mind that there are two independent variables, 1) the level of radiation, indicated by the colours, and 2) the fluid they were given while exposed to the radiation, which is indicated on the water bottles. After this 6hr conditioning period, rats were given a choice between two drinking bottles, one with water and another with, you guessed it, saccharin water. The dependent variable was how much of the saccharin water the rats consumed. Like humans, rats like things that taste like sugar, so ordinarily they prefer sweet-tasting saccharin water over plain, unflavoured water. Since radiation produces gastrointestinal upset, Garcia hypothesized that the rats might associate their illness with the sweet taste and avoid it in the future.
And this is what he found.

Slide 7: Saccharin Preference

The main measure was the % of saccharin water the rats drank when given a choice,

Click

shown here on the y-axis on the left. Rats that got water during the conditioning session drank mostly saccharin water afterwards,

Click

close to 100% regardless of whether they were in the control group or the radiation groups. This strong preference for sweet saccharin was also similar in the rats that got saccharin water during training,

Click

but were not irradiated. Since they didn't get sick, they didn't have a US to associate with the sweet taste. The interesting part of this experiment is that rats who received saccharin WITH radiation

Click

avoided drinking saccharin water later. The more irradiation, the more they avoided the sweet-tasting water. Garcia tested saccharin preference later in these same rats and found that there was strong aversion that lasted 30 days

Click

and didn't go back to pre-irradiation levels until 60 days later.

Click

This seems like a tidy experiment, but you might say, HEY, wait a minute! Did the rats given water while irradiated, these ones here,

Click

avoid water? Does their saccharin preference indicate that they

like sweet taste, or is it that they now hate regular water? Garcia thought otherwise, so he did some more experiments about the nature of the relationship between different types of CSs and nausea-inducing and other aversive events. In classical conditioning experiments, animals have a whole host of sights, sounds, smells, and tastes in the environment to choose from, so which ones get chosen for conditioned taste aversion?

Slide 8: Garcia's Next Experiment

In another experiment, Garcia and colleagues exposed the rats to a few different types of conditioned stimuli when they drank: in a pre-test they either got water with the sweet taste of the saccharin or a bottle, when licked, that turned on a bright light and noise. They then presented these with different types of aversive events during conditioning.

Click

Rats were randomly assigned to have all of these stimuli paired with either nausea-inducing x-rays

Click

or painful electric shocks.

Click

After conditioning, there was a post-test

Click

where the rats were given a choice of sweet water OR the tasteless, but bright and noisy stimulus with plain water. This way, they separated the conditioned stimuli to see if they were preferentially associated with particular types of aversive unconditioned stimuli.

Slide 9: Fluid Consumption

The x-ray experiment is shown on the left in blue, and the shock experiment is shown in red on the right. In both cases before conditioning, rats drank roughly equal amounts of the sweet, saccharin water as bright noisy water, showing no strong preference for either. However, AFTER conditioning with the different aversive USs, there was a clear distinction in preference depending upon whether the rat had been conditioned to pain or illness.

Click

The rats in the nausea condition clearly avoided the sweet saccharin water

Click

while those in the pain condition

Click

avoided the tasteless, but bright and noisy water. This shook up the learning world, which firmly supported the idea that conditioned learning is universal, so it shouldn't matter which stimuli is paired with what. Garcia showed that our sense of taste is more easily conditioned to illness, while our sight and hearing are more easily conditioned to fear.

Garcia's findings sparked all sorts of debate on Skinner's and Pavlov's perspectives on learning. They maintained that the processes of associative learning were universal and general, and that any arbitrary stimulus could be used as a CS, but these conditioned taste aversion experiments showed otherwise.

Slide 10: Conditioned Taste Aversion in Real Life

Garcia's findings fit with an evolutionary perspective on taste aversion in that it's important to learn which tastes might make us sick. It's valuable to learn quickly to associate the tastes and smells of particular foods with nausea, in order to avoid contact with that potentially harmful substance again.
Click
This knowledge has been used to deter predators, such as coyotes from eating livestock, by placing carcasses laced with lithium chloride,
Click
a non-lethal chemical that produces nausea, near the livestock they want to protect. Many farms have dramatically reduced coyote predation on sheep herds and turkey farms without trapping or shooting the predators, since the predator's own natural food aversion keeps them away.

Slide 11: Conditioned Taste Aversion
Hopefully that gives you a clear idea of conditioned taste aversion.

To return to video, click here

Tricky Topic: Operant Conditioning

Slide 1: Operant Conditioning
Operant conditioning is basically what most people would call trial and error learning. This type of learning follows certain rules, and this knowledge has allowed us to manipulate

conditions to reinforce desired consequences. In fact, it's a powerful tool that has allowed to collaborate with other animals.

Slide 2: Operant Conditioning: Defined

Operant conditioning is one type of associative learning, where an individual makes a connection between two different stimuli or events. More specifically, it's learning about the consequences of actions, so is based on voluntary, deliberate behaviours,

Click

or learning by choosing. What are some examples?

Imagine you just got a new phone, after years of struggling with your old one.

Click

You decide to text everyone to let them know the good news!

You have a general idea of how it works, so you take the instruction booklet

Click

that came with it and chuck it in the recycling bin.

Click

You're going to figure it out all on your own

Click

by making voluntary responses, like tapping on buttons

Click

and observing the consequences. If a response results in an unwanted outcome,

Click

then it's less likely you'll do that in the future.
Click
If another response,
Click
leads to a favourable outcome,
Click
then it's more likely to be repeated in the future.

Slide 3: Early Research: Thorndike

Some of the earliest research in this field was done by E.L Thorndike in the early 1900's. Thorndike proposed his Law of Effect which states that the consequences of a behaviour increase or decrease the likelihood of it being repeated. This theory was based upon his research with cats in a puzzle box.
Click
A cat was placed in a box with a lever-operated door, and tasty salmon was placed on the other side. By trial and error, the cats all managed to escape the box by trying different behaviours, and the ones that resulted in desirable outcomes, like pressing a lever that opens a door, were repeated. After a few trials in the puzzle box, the cats escaped very quickly
Click
once they figured out the best response. B.F. Skinner later coined the term operant to mean any action that operates on the environment to produce specific consequences.
Click
He invented the operant conditioning chamber, which is usually called a Skinner box. This is an improvement over

Thorndike's puzzle box because it's designed to measure and manipulate many behaviours; animals tested in a Skinner box can make many responses to obtain their desired consequence, such as pressing a lever multiple times, compared to only one response (escape) in Thorndike's puzzle box. This is an important innovation because it enables researchers to measure complex concepts, such as the effort an individual is willing to put into a task, by measuring the # of responses an animal is willing to make for a particular consequence. For instance, we know that a hungry rat will make more operant responses for food than a recently fed one, which tells us something about differences in their motivation for food. The Skinner box has been used extensively in many areas of psychology and neuroscience, because motivated behaviour is important for so much: feeding, mating, memory, intelligence, you name it.

Slide 4: Operant Behaviours and Consequences

So here are some examples of operant behaviours, their consequences, and the outcome on future behaviour. Let's examine 2 behaviours that you might be familiar with. If you post a picture of your cat in Instagram,

Click

you might be rewarded with loads of likes.

Click

This behaviour resulted in a WIN for you so the outcome is that you'll probably post more cat photos in the future.

Click

How about your morning coffee?
Click
If your coffee gives you a jolt in the morning so you feel more awake and alert
Click
and this helps you start your day,
Click
you're likely to continue your morning coffee drinking.
Are there rules that govern how we respond to consequences? Sure, lots of them. Through years of research by Skinner and others, we are still learning how this type of learning works.

Slide 5: Reinforcement and Punishment

The most basic rule is whether a consequence strengthens or weakens behaviour.
Click
Reinforcement is when a consequence INCREASES the occurrence of a future behaviour,
Click
whereas punishment is when a consequence DECREASES the occurrence of a behaviour.
Reinforcement and punishment both come in two flavours, positive and negative depending upon whether a stimulus is presented or removed. Positive reinforcement
Click
is when the behaviour results in the addition of a desirable outcome, such as feeling great after exercise.
Click

People who feel good after exercising will likely repeat that behaviour in the future. Negative reinforcement
Click
occurs when we respond to get rid of something undesirable,
Click
such as buckling a seat belt to get rid of the annoying buzzing alarm from the car.
Positive punishment is when a behaviour results in the addition of something undesirable. An example is parking in no parking zone and getting a ticket. This makes that behaviour less likely to be repeated in the future, lesson learned. Negative punishment is when a behaviour results in the loss of something desirable
Click
such as when a kid uses bad language where their parents can hear, and they lose all screen time for the day. The intent of this is to reduce the swearing behaviour.

Slide 6: Types of Reinforcers

Reinforcers are rewards or incentives that guide behaviour in the direction so we get what we want. But what do we want? There are some reinforcers that are universal, in that everyone finds them innately rewarding or aversive.
Click
Primary reinforcers are those that do not require prior learning, since they satisfy some instinctual need. Examples of a positive, primary reinforcer is food
Click

especially when we're hungry and the food is tasty. Pain
Click
is a universal primary, negative reinforcer in that all animals will engage in behaviours that reduce or avoid it. Secondary reinforcers,
Click
also called conditioned reinforcers, are not inherently rewarding or aversive, they are meaningful because they are associated, in past experience, with a primary reinforcer. A fantastic example of a positive, secondary reinforcer is money
Click
like these bills here. If I told you that you could pick one, you would likely take the hundred since its worth more money, rather than the much prettier $50 or $10. An example of a negative, secondary reinforcer is a low grade on a test,
Click
which should hopefully strengthening studying behaviour to avoid getting this grade on the next test.

Slide 7: Operant Conditioning in Real Life

Understanding operant conditioning is actually very useful in real life, as anyone who has tried to train a dog will tell you. Our knowledge of how operant learning works has allowed us to tap into the superpowers of other animals, like dogs' amazing sense of smell. By rewarding detection of certain substances, like explosives, with a treat, dogs are able to operantly learn about behaviours and consequences in a way to make us safe. A combination of threats and bribes are quite

often used to shape the behaviour of lots of animals, including humans

Click

as every parent knows. Addictive drug-seeking and drug-taking behaviours also follow the rules of reinforcement and conditioning,

Click

so many successful treatments incorporate classical and operant conditioning principles to "untrain" problematic behaviours.

Slide 8: Operant Conditioning

Operant conditioning allows us to make decisions about based on how past behaviours worked out. Knowing the principles of reinforcement and punishment are powerful tools in training ourselves and other animals.

To return to video, click here

Tricky Topic: Schedules of Reinforcement

To be updated at a later date

To return to video, click here

Tricky Topics

Tricky Topic: Nature of Language

Slide 1: Nature of Language

Language is critical part of how humans work with information, so we'll consider the nature of language.

Slide 2: Human Language

Human language is a system of communication specific to Homo sapiens. Most animals communicate, but they're only able to convey immediate concerns and concrete states, like being angry, threatened, hungry, hurt, or eager to reproduce. So what makes our system of communication different than other animals?

Slide 3: Human Language Forms

Unlike BOOM or MEOW, most word sounds don't bear any relationship whatsoever to the things they're describing. So, the words in human language are symbolic. These symbols differ between languages, so there's a lot of variation in the sounds different groups of humans use to communicate – there are about 5000 languages spoken in the world today. We think of language as spoken or written, but some languages, like American Sign Language, are completely based on gestures.

With so many forms of this symbolic system, human language

is very flexible. This openness to communicate different meaning is probably the biggest difference between language and other forms of animal communication. ALL known humans use language to communicate, and there are some universal rules amid all this variation.

Slide 4: Components of Language

Lexicon refers to all the words in a language, this includes everything in the dictionary AND everything that's not.

Click

Grammar refers to the set of rules for conveying meaning, using words from the language's lexicon. These two components provide the structure for language, so others who know the same system can understand. For instance, most plural words in English end with the letter "s" while in Turkish plural words end with either "ler" or "lar." Even though grammatical details differ between languages, the use of these rules is universal. From these two foundational components, language is an incredibly flexible communication system and allows humans to talk about events not tied to the present moment.

Let's consider some other components of language, by using an example. Take this sentence

Click

"I talk too much." Although you can see that there are four words here, there are more than four sounds. First is the "I" sound of the first word,

Click

then the “t” sound of T,
Click
the “aw” sound of A,
Click
and the “k” sound of K.
Click
Note I didn’t include the silent L, since it doesn’t contribute to the sound of the word talk. In the word too there’s another “t” sound with T
Click
and an “oooo” sound from the two Os
Click
Much starts with the “m” sound of M
Click
then “uh” from U,
Cllck
followed by the “ch” sound from CH.
Click
This sentence has four units of meaning,
Click
”I” is the subject of this sentence,
Click
talk is the action happening,
Click
too conveys excess, and
Click
much indicates amount.

Click

These are called morphemes, or units of meaning in a language.

In this sentence each word is also a morpheme, but that's not always the case. This similar this similar sentence

Click

"I talked too much" Has four words, but five morphemes. Can you find the extra one?

Slide 5: Language and Thought

The benefits of language as a communication system are obvious, it allows humans to talk about the past and future, and even things that have never happened. It allows us to easily share memories, and therefore knowledge.

Click

With 5000 different languages, there are a lot of ways to say things. Does that mean that there are different ways of thinking about things?

There is some evidence for this, by looking at how languages with different attributes influence people's judgements.

Slide 6: Linguistic Relativity

Linguistic relativity, originally called linguistic determinism, is the idea that language influences the way we think.

Click

This perspective is also called the Sapir-Whorf hypothesis after Edward Sapir and his student, Benjamin Lee Whorf. Evidence to support this was mainly from comparisons of speakers of

different languages. Some languages have more words in their lexicon to describe concepts like colours,
Click
so one approach is to compare participants' performance on a colour categorization task.
Click
Whereas English has only one word for the colour category blue, Russian has two words depending upon whether the blue is light or dark.
Click
One study asked native English and Russian speakers to categorize colours;
Click
they were shown a square like the one on the top, and then had to choose one from a pair (shown on the bottom). For the Russian speakers, when the blues were in different colour word categories, they made faster discriminations, but the English speakers did not. This shows using an objective categorization task, that having words for a category made the task easier.
So there is some evidence of an influence of language experience on perceptual tasks, but these differences tend to be small and restricted to certain types of tasks. That's why the term linguistic determinism fell out of favour, and linguistic relativity is more commonly used.

Slide 7: Nature of Language

The structure of language and collection of words allow information to be shared with others. This allows for

variability and flexibility that makes human language much more powerful than other animal communication systems.

To return to video, click here

Tricky Topic: Heuristics

Slide 1: Heuristics

In this lecture, we'll explore the importance of heuristics in decision-making.

Slide 2: Making Decisions

The average human makes countless decisions every day, and most of these happen without our notice. Each decision we make involves processing information as efficiently as possible, so that we can free up our minds to do the next thing. Decision making is all about problem solving, which sometimes we do very well, and other times really poorly because we rely on certain strategies that lead to mistakes. There are many different problem-solving strategies available to us, so let's look at some common ones.

Slide 3: Problem Solving Strategies

An algorithm is a step-by-step procedure for solving a problem. They're powerful because they're thorough, so are designed to generate the BEST answer. Computers, with their massive processing speeds, use software algorithms a lot. A downside for humans is that they're time-consuming, so we

don't use them as much.
Click
We sometimes arrive at sudden solutions in a flash, referred to as a Eureka insight, which is the word Greek mathematician Archimedes shouted when he realized the principle of volume displacement while taking a bath. These flashes of insight are unpredictable, so aren't reliable tools in our day-to-day problem solving.
Click
We're much more likely to use mental shortcuts called heuristics. Let's look at an example.

Slide 4: Unscramble This

What word can you make from these eight letters? Take a minute and see if you can unscramble it, pause the video if you like. Did you get it? In fact, there are over 40 000 ways to rearrange these letters, so using an algorithm to check every single one against an English dictionary would take forever for a slow human brain. One way to try and solve this problem is to apply some shortcuts,
Click
..like placing the "s" at the end, since this is how we form plurals in English. Also, most words start with consonants rather than vowels so you can quickly eliminate quite a few of those 40 000 possibilities by ignoring the combinations that start with vowels. Eventually you're likely to come up with the answer

Slide 5: Answer

RAINBOWS.

It's easy to see from this simple example how we use heuristics for these types of problems, but it wasn't until recently that our reliance on these mental shortcuts became widely accepted.

Slide 6: Rational Choice Theory

For most of the 20th century, Rational Choice Theory was the prevailing view of psychologists, economists, and others who studied decision making. This is the idea that humans make RATIONAL choices to best reach their goals. At the time, most experts believed that decision-making was based on cost-benefit analysis;

Click

weighing the costs associated with a course of action with the predicted rewards. However, in the early 1970s,

Click

2 Israeli psychologists, Daniel Kahneman and Amos Tversky, challenged rational choice theory. They felt that people make all sorts of NON-RATIONAL decisions and demonstrated this with some simple studies.

Slide 7: Challenging Rational Choice Theory

In one experiment participants heard 39 names, 19 famous women and 20 non-famous men. Then they were asked which gender they heard more frequently.

Click

Most people, 80%, claimed that they heard more female names, presumably because the famous names were more memorable. This tendency to solve problems based upon how easily we can pull information into our awareness is called the AVAILABILITY heuristic. And it's something that we use ALL the time.

Tversky died in 1996, but Kahneman was awarded the Nobel Prize in Economics in 2002,

Click

based on their work on biases in judgement and decision-making.

Slide 8: What Would You Do?

Let's say that you're late for class and you can see up ahead that the crosswalk light is telling you to stay put. What do you do?

Click

Your brain might quickly recall times when you've jaywalked in the past and nothing happened, and so decide to charge on ahead.

Click

OR, you might remember that there were a number of crosswalk accidents recently and decide to play it safe and stay put. Either way, we make these quick decisions all the time, based on the information that is AVAILABLE to us. So, under what conditions are we likely to use the AVAILABILITY HEURISTIC?

Slide 9: Availability Heuristic

One factor is vividness. In other words, if I can imagine it, it must exist. In one study people were asked to estimate the likelihood of dying from various causes, and most people said that death from a tornado was much more likely than dying from asthma.

Click

In fact, this is totally wrong, asthma kills many more people, but tornadoes are dramatic events, and are much more easily called to mind.

Click

Another source of availability is our recent experiences. Events that receive a lot of media attention can bias our thinking and lead us to make incorrect judgments. In other words, if everyone is talking about it, it must be everywhere. For instance, leading up to the 2016 summer Olympics in Rio,

Click

there was a lot of news coverage about the mosquito-bourne Zika virus, linked to birth defects in newborns. Sales of mosquito repellants rose dramatically, even in areas where the risk was very low.

According to Kahneman and Tversky, we have a tendency to rely on this way of thinking when we're uncertain. But what about situations where have solid information to help us solve a problem?

Slide 10: What are the Odds?

Let's say we have a container with 20 red chips and 80 white chips. If you put your hand in and pulled out a chip at

random, how likely is it that you'll get a white one?

Click

Most people correctly answer 80%.

Click

What about the chance of getting a red chip?

Click

Again, most people would correctly answer 20. But let's make this a little more interesting.

Click

Let's say we have a container with 20 lawyers and 80 engineers. Again, if you put your hand in and pulled out a person at random, how likely is it that you'll get a an engineer?

Click

Most people correctly answer 80%.

Click

What about the chance of getting a lawyer?

Click

Again, most people would correctly answer 20. BUT the interesting thing is that people throw this logic out the window if they're first given a personality description.

Click

So, if instead I told you that we randomly pulled someone out of this collection of 100 people, and that this person likes to argue, is very good at debating, and is considering a career in politics, would this change your estimate? Do you feel like the odds now are MORE than 20%. Most people when given this description, say it's more likely that this person is a lawyer,

since it fits the common stereotype of a lawyer. However, the odds HAVE not changed, the likelihood remains 20%. This type of mental shortcut is known as the representativeness heuristic.

Slide 11: Representativeness Heuristic

When using this heuristic we estimate the probability of an event based on how typical it is of another event. We think of certain occupations having representative behaviours, so it can lead us to ignore other information. Because debating and politics are common interests for many lawyers, this can lead us to use the representativeness heuristic and bias our assessment of the random draw.

Slide 12: Heuristics

These are just TWO examples of heuristics. They save us time so often come in handy, but they are inherently biased so can also lead us to make mistakes.

To return to video, click here

Tricky Topic: Measuring Intelligence

Slide 1: Measuring Intelligence

This Tricky Topic discusses how intelligence is measured and how we have arrived at the current paradigm of intelligence testing. Before getting into how we measure intelligence, we must first ask what is intelligence?

Slide 2: What is Intelligence?

What are we really measuring when we talk about intelligence? What do we currently value in society as being intelligent?

Click

Is it the mathematical mind of Einstein?

Click

Or perhaps the artistic genius of Picasso? Or is it both? Nevertheless, it is important to understand how society's views on intelligence have changed and how, as a result, the testing of intelligence has changed as well.

Slide 3: Theories and Measurements (1910-1980)

If we look back at the history of IQ testing, we see that it has changed and evolved for both practical and theory-driven reasons. Where in general, the history of intelligence tests can be divided into 3 distinct historical periods. Intelligence testing as an idea was first coined in 1865 by Sir Francis Dalton in England. However, it wasn't until the early 1900s that intelligence was first measured in a practical and clinical context.

Click

The 1st practical test was devised by French psychologist Alfred Bennet.

Click

And this was a test that he made consisting of 30 problems of increasing difficulty,

Click

where the score was then determined by the patient's mental

age divided by the chronological age multiplied by 100, which gave a score referred to as the intelligence quotient or IQ.
Click
And this method of scoring very clearly become problematic across different ages
For example, let's say you have a 30 and 40-year-old man. To begin,
Click
let's say the 30-year-old man scored a 30 on this test. So let's say he has a mental age of 30 and a chronological age of 30,
Click
so his score would therefore be his mental age divided by his chronological age times 100, which gives a score of 100 for his IQ.
Click
This contrasts with the 40-year-old man who has a score of 30 on the test as well, so that is a mental age of 30 and a chronological age of 40, where his score would come out to an intelligence quotient of 75. So even though these 2 men did exactly the same on the test itself, because of their difference in age, the 40-year-old man had an IQ score three quarters that of the 30-year-old man's score.
So this problem is evidently very prominent and became addressed in the 1930s by David Weschler.
Click
And David Weschler distinguished between adults and children as having fundamentally different cognitive abilities

and he devised respective intelligence tests for children and adults, allowing for the negation of chronological age in scoring. David Weschler devised 2 tests. The first one is the Weschler adults intelligence scales,
Click
with the second being the Weschler intelligence scale for children.
Click

Slide 4: Theories and Measurements (1980's)

Now, the second era of intelligence testing came in the 1980's with the Kauffman assessment battery for children. And this was an intelligence test that directly challenged the Weschler intelligence test in 4 specific ways.
Click
The first being that it was guided by theories of fluid and crystallized intelligence and Piaget's theory of cognitive development.
Click
The second, it recognized fundamentally different intelligence characteristics for different ages amongst children.
Click
The third, it measures several distinct aspects of intelligence.
Click
And finally, it assessed different types of learning styles.

Slide 5: Theories and Measurement (1990's)

So following this, the third and current era came in the 1990's,

for intelligence tests began to recognize the many different facets and measures of intelligence. So Carroll took Cattell-Horn theory and analyzed all known intelligence tests linking different models on intelligence from single qualities to multidimensional models. This has set up the current paradigm of intelligence tests that assess different forms of intelligence.

Click

So, for example, we'll look at the fourth version of the Weschler adult intelligence scale and the Weschler intelligence scale for children that was released in 2008. And these tests now include 4 different dimensions of intelligence.

Click

Verbal comprehension,

Click

perceptual reasoning,

Click

working memory,

Click

and processing speed. So, now that we understand what the current paradigm of intelligence tests are actually measuring, it is now important to look at and address how individuals are scored and ranked within current intelligence tests.

Slide 6: Current IQ Testing

We cannot describe the scoring of IQ tests without first discussing the very basic ideas behind the theory referred to as the central limit theorem. This is a part of the probability

theory. And to define it, the central limit theorem states that a group of independent, random variables of a significant quantity will be normally distributed. And this sounds like a mouthful, but we'll try and highlight this in the next example, where we'll look at the heights of individuals in a certain population. So, when we look at a group of individuals,

Click

each person's height is independent of all others as well as random within the population.

Click

So if we then took this group and began to bin them based on their heights, according to the central limit theorem, they would follow a specific type of distribution as these individuals are both independent to one another and random within the group. And again, the distribution they would follow is termed a normal distribution.

Click

So, if we then plot the heights of all the individuals in the population into a histogram, as you can see here, and then plot the curve of this histogram, we should see what is described as a bell curve. It is important to know that the bell curve on the histogram becomes smoother and continuous as the number of individuals in the population we're looking at increases.

Click

Where a really large population following a normal distribution would look more like this curve: extremely continuous and smooth. And to look further into a normal

distribution, what we see is that there are 3 main characteristics that hold true across all population measures that are shown to be normally distributed.

Click

The first being that the mean, median, and mode are all equal.

Click

The second being that the distribution is symmetrical- 50% of the data or individual counts fall on either side of the centre.

Click

And finally, the distribution is uniform such that the SD, which is the measure of how spread out the numbers are from the mean, is constant in a normal distribution such that one SD encompasses approximately 68% of individuals,

Click

2 SD encompass approximately 95% of the individuals,

Click

and 3 SD encompasses approximately 99.7% of the individuals within that normal distribution.

Click

So now, just like the heights of individuals, we can also use IQ scores on a frequency plot that will be normally distributed. That is, IQ scores of individuals also follow a normal distribution where in this case they have a mean of 100

Click

and a SD of 15.

Click

So scores from 85-115 are termed average.

Click

Scores less than 70 are extremely low.

Click

Scores greater than 130 are very superior.

Click

As a quick example, let's say you score 115 on your IQ test.

Click

So this means that you have an above average score that is within the 84th percentile, meaning that you fall in the top 16% of scores.

Slide 7: Measuring intelligence

This tricky topic covered both what intelligence tests are measuring and how individuals are scored and ranked relative to others based on their IQ. Thanks for listening.

To return to video, click here

Tricky Topic: Validity and Reliability

Slide 1: Validity and Reliability

This Tricky Topic covers the concepts of validity and reliability, and specifically relates these two terms to the IQ test.

Slide 2: How useful is a test?

In almost all aspects of our lives, our merits and values are judged or determined by some sort of test or assessment. From

a very young age, we are tested all the way from the classroom to the doctor's office where you might need a new pair of reading glasses. And in of all these tests we perform and are subjected to throughout our lives, it is important to ask, "how useful is this test?", or "how useful are the results this test is producing?".

Click

So, for example, how good of test is bench press for athletic ability such as football? Should the NFL and CFL teams be using this as a measure for which players they draft or not?

Or can measurements of the human skull really tell us about the individuals' brain and therefore mind within? We'll come back to this example in more detail at the end of this tricky topic

Slide 3: Validity

We can begin to answer these very important questions with 2 different concepts, those being validity and reliability. To begin, validity

Click

is asking the question "how well does the test actually measure the concept (or construct) that it claims to measure?".

Click

So, for example, is holding a measuring tape to the sky a valid way to measure the circumference of the sun? As we all should know, this is not a valid way to measure the sun. The results from this method of measurement would be completely unrepresentative of the true circumference of the sun and we

know that there are much more valid ways to do this measurement, like using the proper mathematical formula
Click
So, bringing this into the context of IQ tests, when measuring the validity of an IQ test
Click
we would ask "does a person's IQ score accurately represent their intelligence?".
Click
This question is obviously very important and can be broken down further into 2 specific subsets, that being construct validity
Click
and predictive validity.
Click
So, to begin, construct validity
Click
is asking the question: "does a test measure the concept or construct it's claiming to measure?". So, for example, does an IQ test actually measure intelligence? Similar to what we just stated in the previous slide. The second being predictive validity,
Click
asking, "how well do test results or IQ test results positively correlate to real world outcomes?". Coming back again to the example of IQ tests,
Click

do IQ scores correlate with school grade achievements and job success?

Click

In terms of predictive validity of the IQ test it actually has a very high correlation with school grades all the way from junior kindergarten to university.

Click

However, it does not predict happiness or satisfaction along the lifespan.

Slide 4: Reliability

The next measure that we use is reliability.

Click

Reliability addresses the consistency of the results. It asks, "how often will a test yield the same results under the same conditions".

Click

To begin, for example, the roll of a standard die will not have good reliability for getting the same number twice in a row. It will have a 1 in 6 chance to roll the same number twice with the die.

Click

Another and perhaps more exciting example could be getting a hole in one in golf.

Click

Most golfers have met another golfer or perhaps themselves who has hit a hole in one before. But it's important to ask yourself "what do you think the likelihood that one of these

people or yourself could hit another hole in one?" or "do you think the fact that a golfer has hit a hole in 1 before is a good measure of their day to day golfing ability? Is this one incident reliable enough that you can conclude anyone who has hit a hole in 1 before could play at the level of Tiger Woods, let's say?"

Click

The answer to this question undoubtedly is no, and the reliability of hitting a hole in 1 is therefore not very high and does not equate to being a world-class golfer like Tiger Woods.

Click

So, in contrast to these last 2 examples, the reliability of the IQ test is actually extremely high. On a scale of 0-1 the IQ test has a correlation coefficient of 0.9.

Click

The test-retest reliability of the IQ test is very high, meaning that if you take the test again there's a very high chance that you will get the same score again. This has been shown to be true even over a number of years. Another important concept is internal consistency,

Click

which is also very high on IQ tests. This measures how well the questions on the test are assessing the same dimension aligned with one another. For example, does a person get the same relative result on question 1 and question 2 if both questions are aiming to measure working memory? Well on the IQ test, the answer is yes.

Slide 5: Validity & Reliability

So, in review, coming back to our initial question, "how useful is a test?", we have 2 main ways to assess this question. That is, validity and reliability. We'll go back to the one example we briefly talked about earlier, where we asked about the usefulness of measuring the dimensions of a skull to learn about the inner workings of that person's mind.

Click

And this is a practice called phrenology that was used fairly commonly in the beginning of the 19th century and this is a perfect example of how tests can be reliable while being completely invalid. The test retest reliability of phrenology is very high, as the bumps on a person's skull will not change much or at all from one examination to another. HOWEVER, the validity of the practice is completely absent, as in no way do the bumps on a person's skull measure or give insights into the inner workings of their mind.

Click

That concludes this Tricky Topic looking at validity and reliability. Thanks for listening.

To return to video, click here

Tricky Topic: Developmental Research Designs

Slide 1: Developmental Research Designs

Childhood is a time of change, so developmental researchers

use special types of designs in order to capture and compare these changes. We'll consider three types of designs, cross-sectional, longitudinal, and longitudinal-sequential

Slide 2: Age-related Changes

Identifying age-related changes is key in the study of development. Measuring variables as they change over time means chasing a moving target. Developmental psychologists use different strategies to address this challenge, each with their own advantages and disadvantages.

Slide 3: Cross-Sectional Design

A cross-sectional design examines different aged participants at the same time.

Click

Once groups of participants are identified and recruited the behavior of interest is measured, for example, the amount of time spent on the internet.

Click

Cross-sectional designs are the simplest of the developmental research design types, because all participants can be tested at once, however this comes with an important limitation. Each age group, called a cohort, in a cross-sectional study grew up at different times in history, and this means different political, societal, parenting norms.

Slide 4: Cross-Sectional

One of the biggest differences over the past few decades is

advances in technology so children born years apart likely have different exposure and access to it A hundred years ago, radio was the most sophisticated form of social media, whereas today most people have immediate access to all knowledge ever known at our fingertips.

Click

This is called a cohort effect and could certainly influence the results of our proposed study of age-related differences in time spent online.

Click

If we find differences, it's impossible to determine if they're related to age alone, or if this is a product of the technological opportunities while growing up.

Slide 5: Longitudinal Design

One way to overcome cohort effects is by using a longitudinal design, where the same group of individuals is tested over time. Let's consider our earlier study of age-related differences in internet use.

Click

We can start with a group of six-year olds, then wait two years and test them again at age 8, and then again at age 10.

Click

This gets around the cohort effect, since all children are drawn from the same cohort. One obvious disadvantage is that this takes a much longer times than a cross-sectional design. This usually makes the study more expensive since participants need to be contacted again and again. Also, there is problem with

attrition, or loss of participants from the original sample over time, which is inevitable people move away or are no longer interesting in participating at later time points.

Slide 6: Longitudinal Sequential Design

The most comprehensive design is a longitudinal-sequential (or sometimes called just sequential) design. This combines both the cross-sectional and longitudinal approaches, to overcome the limitations of both. Let's look at how we can fit our original question of internet use into this framework

Click

Let's look at children from two cohorts, those born in 2012 and 2014. If we test them together in 2020

Click

we'd have a group of 6 year olds and 8 year olds

Click

At that point we could do a cross-sectional comparison. If we wait two years and test the same children again, we now have a group of 8 year olds and 10 year olds

Click

We can do another cross-sectional comparison,

Click

but we also have the ability to do a longitudinal comparison in the same participants.

Click

Note that we can also compare age cohorts born in different years

Click

If we test again two years later, we have a group of 10- year olds and 12-year olds
Click
and we can make those three comparisons again
Click
So this type of design is incredibly powerful since it can disentangle age-related changes from cohort differences.
Click
However, this research design is not used often, because it's very time-consuming, expensive, and of course with several groups followed over time there is a great chance of attrition.

Slide 7: Developmental Research Designs
The continual change that happens early in life means that special research designs are required.

To return to video, click here

Tricky Topic: Piaget's Stages of Cognitive Development

Slide 1: Piaget's Stages of Cognitive Development
This Tricky Topic discusses Piaget's stages of cognitive development, outlining his theories of early cognitive development in particular.

Slide 2: Early Cognitive Development
Early cognitive development was extensively studied by Jean

Piaget.
Click
He studied early infant and childhood advances in the ability to think, pay attention, reason, remember, learn, and solve problems.
Click
In particular, he mostly studied attention.
Click
And this is because attention can be observed and measured in all ages, even when the individuals are too young to communicate via language or other means.
Click
The main question Piaget asked himself was "how does a child's thinking develop?". His interests and life's work trying to answer this question stemmed from the simple observation that children often answer simple questions wrong at different developmental stages and Piaget wanted to know in what way do children think that makes them answer these questions wrong. As mentioned, Piaget thought a potential doorway into answering this question was by studying a child's attention. He viewed all children as actively constructing knowledge about their world by forming schemas with new experiences.
Click
Now, schemas are very important. They are mental representations of aspects of the world which provide a framework for understanding the world. There are 2

important mechanisms for schema formation.
Click
They are assimilation and accommodation.

Slide 3: Schemas

Assimilation is fitting a new experience into an already existing schema when children encounter something new. Accommodation is the process by which a child will change an existing schema to incorporate new information. For example, say a child sees a donkey for the first time.
Click
With assimilation, the child might fit the donkey into an already existing schema they have of a horse, for example.
Click
Whereas if the child used accommodation, the child would change the existing schema of the horse, acknowledging that this is actually not a horse, but indeed a donkey.

Slide 4: Jean Piaget

Once again, it's really important to illustrate that Piaget's primary focus was infant thought. He did this by looking at their ability to form new schemas for novel and unfamiliar stimuli by looking at their focus and attention.

Slide 5: Piaget's Stages of Cognitive Development

It was based on these specific observations of children that Piaget formed his idea of early cognitive development in which he came up with 4 distinct phases of cognitive development

from birth through adolescence.
These were first the sensorimotor stage,
Click
which lasts from about birth to 2 years old.
Click
Next was the preoperational stage from about 2-5 years old.
Click
And then the concrete operational stage from 6-11,
Click
and then finally the formal operational stage from ages 12 and up

Slide 6: 1) Sensorimotor Stage (0-2)

To begin, in the sensorimotor stage, Piaget claimed that the knowledge that a child or an infant gains is through the senses, that is through tasting, smelling, seeing, touching, and hearing.
Click
One phenomenon that Piaget believed to be indicative of these early stages and in particular the early stages of the sensorimotor stage was the lack of object permanence. And that is an absence of the ability to recognize that objects still exist when they are not being sensed. One way to judge is this is to have an object of interest in front of an infant and then put a cloth or some other object in front of it. For the first 8-9 months infants will not understand the object of interest is still present, but just on the other side of the blocking object

Slide 7: Preoperational (2-5)

In the second and preoperational stage of cognitive development Piaget believed that certain qualities of thinking began to develop. The first being symbolic thinking, that is using symbols such as words or letters to represent ideas or objects.

Click

The second is animist thinking. This is the belief that inanimate objects are alive. For example, children might think of the sun as alive because it follows them when they walk. In addition, they might think that their stuffed teddy is a real bear.

Click

The third is egocentrism, which is to view the world from one's own perspective while unable to view it from another person's perspective. This theory can be illustrated by one of Piaget's classic experiments referred to as the 3 mountains task. In this experiment, 3 slightly different mountains are arranged on a table, with the child on one side and a doll on the other. The child is given 3 options of drawn perspectives and asked to pick the one that the doll was likely looking at. A child in this stage will pick the perspective they themselves are seeing every single time, as they are unable to imagine what the doll's perspective might be.

Click

Finally, the fourth is a lack of conservation- absence of the ability to recognize that some properties of an object can change while others remain constant. For example, children in

this stage lack conservation of liquid.
Click
If they see 2 equal glasses with the same amount of liquid in each glass, they will recognize that the amounts of water are the same.
Click
However, if you then in front of them pour the water from one of the glasses into a petri dish,Click
they will now say that the glass has more water because it's bigger, even though the amount of water never changed from the glass to the petri dish.

Slide 8: Concrete Operational (6-11)

This leads into the 3rd stage, which is the concrete operational stage, where children can now conserve shape, number, and liquid. If looking at the previous problem, children will now identify that even though the size of the container is different, the amount of water between the glass and the petri dish is the same. However, this ability is limited to mental observations of real or concrete objects and events. In this phase they still cannot understand abstract ideas and reasoning. For example, they have a hard time with the worded questions where they have to imagine objects. Let's look at the following written example.
Click
Let's say a child was asked, if you have water in a small cup then you pour it into a bigger cup, which cup has more water?
Click

They would answer the bigger cup in this stage of development.

Slide 9: Formal Operational (12+)

Lastly in the 4th formal operational stage, formal logic develops. For example, a child in this stage could ration that if Maria is a woman, and all women are mortal, then Maria is mortal. In addition, children develop scientific reasoning and hypothesis testing skills during this stage.

Slide 10: ???Piaget's Stages???

So before finishing, let's look at the following experiment. This experiment is one example illustrating an infant's ability to understand basic statistics and probability.

Click

Researchers in this experiment took many black balls and very few red balls and put them into a box in front of 8-month old infants. It's really important that they did it in front of the infants such that they could see the proportion of black to red balls. The idea is that the infants were actually able to see and recognize the different proportions of the black balls and the red balls and therefore make basic statistical predictions based on these.

Click

The way this is illustrated was the researchers then put their hands into the box and would pull out different combinations of red and black balls. So, when researchers pulled out an expected hand of many black and very few red balls,

Click
babies would pay little attention. However, when researchers pulled out many red and few black balls,
Click
babies spent a significant amount of time focusing on that hand. So, researchers therefore concluded that the babies were recognizing this as an unlikely event, suggesting that they understood the basic premise that a sample group from the box should reflect the contents of the full box, which in this case they knew was many black balls and few red balls.

Slide 11: Piaget's Stages of Cognitive Development
This concludes this Tricky Topic looking at Piaget's stages of cognitive development. Thanks for listening.

To return to video, click here

Tricky Topic: Prenatal Development

Slide 1: Prenatal Development
This Tricky Topic discusses the phases of prenatal development as well as how teratogens can interfere with these phases, producing lifelong effects.
Click
By the time a baby is born, the amount of growth and development it has already gone through in the womb is incredible! Although babies first enter the visible world when they are born, their journey of growth begins well before they

first open their eyes.
Click
We begin with a single cell
Click
forming an organism that undergoes extreme growth and maturation
Click
in the mother's womb to form the baby we see at birth,
Click
which is comprised of billions to trillions of cells. It is the stages of development before the baby is actually born that we are going to focus on for this tricky topic. This process is referred to as prenatal development.
Click
Prenatal development can be broken down into 3 major stages. The first is the germinal stage,
Click
which lasts from conception to about 2 weeks post-conception. This is followed by the embryonic stage
Click
which lasts form the 2 weeks to 8 weeks post conception, and then finally the fetal stage
Click
which lasts from about 8 weeks post conception to birth.

Slide 2: Germinal Stage

To begin, the germinal stage begins when the eggs are released from the ovary entering and moving down the fallopian tube

within the potential prospective mother. Subsequently, during intercourse, sperm cells swim up the fallopian tube to meet the eggs. While many sperm cells surround and egg, only one will succeed in penetrating it, a process known as fertilization.
Click
It is at this point that the sperm and the egg come together to form a zygote.
Click
The zygote then continues down the fallopian tube while going through many subsequent cell divisions, growing in size and density. At approximately 4 to 5 days, the zygote has formed into a blastocyst that enters the uterus.
Click
Following this, at about 11-12 days the blastocyst implants into the uterine wall and this is a critical stage where about 30-50% properly plant, and therefore the pregnancy ends. However, when this is successful and the blastocyst implants into the uterine wall,
Click
it sets up the next stage of embryonic development.

Slide 3: Embryonic Stage

And this being, the embryonic stage. So, once a blastocyst implants into the uterine wall, the embryonic stage begins. At this point the growing bundle is termed an embryo. In particular this stage is marked by the formation of major organs, including the nervous system, the heart, eyes, ears, arms, legs, teeth, palate, and external genitalia. The embryonic

stage until about 8 weeks after conception, where it then leads into the fetal stage.
Click
The fetal stage is marked by the formation of bone cells. In addition, at this point, major organs have already formed. For example, the heartbeat can first be detected around 8 weeks. So, from here until birth, organs continue to grow and mature, producing a rapid growth in the embryo's size. So now that we've briefly gone through the stags of prenatal development, there is a very important concept we need to address.

Slide 4: Environmental Influence on Fetal Development
That is that the environment is extremely important because it has great influence on fetal development. This really illustrates the temporal importance of certain developmental conditions and periods. During prenatal development the fetus is completely dependent on the environment of the mother's womb. The factors within the mother's womb come from many sources, including what the mother eats,
Click
drinks,
Click
smokes,
Click
feels, and experiences. And it is the collection of these factors forming the environment of the worm that governs the fetus's development. This is referred to as prenatal programming.
Click

Prenatal programming is the process by which the events in the womb alter the development of both physical and psychological health for both the newborn baby
Click
as well as the subsequent adult.
Click
With respect to negative effects, damage can be caused either by a lack of factors necessary for proper development or by the introduction of factors that actively interfere with proper development.

Slide 5: Teratogens

And this brings us to teratogens. These are substances and chemicals that come from the external environment and have a negative impact on fetal and infant development. The severity of the effects of teratogens is time dependent.
Click
For example, certain teratogens have greater effects when consumed at a specific period of prenatal development. The severity of the teratogen of the subsequent effects is dependent on the timing at which this teratogen is introduced. In general, the earlier the exposure to a teratogen during a pregnancy, the greater the effect. Several substances are known teratogens.
Click
These include nicotine, caffeine, alcohol, and some prescription drugs, just to name a few. These have all been shown to have major negative effects on prenatal development.

Slide 6: Prenatal Development

That ends our Tricky Topic on phases of prenatal development and how the environment can affect these phases. Thank you for listening.

To return to video, click here

Tricky Topic: Myelination of the Prefrontal Cortex

Slide 1: Myelination of the Prefrontal Cortex

Although the brain of a six-year-old will look similar in size and appearance as the adult brain. The neural connections within the brain continue to develop throughout adolescence and well into adulthood.

Slide 2: Myelination of the Prefrontal Cortex

The myelination of the neural pathways within the prefrontal cortex is one of the final steps to transform a teenage brain into a fully matured adult brain.

Slide 3: Myelination of the Prefrontal Cortex

Myelination refers to the formation of a myelin sheet around the axons of neurons. The glial cells of the central nervous system called oligodendrocytes produce the myelin sheets, which are a fatty substance that wrap around and insulate neuronal axons. Myelination is a crucial adaptive process since it strengthens and accelerates the electrical transmission

between neurons, thus coordinating how well brain regions work together.

Slide 4: Myelination of the Prefrontal Cortex

After birth, the population of oligodendrocytes drastically expands and there is a wide spread of myelination happening throughout the first two years and this gradually continues into early adulthood.

Slide 5: Myelination of the Prefrontal Cortex

However, the rate of myelination within the brain follows a distinct spatial temporal pattern. Specifically, myelination will start at the brain stem regions and move upwards from the back of the cerebral cortex towards its front. This pattern closely mimics the evolution of the brain in which the more primitive structures will undergo myelination first and the structures associated with conscious thought and higher cognitive function will be myelinated last. As a result, the prefrontal cortex is the last brain region that gets fully myelinated. Although most brain regions will have already received a surge in myelination prior to reaching adolescence, the prefrontal cortex will only begin its rapid increase in myelination after puberty and will only reach its full maturation until early adulthood. This has many implications when it comes to understanding the risk-taking behaviour and poor emotion regulation that teenagers will often demonstrate.

Slide 6: Myelination of the Prefrontal Cortex

The prefrontal cortex is heavily connected to other brain areas

and is responsible for a variety of higher-level cognitive functions or what is commonly referred to as executive functions such as planning and decision making, controlling emotional impulses, attentional control, and the ability to conceptualize long term goals. Therefore, during adolescence, the neural networks responsible for these functions are still being refined and constructed by the process of myelination. Consequently, these networks are far from perfect.

Slide 7: Myelination of the Prefrontal Cortex

Think back to your early teenage years. I bet you can think of many examples in which you would now seriously question the decisions you made, whether it be engaging in risky behaviour that you would never consider doing now or having absolutely no control over your emotions or simply being easily distracted are all behaviours that can be associated with the lack of prefrontal myelination. It is for this reason that once we reach our early twenties or for some, it might take a bit longer, that we can plan things more effectively, handle our emotions in a healthier manner, and overall become better thinkers.

To return to video, click here

Tricky Topic: Theories of Motivation

Slide 1: Theories of Motivation

Why do we do the things we do? Why are we drawn to certain

activities and behaviours? In this Tricky Topic, we're going to dive into the muddy waters of motivation.

Slide 2: Motivation

Studying motivation is essentially exploring what individuals WANT. When faced with making a decision, our WANTS have a huge voice in what we actually decide to do. We make hundreds of little decisions every day, possibly thousands. Some of these are deliberate and take years , like choosing what kind of career to pursue, while others are more spontaneous and unplanned, like the kinds and amounts of food we choose to eat.

Slide 3: Motivation Defined

Motivation is defined as wants or needs that direct behavior toward a goal. There are a couple of terms that are used to describe different aspects of motivation which will be useful in comparing theories.

Click

A need is commonly defined as a biological state of deficiency that triggers drives.

Click

A drive itself is a subjectively perceived state of tension that occurs when deficient in something. Therefore, drives are need-specific.

Click

An incentive is any object or event that motivates behavior. This is another word for a reinforcer, or something that

increases the likelihood of a behaviour happening. An incentive can trigger motivated behavior without a true biological need.

Whereas drives PUSH behaviour, incentives pull behaviour, and so there are both internal and external forces that can feed into motivation. Wanting is sometimes congruent with our needs, but not always. Let's consider some examples.

Slide 4: Needs, Drives & Motivated Behaviours

Some needs are obvious and universal, like the need for food.

Click

We NEED energy and nutrients, certainly we can't live without them, so the DRIVE of prompts a motivated BEHAVIOUR, in this case eating. This trio of need-drive-behaviour is seen in all animals and, in fact, the biological processes that trigger and control hunger are very similar in humans, rats, and mice.

Click

The need for water is also easily understood in terms biological deficiency; thirst becomes overwhelming if we get severely dehydrated, so it promotes drinking behaviour. However, ALL motivated behaviours don't fit as neatly into this tidy framework.

Take knowledge for instance.

Click

Clearly, we humans go to great efforts to acquire knowledge and understand what's going on around us. Curiosity is a strong motivator in other animals as well, and it drives

exploration. BUT, does this fit the definition of a need? You won't necessarily die from lack of knowledge, so it's not as critical to survival as food or water. We'll review several different theories of motivation and consider how well they explain these different types of goal-directed behaviour.

Slide 5: William James & Instinct Theory

One of the earliest thinkers to weigh in on motivation was William James, who is considered to be the father of American psychology. He hypothesized that behaviours are driven by different instincts that help us survive. Instincts are defined as unlearned behaviours shared by members of a species.

Some instincts, like feeding

Click

are obvious and are common amongst all animals

Click

Other unlearned behaviours described by James, such as a baby seeking out a nipple for milk

Click

are also related to survival, as is the mother's instinct to protect the child. However hunting prey was also considered by some to be an unlearned human instinct, and there was a lot of disagreement between researchers on what behaviours should be included. Furthermore, emerging evidence showed that learning could have a powerful effect on motivated behavior, and instinct theory could not account for this.

Slide 6: Evolution & Natural Selection

James was strongly influenced by Charles Darwin's theory of evolution through natural selection. At the core of this is the idea that the purpose of any living organism is to perpetuate itself. You've likely heard the phrase, survival of the fittest, which is the cornerstone of Darwin's theory of natural selection. From this perspective, fitness refers to the ability to survive AND reproduce.

Basic needs, such as food, fluids and optimal temperature are often explained from this perspective. If we become deficient in some need, drives can redirect our behaviour towards goals that can keep us alive. Given that certain motivated behaviours are shared by all animals, the evolutionary model suggests that they were naturally selected for in our early ancestors, because they promoted fitness.

So it's easy to appreciate how James was swayed by Darwin's theories at the time.

Slide 7: Drive Reduction Model

Another prominent theory related to evolutionary model is the drive reduction model. It extends the evolutionary model and adds explanation about the mechanism of motivation. It states that behaviour is driven by the need to balance physiological systems when depleted and is closely tied to the idea of homeostasis,

Click

the tendency to maintain balance in biological systems.

Slide 8: Homeostasis & Set Point

According to drive theory HOMEOSTASIS sets up equilibrium around an optimal set point, or fixed setting, of a particular physiological system.

The drive reduction model of motivation is based on the body's tendency to maintain homeostasis, we'll consider temperature. This model suggests that there are sensory detectors that monitor the current state, which is compared to the body's set point,

Click

which for temperature in humans is about 37 degrees Celsius. If it's too hot

Click

then the body kicks in various cooling responses, such as sweating or behaviours like removing clothing or relocating to a cooler place. If it's too cold,

Click

then the body activates heating responses, such as shivering or behaviours such as adding a layer of clothing.

This perspective is obviously dependent on set points, and we know the set point for body temperature in humans. But what about other drives such as hunger?

Click

What is the set point for food? We require many different types of nutrients, but there don't appear to be simple set points for sugars and fats in the same way there is for temperature, so the drive reduction model can't fully explain how hunger and feeding work. Another issue with this model is that some

strong drives (like sex drive) don't appear to be driven by physiological set points at all.

Slide 9: The Optimal Arousal Model

The optimal arousal model of motivation argues that humans are motivated to be in situations that are neither too stimulating nor not stimulating enough. Sort of the "Goldilocks principle", not to boring, not too stimulating, but just right.

Click

Support for this model is supported by observations of people in the 1950's who volunteered to undergo SENSORY DEPRIVATION, usually achieved by having them spend long periods of time in a sensory deprivation or ISOLATION tank. Most volunteers could not remain in sensory deprivation for more than two to three days even if they were paid double. Long-term deprivation led to "pathology of boredom" and sometimes resulted in hallucinations and cognitive impairment. The interpretation from these findings was that the brain will CREATE stimulation if it's lacking, and is the foundation of the optimal arousal model.

Slide 10: Yerkes-Dodson Law

The Yerkes and Dodson Law is not strictly related to motivation, but it uses the idea of optimal arousal to explain effects on performance.

This law states that moderate levels of arousal lead to optimal performance.

Click
At low levels of arousal,
Click
such as during boredom or apathy people show very poor, or even NO performance on a given task. At high levels of arousal such as with states of panic,
Click
people's task performance on just about anything is quite bad. There is a sweet spot in the middle where just the right amount of alertness leads to the best task performance.
Yerkes and Dodson also found in their experiments that optimal arousal effects differ with task difficulty. More difficult tasks shift the curve to the left, meaning levels of anxiety are particularly damaging for novices.
Yerkes and Dodson's research was done over 100 years ago in mice, and although there has been some support from human studies, this phenomenon is not really a law.
Another criticism is that performance IS NOT EQUAL TO MOTIVATION, but motivation and performance often go hand in hand (think back to the last time you wrote an important exam).

Slide 11: Maslow's Hierarchy of Needs

Finally, we come to Abraham Maslow's Hierarchical Model of motivation which attempts to explain basic biological needs, such as food and safety as well as needs not directly tied to survival, such as personal achievement. Maslow's model organizes all of these diverse needs into a hierarchy according

to priority, arranged in this pyramid. At the bottom
Click
are physiological needs, such as the needs for food, water, and adequate body temperature.
Click
On the next level are security needs, which include the needs for physical security, stability, and safety from threats.
Click
Next are social needs, including the desire for family, friendship, and belonging to a social group.
Click
The fourth level in Maslow's hierarchy of needs is the need for esteem, the need to appreciate oneself and one's worth.
Click
And, at the top of the pyramid is self-actualization, the full realization of one's potential.
This model is useful in that it gives organization to a diverse collection of motivated behaviours. It suggests that basic needs must be met first before progressing up the hierarchy. However, this model doesn't have a lot of scientific support. Critics of Maslow's model point out that belongingness in social species such as humans is critical for many physiological needs, and therefore this hierarchy might not be accurate.
However, Maslow's pyramid attempts to explain motivation based on both needs, at the bottom, and wants at the top.

Slide 12: Theories of Motivation

So there you have it, a messy, complicated, but hopefully interesting introduction to the psychology of motivation.

To return to video, click here

Tricky Topic: Hunger

Slide 1: Hunger

Hunger is a fundamental drive, since it keeps us alive. If we weren't motivated to eat, we'd die after about a week or so. But, our relationship with hunger, feeding and food is quite complex. Even though, from a biological point of view, food is just fuel to keep our bodies working, we don't treat food as a simple energy source. For example,
Click

Slide 2: Mmmm

...some (or even all) of these foods might look IRRESISTABLE to you. OR you might be the rare person who doesn't like popcorn, pizza, or pancakes, so you might choose NOT to eat these foods if offered. Maybe you love pizza, but HATE black olives.
But what if you were REALLY, REALLY, REALLY hungry? Would you eat whatever food is available, even black olives? What influences your decision? It turns out that there are two main types of influences on hunger.
Click

Slide 3: Influences on Hunger

The first is biology, which is all about meeting energy requirements.

Click

The second main influence is psychology, which concerns how our experiences, memory, expectations, and thoughts control the types and amounts of food we eat. We'll start first

Click

with biological influences. So where are the hunger control centres?

Slide 4: Stomach

Well, one sensible starting place is the stomach, which is hard to see in this illustration with the rest of the internal organs in the way, but it's located here.

Click

If you don't eat for a period of time, you might have noticed your stomach growling. Is that a NECESSARY part of the hunger response? The short answer is no, not really, but let's look at some of the evidence that supports this conclusion.

Click

There are sensory nerves that allow the stomach to communicate with the brain, so it seems possible that these might be responsible for signalling when its empty.

Click

However, if these nerves are cut surgically, individuals still feel hungry and full. Some other evidence comes from research on people who have undergone gastric bypass, where the majority

of the stomach is removed, and these individuals still have feelings of hunger.

Slide 5: Blood

Things circulating in the bloodstream are important signals to our energy status. We absorb three main types of energy sources from the food we eat fat, protein, and carbohydrates. Carbs are a readily available source of food energy since they can be broken down fairly easily into simple sugars.

Click

One bloodborne substance that appears to be important in hunger is glucose.

Click

When we go without food for a long period of time, our blood glucose levels drop, and this is detected by special areas in the brain involved in hunger.

Slide 6: The Hungry Brain

The hypothalamus, which is located right about here in a human brain, has an important role in controlling hunger. Since hunger is very similar in humans and other animals, a lot of what we know about the hypothalamus and feeding is from studies with rats

Click

The hypothalamus is located roughly here

Click

In real life, a rat brain looks like this from the side view,

Click

but if we flip the brain so that we're looking up at it from underneath,
Click
the hypothalamus is located in this region.
Click
If we were to take a section through this part of the brain and lay it flat so we can see the structures inside...
Click

Slide 7: Hypothalamic Feeding Areas

...it looks like this. The hypothalamus is down here
Click
at the bottom of the brain.
Click
This darkly coloured region is a collection of neurons that make up the ventromedial hypothalamus,
Click
which reduces feeding by promoting feelings of satiety, in other words feeling full. This part of the brain stimulates the SYMPATHETIC NERVOUS SYSTEM, responsible for FIGHT or FLIGHT functions, and destruction of this area leads to overeating and weight gain.
The region here at the sides of the is called the LATERAL HYPOTHALAMUS
Click
and it is involved in promoting feeding. When this area is stimulated, animals IMMEDIATELY feed, even if they've already eaten.

Slide 8: Hormones/Neurochemicals

It turns out that there are a bunch of chemical messengers that are involved in hunger and satiety (inhibiting feeding). These all communicate, usually directly, with the hypothalamic areas just described. Neuropeptide Y is one of the most potent appetite stimulators ever discovered, since if it's introduced into the brain of a lab rat, it will immediately eat, even if it has just eaten a meal. Orexin, ghrelin, melanin, and the endocannabinoids (which bind to the same receptors as marijuana) are all appetite stimulators

Click

that promote feeding.

On the other hand, there are also a ton of chemical messengers that reduce feeding

Click

Insulin (which is released when we eat carbohydrates) acts on the hypothalamus to inhibit feeding. Leptin, released from fat cells also acts on the hypothalamus to reduce food intake. Peptide YY and cholecystokinin (known by its abbreviation, CCK) are chemical messengers released from the gut organs in response to food intake, and they reduce feeding as well.

So clearly there are a lot of checks and balances on feelings of hunger and satiety, so it makes you wonder why anyone would over OR under eat. There must be something more to this story.

Slide 9: Influences on Hunger

Even though our biology is wired for us to eat when we require

energy, and stop when we have enough, our experiences have a huge effect on feeding. So let's look at some of the psychological influences on feeding.

Slide 10: Food Preferences

Here's a quick test. Which would you prefer to eat, a banana from the bunch on the left or the right? Most people will choose the nice, clean yellow bananas. Why? They look much fresher and probably taste better. The bananas on the right are probably all soft and squishy. All of these bananas shown here are perfectly fine to eat, I know because I ate them. However, we have a bias to fresh-looking foods. It's not an accident that we eat very few blue-coloured foods, since moldy food is blue.

Click

Let's return to some of the foods I showed earlier. Do these appeal to you more than these?

Click

How hungry would you have to be to eat raw oysters? What about brussel sprouts? Black licorice? These are amongst the top 25 most hated foods, according to a quick search on Google. What is it about these foods that turns people off? They all have nutritional value, so can fulfill biological needs for energy. Is it because they are unusual? Or do they actually taste bad?

A HUGE factor in food preference is prior exposure in our family or culture, and an enormous impact on what we choose to eat.

Slide 11: Conditioned Hunger

As Pavlov's research on learning showed, signals outside the body can have a strong impact on the digestive system. He taught dogs to drool in response to a bell by pairing the sound of the bell with meat, which dogs instinctively drool for.

Cues associated with food through classical conditioning can trigger hunger in people too.

Click

If you habitually check the time to see when to break for lunch, as millions of people do every day, the clock face showing that's it's lunch time becomes like Pavlov's bell, it becomes a PREDICTOR of food availability

Click

and triggers feeling of hunger

Click

Using external cues to tell us when we're full can be problematic, since internal cues are much better indicators of energy need. How do you know when YOU'RE hungry or full? Do you listen to your body or look at your plate? The "finish your plate" rule is certainly a good idea to prevent food wastage, but some believe that it might promote overeating and obesity.

Click

Slide 12: Expectancy

Research by Brian Wansink's laboratory suggests that we become so used to using external cues that we ignore our internal signals. In other words, we eat with our eyes, not with

our stomachs. Wansink did a clever experiment where he gave two groups of participants a bowl of tomato soup and told them to enjoy as much as they wanted.
Click
Half of the participants ate from a special refilling bowl, which was connected to a heated container of soup hidden from view. So their eyes were tricked into thinking they were eating a normal bowl of soup. Afterwards, both groups gave very similar estimates of how much they thought they ate, but when this was compared to how much they actually ate,
Click
those in the refilling soup group consumed much more than the controls.

Slide 13: Hunger

Therefore hunger is controlled by BOTH biological and psychological factors. Although our digestive and nervous systems give us plenty of signals about when we should eat, AND when we should stop, our personal histories and experiences can override these signals. The interplay between biology and psychology are a huge part of maintaining energy needs and body weight.

To return to video, click here

Tricky Topic: Theories of Emotion

Slide 1: Theories of Emotion

Feelings are very powerful experiences, and there has been a lot of argument and disagreement about HOW they're produced. Where do subjective feelings come from? There are four prominent theories that have tried to explain this.

Slide 2: James-Lange Somatic Theory

First is the James-Lange Somatic theory, named after William James and Carl Lange. The term SOMATIC means body, which is the starting point of the creation of feelings according to this view. Basically the idea is that we experience emotion internally IN RESPONSE TO physiological changes. Keep in mind that this should happen for positive emotions as well, but it's much easier to demonstrate with negative emotions.

Say you see something frightening, like approaching zombies. The James-Lange theory suggests that FIRST,

Click

your body reacts by pumping up heart rate and respiration and other physiological changes, and this gets detected by the brain and creates a subjective emotional experience,

Click

in other words, feelings of fear. This theory is somewhat counter-intuitive, because it places FEELINGS last as a response. This theory is supported by the fact that our bodily responses can FEEDBACK to our experiences. In fact, people report feeling happier when holding a pen in their teeth (which activates smiling muscles) compared to holding a pen in their lips, (which activates frowning muscles). Give it a try and see how YOU feel.

Slide 3: Cannon-Bard Theory

The Cannon–Bard theory, named after Walter Cannon and Phillip Bard, states that feelings occur independent of emotional expression, in other words, there is no correlation with physiological state and emotional responses happen in parallel. Support for this theory comes from research showing that there are multiple parallel pathways in the brain that respond to emotional triggers,

Click

and that the pathway through the thalamus leads to a whole host of physical and physiological changes,

Click

while the pathway through the cortex is important for the subjective emotional experience.

Slide 4: Two-Factor Theory of Emotion

The two-factor theory of Schacter & Singer states that our conscious experience of emotion is determined by both an awareness of what's happening in the body

Click

AND a cognitive appraisal of the situation.

Click

In other words, we make a decision about which emotion we're experiencing based upon the explanation that best fits the circumstance.

Click

So, if you see approaching zombies you don't just robotically respond with fear, rather you look at what's happening in your

body AND also make some sense from what's happening in the situation. Sometimes you might not be all that afraid of zombies.

Click

For example, if you saw approaching zombies on your favourite zombie series, you might feel your heart racing, BUT this would also paired with an appraisal of the situation. In my case, because I'm a big fan of the zombie genre, this would lead me to feel very happy, rather than terrified (which is how I'd feel if I ever saw the zombies in real life).

Slide 5: Cognitive-Meditational Model

In contrast to Schacter and Singer's two-factor theory, Lazarus proposed the cognitive-mediational theory which places cognitive appraisal as the FIRST step in the emotion process. Once the individual makes an appraisal of the situation and ability to cope

Click

this can then trigger all of the emotional responses.

This theory is supported by the fact that different people respond to the same antecedent stimulus (in this case zombies) with different reactions. Lazarus showed that the appraisal process has a big impact on whether a stimulus triggers and emotion and how intense it will be.

Slide 6: Theories of Emotion

Although neither of these theories explains all aspects of subjective emotions, each has its strengths and weaknesses so

modern views of emotion incorporate evidence from all of them

To return to video, click here

Tricky Topic: The Emotional Response

Slide 1: The Emotional Response

For many, many years researchers argued over what best defines what an emotion.

Are facial expressions the most important response to an emotional event – certainly they change with emotional states. What about the feelings emotions trigger inside, are those the most relevant responses? Or is it instead the physical changes in the body, like a racing heart, that tell us about emotions. Researchers came together on this fairly recently and now recognize that we can best understand emotions by considering the MANY responses that accompany them. So the modern view is to leave nothing out and to view emotion as a process.

Slide 2: The Emotion Process

So let's take a quick look at the EMOTION PROCESS, since emotional responses are the end result.

First there's some sort of antecedent event, something that TRIGGERS the emotion. There are lots of examples, for me a seeing a puppy or kittens automatically makes me happy. So these stimuli are ANTECEDENT to the emotion of

happiness for me. Other antecedent events, such as an upcoming exam might invoke feelings of panic or anxiety for some people, others get totally freaked by spiders. These stimuli are antecedent to the emotion of fear.

What all of these antecedent events all have in common is that they prompt us to make an appraisal

Click

which is the next step in the emotion process where we make sense of the thing we have encountered.

Depending on the results of the appraisal there is an emotional response

Click

which is actually a collection of responses by the body and brain. These can be categorized as PHYSIOLOGICAL CHANGES, BEHAVIOURAL/EXPRESSIVE CHANGES, AND SUBJECTIVE CHANGES, which will be the focus of this tricky topic.

Slide 3: Three Response Components

These three changes represent the body's response to an emotional event. They each have a different function to help us deal with emotional situations.

Physiological changes are changes in the body that come with emotions like changes in heart rate.

Behavioural-expressive changes involve observable behavioural responses, the most obvious of these in humans are facial expressions.

Subjective emotional experiences are what we call FEELINGS

Slide 4: Physiological Changes

Physiological changes are mainly controlled by the AUTONOMIC NERVOUS SYSTEM which has two divisions, the sympathetic

Click

also called fight or flight and whose neurons exit from the middle of the spinal cord

Click

and the parasympathetic

Click

also known as rest and digest and originates from cranial nerves and the posterior spinal cord

Click

Fight or flight responses get activated with INTENSE emotions, like terror or excitement. There are a whole host of autonomic changes, but the ones we notice most often are racing heart and increases in respiration.

The rest and digest responses are activated when we're relaxed and content, and these are less noticeable because heart rate and respiration relax.

All of these responses are involuntary so we don't have a lot of conscious control over them.

Slide 5: Behavioural-Expressive Changes

The behavioural-expressive changes involve observable body movements, and of course what we humans notice most is what happens on the face. We're are wired respond to faces; newborn babies even mimic the facial expressions of adults.

But how can we study these facial expressions, how do psychologists manipulate and measure them?
Click
The Facial Action Coding System (FACS) is a widely used method developed by emotion research Paul Ekman. He had volunteers move different combinations of facial muscles, and had coders score all observable muscular movements possible on the human face.
He found that certain combinations of muscles were interpreted as specific emotions by others who observed them. It's widely accepted that these behavioural changes in the face are important for communicating emotional states, and cross-cultural research indicates this is universal.

Slide 6: Emotional Communication

Some other interesting research on the facial action coding system has revealed that true and fake emotions are expressed differently on the face. Which smile looks genuine, the one on the left or the one on the right? Most people would choose the one on the left. This smile is called a Duchenne smile,
Click
after the French anatomist who first described it. Why was an anatomist interested in smiling? Well. it turns out that genuine happy smiles involve contracting not only the muscles of the mouth,
Click
but also the band of muscles that surround the eye.

Slide 7: Emotional Suppression

Because facial expressions are used to display emotions to others, sometimes we suppress them when we want to conceal them. The term poker face refers to a blank expression that can't be read by others. We have much more control over behavioural emotional responses than physiological changes.

Slide 8: Subjective Changes

Subjective changes are internal, personal responses and are what we typically refer to as FEELINGS.

Click

Each emotion creates a unique feeling – anger FEELS different than happiness. In fact, our internal experiences help distinguish different emotions. For example, both fear AND anger increase heart rate, but they are experienced very differently and triggered by different antecedent events.

The subjective nature of feelings means that the only way that we can measure them is to ask people, using a self-report.

Click

So, this aspect of emotion can really only be studied in individuals with verbal ability.

Slide 9: Measuring Emotional Responses

Given the diversity of reactions to emotional events, measuring emotional responses comprehensively requires a large toolkit. Physiological changes are usually detected by measuring some aspect of autonomic nervous system function associated with arousal,

Click

such as heart rate, blood pressure, and respiration. The polygraph or "lie detector" test is based on the assumption

click

that telling a lie creates anxiety or tension. Although the liar might try to hide this tension by altering facial expressions and movements, it's difficult to control the what's happening inside the body.

Click

Behavioural responses can be measured by observing an individual under different emotional conditions, and if this is done in humans, facial expressions are the easiest behaviour to detect. Although facial expressions of emotion appear to be universal across all humans, we can easily exaggerate or suppress our emotional displays, and therefore they might not be as accurate a predictor of emotions compared to physiological responses.

Click

Subjective feelings are measured by self-report, usually with some sort of rating scale for intensity of different emotions. One issue with this is that non-verbal individuals,

Click

such as babies and animals, cannot complete self-reports so we infer how they're feeling by other behaviours.

Slide 10: The Emotional Response

So the emotional response is multi-faceted and complex, and still not completely understood.

To return to video, click here

Tricky Topic: Freud's Theory of Personality

Slide 1: Freud's Theory of Personality

This Tricky Topic will focus on Freud's theories and evaluate the useful, and not-so-useful contributions to the study of personality. Before we delve into Freud, let's review what's meant by this term.

Slide 2: Personality

Psychologists define personality as unique and enduring set of behaviours, thoughts, feelings, and motives that characterize an individual. So personality is what makes us US and not someone else. According to this definition,

Click

personality stays relatively stable over time and across different situations. This is really useful to us; we use personality information all the time because it allows us to predict what people like and dislike, and how they'll behave under certain circumstances. When we're buying gifts, planning a party, or choosing a romantic partner, what we know about others' personalities guides our decisions.

Let's look at an example.

Click

Both of these kids shown here on the right were just told by their parents that they are moving across the country and will

have to go to a new school and make new friends. Which girl will feel most distressed by this? Most of us would choose the girl on the top. And if these images are indeed true reflections of their personalities, we'd probably be right.

So where does Freud fit into all of this? His perspective on personality is closely tied to his approach to treating mental illness, which is what he's most famous for.

Slide 3: Freud's Legacy

Freud's biggest legacy is his creation of the field of psychoanalysis, a strategy of using *talk therapy* as a way to modify behaviour. Freud's name for many people conjures up an image like this one:

Click

Someone lying on an armless couch, revealing their innermost desires to a therapist who sits in the background, taking notes and making interpretations. Although Freud's exact therapeutic techniques aren't widely used today, this treatment approach is one of the foundations of modern clinical psychology.

Freud's approach to treatment rested heavily on the assumption that a big part of who we are comes from our early life experiences,

Click

which can result in a unique and enduring set of behaviours, thoughts, feelings, and motives that characterize an individual; keep in mind that this is our working definition of personality. So let's look at Freud in more detail.

Slide 4: Sigmund Freud (1856-1939)

Sigmund Freud was an Austrian neurologist and one of the best known figures in modern psychology.

Click

Freud's clinical practice was heavily influenced by a fellowship to study with French neurologist Jean-Martin Charcot in 1885. Charcot was exploring hypnosis as a way to treat patients with what was known at the time as hysteria, a disorder of physical complaints with no known cause.

Click

From this Freud became interested in the power of the unconscious mind, and he developed techniques, including dream analysis and free association to unlock the mind's unconscious motives.

Slide 5: Freud's Idea of the Mind

The foundation of Freud's ideas about personality and mental illness was his representation of how the mind is structured.

Click

He stated that the mind has three layers of consciousness, the conscious (which is whatever is going on in your mind right now), the preconscious (which are things that can be called into conscious thought), and the unconscious mind (which is all the stuff that sits outside conscious awareness, but can have powerful effects on thought and behaviour). Freud believed the unconscious mind was a largest component of consciousness.

Click

In addition to these difference levels of consciousness, Freud also hypothesized that there are three distinct components or PROVINCES

Click

that control impulses that arise from the unconscious. According to Freud,

Click

the ID is the first to develop and is the seat of impulse and desire. It operates on the pleasure principle and guides behaviour to self-gratification.

Click

The EGO, is the next to develop, around the 1st year of life and operates on the reality principle, and attempts to make realistic attempts to obtain self-gratification. Unlike the ID, the ego has direct contact with the outside world.

Click

The last province to develop is the SUPEREGO, which develops around ages 2 or 3 and operates on the moral principle and evaluates our actions in terms of right or wrong. According the Freud, the superego is in constant battle with the ID to try and control unconscious urges and desires.

So how does this influence personality?

Slide 6: Individual Differences

According to Freud, in a psychologically healthy person

Click

the EGO strikes a balance between the urges of the ID and the control exerted by the SUPEREGO. In contrast,

Click
an overly controlling person has a relatively large SUPEREGO that represses the urges of the ID. On the other hand, in someone who is an overly impulsive person,
Click
the ID predominates so the individual seeks pleasure without the right balance of moral guidance.
Freud hypothesized that dealing with the impulses of the id can cause problems, so…

Slide 7: Dealing with the ID

…he theorized that mind uses DEFENCE MECHANISMS to protect itself from the threat of anxiety-promoting thoughts or impulses that arise from the id. Freud stated that these defence mechanisms
Click
OPERATE UNCONSCIOUSLY and DENY or DISTORT REALITY in some way.

Slide 8: Defence Mechanisms (Anna Freud)

Although these were first proposed by Sigmund Freud, they were fleshed out by his daughter, Anna.
Click
The best described of the defence mechanisms is repression,
Click
which is keeping unpleasant thoughts, feelings, or impulses out of consciousness awareness.
Click

Reaction formation is turning an unpleasant idea, feeling, or impulse into its opposite.
Click
Projection is described as denying or repressing ideas, feelings, or impulses and projecting them on to others.
Click
Sublimation is expressing socially unacceptable impulses into a socially acceptable way and
Click
fixation is being preoccupied with an earlier stage in development.
These defence mechanisms are very popular since it's quite easy to come up with examples. Take reaction formation, for instance. Let's say someone is uncomfortable about the fact that they might have homosexual tendencies (maybe because of way they were raised), so they deal with this conflict by flipping it around and outwardly expressing homophobia. On the surface this appears to make sense, but these defence mechanisms are very difficult to test since they deal with thoughts that are unconscious AND subjective, so they're VERY DIFFICULT TO MEASURE. Furthermore, there's no solid evidence that the id, or other provinces, exist in the mind, so theories that grow from this assumption are not well supported.

Slide 9: Psychosexual Stage Theory

Probably one of the most controversial ideas of Freud's is his PSYCHOSEXUAL STAGE THEORY, summarized in this

table. Basically Freud hypothesized that personality develops in stages throughout early life, and that each age is concerned with pleasure-seeking from a particular area of the body. The first stage, according to this theory, is the

Click

oral stage that occurs between birth and 18 months. Children at this age spend a lot of time putting things in their mouth and Freud believed that fixations resulted in excessive behaviours in adulthood that involve the mouth, like smoking and sarcasm.

Click

The ANAL stage is next from the ages of 18-36 months, where children spend a lot of time learning how to potty train; fixations on the anal region at this stage results in obsessive and compulsive cleaning behaviours (that's where the term anal retentive comes from). The other stages are equally bizarre, but more importantly, from a scientific point of view they're not grounded in sufficient evidence.

Click

In fact, since these theories were developed, there has been absolutely NO support for this view of personality. It did open the door however, for the idea that early life experiences can affect thought and behaviour in adulthood.

Slide 10: Summary

So to summarize, Freud had a powerful influence not just on the study of personality, but also clinical psychology. If we look at the evidence that has amassed since Freud proposed these

theories,
Click
there's certainly evidence for a powerful role of unconscious thought processes, which has been embraced by cognitive psychologists and rebranded as implicit thinking. Also
Click
the role of early life experiences in adult behaviour has been supported by research in
Click
behavioural neuroscience with the field of epigenetics which has revealed long-term changes in gene expression as a result of early life events
Click
This idea has also been influential in clinical psychology with studies of the effect of early life trauma. However,
Click
the psychosexual stages of development theory, which is the theory most directly tied to ideas of personality, have not been supported with evidence.

Slide 11: Freud's Theory of Personality

Sigmund Freud is arguably psychology's best known AND most controversial figure, but his ideas have contributed more to literature than they have to the study of personality. He introduced some ideas that did NOT withstand later scientific scrutiny, but he did make some important contributions to our understanding of the influence of early life events and the role of the unconscious.

To return to video, click here

Tricky Topic: The Big Five

Slide 1: The Big Five

The Big Five model has been the most influential in guiding modern research on personality; most studies of personality use measurement tools based on its assumptions. Also called the FIVE FACTOR MODEL, it explains personality in terms of five broad categories of traits. This might seem limited to measure something as widely diverse as personality, so we'll first look at how this idea developed.

Slide 2: What Makes up Personality

Early influential views of personality; psychoanalytic, humanistic, and social-cognitive emphasized the causes of personality but the tools to measure it were vague or lacking, which makes these theories tricky to research scientifically. One attempt to remedy this is to define personality in concrete terms so it can be measured. One way to do this is to look at the building blocks of personality.

Slide 3: Trait Theories

Trait theories of personality differed from others n that there was a much greater emphasis placed on measurement. This approach was strongly guided by the LEXICAL HYPOTHESIS

Click

which suggests that we can turn to language to determine what makes up personality.

Click

The most ambitious attempt to apply the lexical approach was carried out in the 1930s by Gordon Allport and Henry Odbert using a good, old-fashioned dictionary. They started off looking for adjectives that described a person and got almost 18000! So, they took out words that dealt with short term moods or emotions, and that left just over 4000. They eventually whittled it down to under 10, reasoning that most people can be described with 10 traits, but there wasn't any HARD scientific basis for this.

However, this was an important start and got others thinking about how to whittle down the many traits we have words for into a manageable list.

Slide 4: Let's Try It!

So, let's try the lexical approach to personality. Pause this video and go get a piece of paper and something to write with. Ready? I'm going to give you 30 seconds to write down some adjectives that can be used to describe someone's personality, in no particular order, just write down as many as you can. Ready? Go.

Click

Ok, let's compare our notes

Click

So here are some items from my list. Did you have any items similar to these? You can group related words into categories

Click

With these words, I came up with four clumps, and what I noticed about them is that some of my clumps were on opposite ends of a spectrum,

Click

with some being high and others low for a particular trait.

Click

This approach is conceptually easy to do, but very cumbersome given the huge numbers of descriptive words. Keep in mind that we only took 30 seconds to devise our lists. So, thankfully we have nerds called statisticians who love to analyze large sets of data, so they had people rate themselves on a scale for lots of different traits and crunched the numbers using a statistical technique called factor analysis

Click

to reveal FIVE clusters or factors capturing descriptive personality words. These can be remembered easily using the mnemonic OCEAN,

Click

for Openness, Conscientiousness, Extraversion, Agreeableness, and Neuroticism. Let's look at these factors in a bit more detail.

Slide 5: The Big Five

Keep in mind that each of the Big Five traits is made up several smaller building blocks, but descriptions of traits at the high and low ends of each one is outlined here.

Click

Openness describes how interested someone is in new experiences and ideas and how imaginative, original, and curious they are.
Click
Conscientiousness refers to how planned, organized, orderly, hard-working, controlled, punctual and ambitious someone is.
Click
Extraversion refers to how sociable, active, outgoing, and confident someone is.
Click
Agreeableness refers to how friendly, trusting, generous, and good-natured someone is.
Click
Neuroticism refers to how anxious, tense, emotional, and high strung someone is.
Click
Let's look at one of these in more detail.

Slide 6: Dimensional Measurement of Extraversion

So, when measuring where someone would fall on one of these dimensions, researchers ask lots of questions and get people to rate how much they agree with statements describing themselves. These three statements here measure the dimension of extraversion, which I pulled from a larger Big Five questionnaire: READ THEM. Someone who is private and introverted might answer these questions like this
Click
Someone who is really extraverted might answer these same

questions like this

Click

However, most people aren't EITHER introverted OR extraverted, most of us would likely answer the questions somewhere in the middle of the range of this dimension.

Click

By looking at each dimension of the Big Five, these self-reports of personality can be quantified.

Slide 7: The Big Five in the Population

If we look at people's scores for extraversion in a large population, there are a few people at the extremes,

Click

but most of us are in the middle. The same is true for neuroticism, which refers to emotional instability

Click

Some people are low in neuroticism, while others are high on this trait, but most of us fall somewhere in the middle. One interesting thing about the Big Five dimensions is that, statistically, they all appear to fall along this NORMAL DISTRIBUTION.

The Big Five dimensions are more of a taxonomy, or categorization scheme, than a theory. This model has been criticized because it mainly DESCRIBES but does not explain personality. However, the model certainly allows people to test theories that DO try and explain personality, since scores on these traits are associated with particular behaviours.

Questionnaires that assess the big five traits SHOULD be associated with behaviours relevant to that trait.

Slide 8: Big Five in Social Media

This study surveyed over 66 000 Facebook users who completed the revised NEO personality inventory, called the NEO-PI-R for short, and compared this to words in users' status updates.

Click

These word clouds were created for participants who scored high on extraversion on the left and those that scored low on this trait on the right. The size of the font shows the strength of the correlation between use of the word and extraversion scores

Click

while the colour coding shows the relative frequency of the word use, with red indicating higher use

Click

If you take a moment to look at the word clouds, it's clear that extraversion is associated with different language in status updates compared to introversion. For instance, for intraversion note use of words like

Click

don't, didn't, doesn't, and isn't, whereas these words are rare in the extroverts' statuses. The researchers suggest that the use if these negative action words align with differences in the need for stimulation at the extremes of this trait. Given the large sample size and the fact that it was drawn from a wide sample

of Facebook users, this provides support that the Big Five traits are capturing a meaningful representation of personality.

Slide 9: The Big Five

So the Big Five Model has given us a reliable way of measuring personality and is much less subjective than the methods first developed by Freud, which relied on interpretation of the researcher. It also appears to capture many of the aspects of personality, and so the BIG FIVE model remains the most influential in modern research on personality.

To return to video, click here

Tricky Topic: Fundamental Attribution Error

Slide 1: Fundamental Attribution Error

How we attribute the causes of others' behaviour colours how we perceive and ultimately judge them. It turns out that when trying to figure out others' intentions, we have tendency to process information in a biased way, and SOMETIMES leads us to make mistakes. This is sooo common that it's called the FUNDAMAENTAL ATTRIBUTION ERROR, which will be the focus of this Tricky Topic.

Slide 2: Attributions

So what are attributions? Quite simply, they are explanations

we make for causes of behaviour. These are also sometimes called causal inferences.

Slide 3: Example

So here's an example. You're bombing along a side street on your bicycle, feeling the wind in your hair and, ALL OF A SUDDEN out of nowhere some guy comes racing along and cuts you off....

Click

...forcing you to slam on your brakes and almost fall head over heels. How would you feel? Scared, probably. Angry, definitely. What's your gut instinct about this guy?

Click

Do you explain his behaviour like this,

Click

"that guy's a total jerk", how did he get his license? If so, you've made a dispositional or internal attribution for his reckless behaviour. Or rather, do you explain his behaviour by looking at factors outside of his personality,

Click

considering that he might have an emergency situation that requires him to drive fast and furious to help someone. If this is where your mind takes you, you've made a situational or external attribution.

Slide 4: Attributions & Social Judgements

So why does this matter? It matters a LOT because how we make attributions is a big part of what we use to make

judgments. So let's look at the impact of making dispositional and situational attributions when explaining the causes of positive and negative behaviours. If someone does something positive and we figure it's due to something internal to that person,
Click
we're probably going to like that person and think they're kind or generous. On the other hand, if someone does something negative and we attribute that to something internal to that person,
Click
we're probably NOT going to like that person very much at all. We might think they're mean or cruel or a jerk. If someone does something positive however, and we think the cause of this apparently kind behaviour is due to the situation,
Click
we probably won't like this person very much. We'll think that they did this nice thing just to get ahead or for selfish reasons. And lastly, if someone does something negative that we this was caused by the situation,
Click
we might not feel so judgy toward that person. Even though we might not admire that person, we probably won't feel really negative about them.
So when do we use dispositional and situational attributions?

Slide 5: Self-Serving Bias

Now when it comes to our own behaviour, we usually explain

it in a way that makes us look good and feel better about ourselves.
What if YOU were the person driving like a jerk? How would you explain the cause of your own negative behaviour?
Click
Are you likely to use a dispositional attribution and admit we're being a jerk? Or rather
Click
we more likely to use a situational attribution and blame it on our circumstances? It turns out the most of the time we use the self-serving bias when it comes to our own behaviour.

Slide 6: Attributions & the Self-Serving Bias

So if we return to this table
Click
we're more likely to use dispositional attributions when we're explaining our own POSITIVE behaviour (I donated to that charity because I'm a nice person) but situational attributions for our own NEGATIVE behaviour (I cut that cyclist off because I had an unusual situation).
So what do we do when we're explaining others' behaviour?

Slide 7: Fundamental Attribution Error

Something very different happens when we evaluate others' behaviour. We have a tendency to rely on dispositional rather than situational explanations.
Click
In other words, when viewing others' behaviour,

Click

we're likely to pay most attention to the actor and ignore the stage. This tendency is SOO strong, that's referred to as FUNDAMENTAL and because it often leads us to make mistakes, therefore this is referred to as the fundamental attribution error.

Click

So our biases can influence how we evaluate others, so keep this in mind the next time you give credit, or blame, to someone else.

To return to video, click here

Tricky Topic: Cognitive Dissonance

Slide 1: Cognitive Dissonance

One of the most surprising and powerful forces for attitude change is a phenomenon called cognitive dissonance, first proposed by psychologist Leon Festinger in the late 1950's.

Slide 2: The Need for Internal Order

Although we're not often aware of it, we humans have a strong need for internal order and consistency. We like to see ourselves as sensible, rational, and reasonable people. But when we're faced with evidence that contradicts this, it makes us feel uncomfortable, and we'll go to great lengths to reduce or avoid this feeling of discomfort. This was the focus of a classic experiment done by Festinger and Carlsmith in the 1950s.

They wanted to see what would happen when they tricked people into doing something that made them feel uncomfortable about their self-concept as a reasonable person.

Slide 3: Festinger & Carlsmith, 1959

What they did was set up a situation where people's opinions didn't match their behaviour. They had 60 participants complete an hour of tedious boring tasks. One of the tasks went like this:

Click

Participants were given a tray and 12 wooden spools. They were instructed to place the spools on the tray, take them off, and then put them on again. They were told this was a PERFORMANCE TASK, but in fact it was designed to be boring and tedious for the next part of the study. The participants were randomly assigned into three groups

Click

with different instructions: the control participants were business as usual, but the two experimental groups were asked if they'd be willing to help out with the next participant because the regular research assistant called in sick. Their job was to go into another room and tell a new participant (who was really a confederate of the researcher) that the task was actually really fun

Click

so they basically tricked them into telling a bald-faced lie. The $1 group were hired for the small sum of $1 to do this, whereas the $20 group got a whopping 20 bucks, which was a lot of

money back in 1959.

Then all groups were asked to rate their own enjoyment of the task (CLICK) on a scale from -5 (dull and boring) to +5 (interesting and enjoyable).

So how much did the three groups of participants ACTUALLY enjoy the task?

Think about that for a minute and make a prediction.

Slide 4: Results

The controls didn't lie, so they gave their true opinion of the task, and rated it slightly negatively, so this can be considered the baseline rating for the boring task. The interesting results are ratings by those who lied and said it was fun.

Click

Those that only got $1 for doing so, actually enjoyed the task, and on average gave it a positive rating. On the other hand

Click

the $20 group rated it close to zero, very similar to the controls.

At this point you might be thinking, wait a minute, why didn't the $20 group report the most enjoyment, after all, they got a lot of money! According to Festinger, these participants already HAD a fantastic reason for lying, they got twenty bucks! They didn't need to feel cognitively uncomfortable about lying because they had an awesome (but slightly unethical) reason for doing so.

Click

It was the $1 group who likely felt uncomfortable about lying, since they didn't really have a good reason for it.

Slide 5: Cognitive Dissonance

This feeling of mental discomfort that happens when we're faced inconsistencies in behaviours, thoughts, feelings, or values was coined COGNITIVE DISSONANCE by Festinger. Cognitive dissonance is not any type of discomfort, it's a cognitive tension that arises when we hold two (or more) contradictory beliefs, or if we behave in a way that that contradicts our beliefs.

According to this theory, when we're faced with cognitive dissonance, we can use one of three strategies to try and reduce it. We can

Click

1. Change the behaviour,

Click

2. change thinking to justify the behavour, or

Click

3. add a new way of thinking that IS consistent.

Festinger's participants in the $1 condition probably used the 2nd strategy, they had to come up with a good REASON for telling a lie.

Slide 6: Cognitive Dissonance & Smoking

Let's take smoking as an example. Everyone knows that smoking's bad for you, especially with the enormous warnings on cigarette packs. Canada actually has some of the most graphic warning labels, and tobacco manufacturers are required to display these on every pack. So why do people smoke in the face of this overwhelming evidence? As a former

smoker, I can tell you one reason is that it's REALLY hard to quit. So what goes on in the minds of smokers? They engage in a behaviour, sometimes 10 or 20 times a day that they KNOW is bad for them. This likely creates feelings of cognitive dissonance and as shown by research from Festinger and others, we do all sorts of things to make that feeling go away. Here are some strategies that smokers might use.

Click

They might change the behaviour and quit, which is the point of the warnings on the packages, in fact cigarette sales declined a bit after the warnings were introduced. BUT it's hard to quit so not everyone is capable or willing to do this. So,

Click

another way to deal with cognitive dissonance is to change the cognition surrounding the harms of smoking. Sometimes people cherry pick an example, like "My Uncle Ollie has been smoking since he was 10 and now he's 80 and healthy as a horse.

Click

Another way to deal with cognitive dissonance is to keep the original thinking (smoking is harmful) but to add a new cognition like, sure smoking is bad, but it helps me deal with stress and stress is MUCH worse for my health.

What this example shows is that sometimes it's easier to change the attitudes than it is to change the behaviour.

Slide 7: Dissonance & Attitude Change

So next time you're faced with a situation when what's in your

mind doesn't match your behaviour, take a minute to think whether you're changing your attitudes just to avoid feeling mental discomfort. You might benefit from taking a step back and determining if you're making the right decision.

Slide 8: Cognitive Dissonance

So in a nutshell, that's cognitive dissonance, one of the most peculiar but powerful forces for attitude change.

To return to video, click here

Tricky Topic: Informational and Normative Influences

Slide 1: Informational & Normative Influences

Before talking about informational and normative influences, let's first talk a little about conformity. Let's consider a couple of examples.

Slide 2: What Would You Do?

Say you're sitting in a classroom, listening to a lecture on statistics. All of a sudden, an alarm goes off

Click

You're not sure if this is the real thing, so what should you do?

Click

In response to the alarm, everyone else in the class, including the lecturer, quickly heads out of the emergency door. What would YOU do in this situation? Do you stay put or do you

follow?
Click
Here's another situation. You're sitting in the audience at a concert you're not enjoying all that much. You went along with your friends because they talked you into it, but you're not really digging it. Once the last song is done, the audience rises for a standing ovation
Click
What do YOU do? Do you stay seated or do you stand up and clap with everybody else?

Slide 3: Conformity
IF in either of these situations you do what others are doing, you are conforming. Conformity is the tendency to adjust behaviour to what others are doing or to adhere to cultural norms.
There are two main reasons why people conform.

Slide 4: Reasons for Conformity
Sometimes we conform because others are a valuable source of information and appear to know what we're supposed to do. This is called INFORMATIONAL SOCIAL INFLUENCE and it's basically following the crowd because they're right.
Click
This is what makes us follow others in the first situation when the fire alarm went off.

The other reason we follow others is because we want to be

accepted and follow social rules. This is called normative social influence and is driven by the desire to be liked
Click
or at the very least, not to stand out. This is likely what makes us join in a standing ovation, even if we weren't impressed by the performance.
In the 1950's Solomon Asch set out to investigate WHY people conform. He designed a simple yet clever experiment to test the power of group pressure.

Slide 5: Solomon Asch's Study

He told participants they'd be doing a perceptual task judging the length of lines, as shown here. They had to match a standard line (shown on the left), to one of three comparison lines shown on the right. This is a pretty simple task with a glaringly obvious answer, but Asch rigged it so that this was done in a group of 6-9 confederates
Click
shown in black, and one actual participant, shown in red. There were several trials and everyone gave their answers out loud, which enabled Asch to manipulate group pressure.
Click
On some trials, the confederates were instructed to give the right answer.
Click
On other trials, the majority gave the wrong answer
Click
Asch referred to these as *critical* trials. The actual participant

was always one of the last to respond, so what did he do?
Click
Asch's results showed that the minority participant (guy) was often swayed by a unanimous, but WRONG majority.

Slide 6: Results

Let's have a look at how the minority participants did compared to controls, who did the line length judgements alone.
Click
Only 5% made mistakes when doing the task on their own, while
Click
76% made mistakes AT LEAST ONCE, when they did this task out loud with a group.
Now, knowing the % of people who caved in to the group doesn't really tell us how OFTEN they did it. It turns out that some of those who WERE swayed by the group made errors on lots of trials and others only once or twice. If we look at it as a percentage of the trials where errors were made,
Click
participants on their own only made mistakes on 0.7% of the trials,
Click
while in a group mistakes were made 37% of the time.
So, clearly, Asch showed that MANY people will be swayed by the group SOME of the time, even if they're clearly wrong. But was this because of INFORMATIONAL or NORMATIVE

influences? It's difficult to tell from these two conditions alone, but Asch added another condition to address this question.

Slide 7: Solomon Asch's Study

In this condition, after hearing the responses of the majority, our participant reported their answers in writing rather than out loud. That way, the group never knew what line the minority participant chose.

Therefore, if the participant was going along with the group because he figured they knew the answer, under these conditions the errors should be the same as the control group that did it on their own.

HOWEVER, if conformity was due to wanting to fit in, then the level of conformity on the critical trials should be much less for the written condition, compared to the out loud condition.

Slide 8: Results: Public vs Private

So what happened when people reported on the critical trials privately? If we look at data on the % of participants who gave a wrong answer,

Click

it was slightly lower in the written condition, 64% compared to 76, but this is still way more than the controls. However, if we look at the % of TRIALS where participants made errors,

Click

it was only 12% compared to 37..

So what does this all mean?

Slide 9: Informational & Normative Influences

These results reveal that when we're faced with group pressure, many of us will cave in. By comparing public and private responses, it appears that both normative AND informational forces were at work, although for this type of task, it was likely the normative influences that had the upper hand. Sort of like the standing ovation when you didn't enjoy the show.

In addition to collecting data on % who conformed and % of trials where people made errors, Asch later straight up asked these guys why they went along, even though the group was making obviously wrong answers. Here's some of what they said. *text on slide*

These statements SMACK of normative influence, motivated by fitting in with the crowd.

Slide 10: Informational & Normative Influences

So these bizarre findings from this simple experiment highlight that what the group thinks and does has a pretty big influence on how we behave.

To return to video, click here

Tricky Topic: Altruism

Slide 1: Altruism

Altruism is a fascinating form of prosocial or HELPING behaviour, and one of the most debated. We'll explore some of the theories and research on this fascinating topic.

Slide 2: What is Altruism?

Altruism is a SELFLESS form of helping, in which there's no obvious benefit to the helper, and often puts them at risk

Click

Altruism makes no sense from an evolutionary perspective. Darwin proposed that natural selection essentially chooses traits, and their genes, which enable an individual to survive and pass on their own genes. Therefore true selflessness, especially if it comes with risk as in this helping situation shown here, is difficult to understand. Individuals who help selflessly DECREASE their own survival changes, but there are lots of examples in humans and other animals, so altruism is a puzzle from this perspective.

As you'll learn, there are many different types of altruism. So although they're all examples of selfless helping, they have different underlying motivations.

Slide 3: Kin Selection

Kin selection is helping our relatives. This type of helping is thought to have an evolutionary mechanism, whereby the motive is to pass on genes, even in extreme cases where the helper themselves might not survive.

We certainly see this in humans, parents will go to extraordinary lengths to help their children

Click

This has also been extensively studied in other species, like bee.

Click

Guard bees act like bouncers to regulate who gets into the busy

hive, and research shows that being closely related increases the chances of getting in.

At first glance, this explanation FEELS wrong, because most people wouldn't explain helping family members as being motivated by genetics. I mean really, are these parents helping their children because they're thinking about their DNA?

Click

Are bees motivated by DNA?

Click

If you ask parents, they'd likely say their helping in motivated by love. Are bees motivated by love too. Who knows?

The fact that we're able to love enough to sacrifice ourselves for our loved ones FITS with the idea of kin selection, so we end up helping our genes if though our individual reasons have nothing to do with it.

Slide 4: Reciprocal Altruism

Reciprocal altruism is a different type of helping that looks like true selfless altruism. Basically it's tit-for-tat helping whereby we help others so that they might help us later. These monkeys will groom each other to remove bugs, and research shows that those who help most are also the greatest recipients of help from others. Reciprocal altruism can be explained in evolutionary terms because this motivation for helping promotes group connectedness and cooperation. Many social species show this type of helping behaviour.

You might have experienced reciprocal altruism yourself because advertisers and marketers KNOW that we have a

strong obligation to pay help back, even if we don't know people all that well. If you've felt pressured into buying something because someone has given you a sample, then that's reciprocal altruism at work.

Slide 5: Social Exchange Theory

This begs the question, is there such a thing as true altruism?
Social exchange theory states that our helping behaviour is the product of a cost-benefit analysis. In other words, we only help when the benefits outweigh the costs. In fact, reciprocal altruism can be explained in terms of social exchange, without the need for a genetic mechanism. There are often clear benefits to helping others, feeling good about yourself or building up favours you can call on in the future.
Social-exchange theory has no problem explaining selfish helping, like when someone makes a charitable donation so that they can claim it on their tax return. What about helping someone where there doesn't seem to be a clear benefit?

Slide 6: Empathy

One huge factor in helping behaviour is empathy, or the ability to share the feelings of others and understand their situations.
Click
The empathy-altruism hypothesis suggests that we help SELFLESSLY only if we can feel empathy for others.

Slide 7: Empathy and the Brain

So what does this look like in the brain? This study shown here

looked at how the brain responds when someone experienced pain themselves or observed a loved one in pain. They focused on two well-established pain circuits by looking at structures involved in both the sensory AND emotional aspects of pain. The design was pretty simple, the researchers recruited couples since they reasoned that romantic partners would feel strong empathy for each other. A female participant from each couple had their brain scanned with fMRI under three different conditions, a pain-free baseline which served as a control,

Click

while they received a 2 sec electric shock on their right hand, or

Click

observed their partner get the same shock.

The researchers looked at a number of brain areas, but they focused on two key pain areas:

Click

the anterior cingulate cortex (or ACC), which active during emotional pain, and the somatosensory cortex (or SI), active during physical pain. The results are expressed in the graphs as a change from baseline, pain-free activity on the y-axis on the left, while time is shown along the x-axis on the bottom.

Clearly, the ACC is active during self pain shown by the green line

Click

AND also during observed pain of a loved one, shown in orange.

Click

The somatosensory cortex, on the other hand, only showed elevated activity during self pain.
Click
This suggests that seeing others in pain activates SOME of the same pain circuits and being in pain yourself, and the authors of this study suggested that the emotional pain circuit is used as a basis for empathy. But WHY does empathy promote altruism?

Slide 8: Why Does Empathy Promote Altruism?

Researchers suggest TWO different underlying reasons to explain the empathy-altruism hypothesis.
Click
The first is called egoistic motivation, whereby empathy makes us feel distressed, and helping rewards us by reducing our own distress. We know from the previous study that watching another in pain activates emotional pain circuits, which generally doesn't feel so good.
Click
The other is called empathic motivation, whereby empathy promotes helpful behaviour solely to reduce the distress of another which is a reward in and of itself. This motivation is true altruism, and some researchers argue that it doesn't exist because we relieve our own distress or guilt through helping others when we feel their pain.

Slide 9: Altruism

So, is there anything as truly selfless behaviour? Some

researchers argue that most everything comes down to social exchange. This view for helping seems a bit cold and calculating, but it helps to explain how our feelings play a big role in helping behaviour.

To return to video, click here

Tricky Topic: The Stress Response

Slide 1: The Stress Response

Stress is unavoidable, throughout our daily lives we encounter a whole range of stressful experiences, from minor hassles to major threats. This Tricky Topic will focus on how our brain and body respond to stress.

Slide 2: What is Stress?

But first, what is meant by the term STRESS? It depends on your perspective. Engineers usually think of this as physical strain on a structure or process while physiologists often define it as a state that activates the body's "fight-or-flight" responses. Most psychologists define stress as an INTERNAL state triggered by situations that overwhelm our perceived ability to meet the demands (of that situation). Most of the time we can juggle multiple tasks just fine, but if we PERCEIVE that we have more demands that we can cope with, we can get OVERWHELMED and experience a state of stress.

Click

In exploring how we respond to stress, it's first critical that we

examine STRESSORS. Simply defined, a stressor is any event that triggers a stress response. Take a minute to think of some stressors that you experience day-to-day, pause this video and write them down.

Slide 3: Stressors

As you've likely just discovered from making your list, stress can be triggered by a variety of stressors, ranging from physically life-threatening events like your home catching on fire, to more psychologically distressing experiences like public speaking, or traffic.

Click

Generally, stressors fall under two classes: systemic and processive. Systemic stressors are those that pose a direct physical threat to survival, like danger from a house fire, lack of food, or severe injury. Processive stressors, on the other hand, are psychological since they don't pose a direct threat to survival. Rather, they're associated with threats based on prior experience and include most of the stressors we face every day lives like these stressors shown here.

The idea that there's a connection between stress and health is certainly not a new idea, the ancient Greeks and Romans wrote extensively about the link between emotions and illness, but it wasn't until the 1930's that we really began to learn HOW.

Slide 4: Hans Selye

Hans Selye is credited with making the initial biological link

between psychological stress and physical illness. He's shown here in sculpture which sits on the grounds at a Hungarian-language university in Slovakia that bears his name. He was a Hungarian-Austrian-Canadian physician and scientist who started his stress research as a young professor at McGill in the 1930's.

Click

He noticed that when rats are exposed to unpleasant events over a prolonged period of time, they show a wide set of symptoms, such as stomach ulcers, enlargement of the adrenal glands, and shrinking of immune tissues. What most fascinated him was that it DIDN'T SEEM TO MATTER WHAT THE STRESSOR WAS, the response was almost identical.

Click

For instance, in one experiment, he exposed rats to prolonged cold, by placing their cages on top of the building during winter OR prolonged heat by putting these rats in the building's boiler room. Despite the fact these stressors put opposite demands on the rat's bodies, they still showed these same set of responses.

Slide 5: Selye's Main Findings

Selye made two very important contributions to the study of stress. First is that the stress response is universal in that the same set of symptoms are triggered by all sorts of stressors, like extremes in temperature, injury or scarce food resources. Also,

Click

this response is almost identical in humans, rats, chimpanzees, fish, and other animals. So, our response to stress is universal across various negative experiences AND across different species. Selye's second main finding is
Click
that it's chronic stress that makes us susceptible to illness. We can handle one or two stressful events relatively easily, but we start to feel the pressure when stress is repeated or prolonged and over the long term this is linked to illness.
So what happens during stress that can have such a global effect on the body? Selye's research pointed to the adrenal glands and its hormones as the heroes AND villains of the stress response. Let's have a look at these adrenal glands.

Slide 6: The Adrenal Gland

The adrenal glands are located just on top of each kidney. It has two main components, the adrenal cortex is the outside bit and releases a whole bunch of hormones but the one most interesting to us in the context of stress is cortisol. The inside part of the adrenal gland is called the adrenal medulla
Click
and it releases different types of hormones than the cortex,
Click
the main ones are epinephrine and norepinephrine (which are also called adrenaline and noradrenaline).

Slide 7: Physiology of the Stress Response

The physiological response to stress has two universal

components that involve different parts of the adrenal gland:
The HPA axis
Click
and the adrenal-medullary system.
Click
The adrenal-medullary system on the right is the connection between stress and hormone release from the adrenal medulla.
Click
When we're faced with a stressor, this gets signaled to the hypothalamus which then activates sympathetic nerves. This is the body's fight-or-flight response activated during times of threat or emergency. The adrenal medulla responds by releasing the hormones, norepinephrine and epinephrine.
Click
This acts to increase heart rate, breathing rate, and raises blood pressure. This fast response is thought to be important to allow quick reactions to stressors.
Click
On the left is the hypothalamic-pituitary adrenal, or HPA axis, which is the connection between stress and hormone release from the adrenal cortex.
Click
When we're faced with a stressor, as you just learned, this activates the hypothalamus, which releases a hormone called corticotropin releasing hormone, or CRF. This travels a short distance to the pituitary gland, located just above the roof of the mouth, which releases a hormone called

adrenocorticotropic hormone, or ACTH, which travels through the bloodstream to the adrenal cortex which in turn releases the hormone cortisol into the general circulation to do a number of things. It frees up energy reserves from storage, so we don't have to pull energy out of the digestive system, which takes a long time. It also inhibits activity of the immune system. This energy liberation from reserves, and energy savings by shutting down of biologically expensive processes like wound healing, prepares the body to deal with the threat of the stressor.

Click

This is a slower response, not surprising since there are more steps for the HPA axis than the adrenal-medullary system.

It appears that prolonged activation of this slower HPA response is associated with susceptibility to illness. So how does this work?

Slide 8: General Adaptation Syndrome

Selye proposed the general adaptation syndrome to explain how repeated, rather than acute stress, that makes us sick. This explanation attempts to explain how the SAME stressor, which initially doesn't cause huge health problems, leads to much larger problems later on. Selye described three stages: alarm, resistance, and exhaustion.

Click

In the alarm stage, the body's resources are mobilized in response to a stressor so the SNS triggers norepinephrine release and stimulation of the HPA axis triggers cortisol release.

Initially in the resistance stage, the individual copes with the prolonged stress and levels of cortisol remain high.
Click
Eventually, in the exhaustion stage, according to Selye, the body's resources to deal with the stressor become depleted which results in a heightened susceptibility to illness.
Click
Since this was first proposed, more recent evidence pokes holes in many of the details of this model. However it remains very influential because Selye made monumental steps in understanding the link between stress and illness. Research shows that the main problem appears to be prolonged cortisol release.

Slide 9: Cortisol: The Culprit

High levels of cortisol over prolonged periods of time are associated with all sorts of problems like increased risk of depression and Type II diabetes, and suppression of the immune system. But why would our bodies respond stress to in such a way that we'd get sick? It doesn't seem to make much sense. The best explanation comes from prominent neuroscientist and stress researcher, Robert Sapolsky.

Slide 10: Why Zebras Don't Get Ulcers

In his book Why Zebras Don't get Ulcers, Sapolsky describes why prolonged stress leads to illness by using an analogy that's captured in the title. Sapolsky put it this way. Unlike humans, stress-related illnesses are actually rare in wild animals, despite

the fact our stress responses are very similar. A zebra's HPA axis isn't all that different from ours. What IS different however, are the types of things that stress us out.

Probably the biggest stressor for prey species like the zebra is getting killed by a predator, like a lion. If a lion attacks, the zebra has to activate its stress response to give it the resources to escape. Either way, the stress response is very short-lived: it either gets caught and killed or it escapes. The zebra doesn't activate its stress response for very long so only has a temporary spike in cortisol levels every so often. Humans on the other hand, stress about things like computers crashing or crappy wifi connections, things that are aversive but definitely not life threatening.

Why does that matter? Because these types of stressors tend to be chronic, and therefore we're activating our stress responses all the time, and as a consequence, elevating our cortisol levels when it doesn't really help us, like how it helps the zebra. Sapolsky says that this OVERUSE of our stress response is BIOLOGICALLY INAPPROPRIATE in our modern world, even though it was probably properly activated by our ancestors. So, in a way, a zebra is a lot smarter than a human, because it activates its stress response only in situations when it's going to be helpful.

According to Sapolsky, what makes us sick is not our inability to deal with stressors, but rather our continued response to prolonged stress in and of itself that's the problem.

Slide 11: The Stress Response

So the take-home message is that if you're faced with a stressful experience take a moment to reappraise it and decide if it's really life-threatening. If it isn't (and it probably won't be), try and tell yourself that it's a waste of your resources to activate all of this biology for a situation where it's not going to be helpful.

To return to video, click here

Tricky Topic: Stress and the Immune Response

Slide 1: Stress and the Immune Response
This tricky topic will examine stress and the immune system.

Slide 2: Stress and the Immune System
If we look back at the physiology of the stress response we see that stress induces a long cascade of neurotransmitter and then hormonal release moving from the hypothalamus to the pituitary gland to the adrenal gland. And the adrenal gland then secretes cortisol from its cortex and epinephrine from its medulla. Once these chemicals diffuse in the body, both cortisol and norepinephrine have been shown to influence the number of immune cells produces in the body, inferring that stress can indeed affect the immune system. This is an extremely important implication for many aspects of our lives and health and sets up the point of focus for this tricky topic.

Slide 3: The Immune System

However, before moving forward we must first briefly discuss the importance of the immune system. We'll begin by looking at 3 very basic elements involved in immune system response. The first are antigens and these are foreign substances such as chemicals, bacteria, viruses, or pollen that cause your immune system to produce antibodies against them.

Click

Bringing us to our 2nd important element being antibodies. And these are large proteins that bind to antigens allowing the immune system to recognize these foreign antigen substances.

Click

And then finally the third very basic element of the immune system would be the immune system cells themselves. And that would be killer cells primarily, of which there are 2 major types, being natural killer cells and cytotoxic T cells. And these cells bind to and destroy foreign substances mediated by this antibody binding.

Click

So moving on if we look at the immune system in a broader sense, it is a system of many biological structures and processes within an organism that protects it against disease, inspects the body for cells that may take on dangerous mutations, and preforms basic housekeeping functions such as cleaning up cellular debris after cellular injury. And the immune system can be subdivided into 2 basic lines of defence:

Click

natural immunity and acquired immunity. Now, natural immunity is the first line of defence against foreign agents, that is antigens. And it is an inborn process for removing antigens from the body. Now, this is response is usually immediate and very quick as well as non-specific, in that it will attack any antigen present. So, a quick example would be cutting your finger.

Click

When you cut your finger, your finger becomes very inflamed and blood vessels contract and dilate to increase the flow of blood to that area, where in addition the dilated blood vessels as well as damaged cells will release chemicals to signal for specialized immune cells to come and destroy invading microorganisms,

Click

thus protecting your body from the infection. So let's say we have all our antigens entering, antibodies will then bind these and this will cue for your immune system cells

Click

to come and destroy these antigens from entering the bloodstream and infecting your body. The second type of immunity is acquired immunity, and this is a much more complex and it requires a number of endocrine and cellular processes. This sector will recognize specific antigens and then reproduce specialized cells or circulating proteins to fight these antigens. What makes acquired immunity unique is that it requires experience. That is, it must have had a prior exposure

to a specific antigen in order to respond to it. For example, let's say you get a cold from virus X. Your body will develop an immune response to this specific virus X such that you will be less likely to get sick when exposed to the virus X a second time.

Click

This might be more familiar to you when you think about the common vaccine injection in which you use to protect your body from further infection and disease. It is tapping into acquired immunity that allows this vaccine to actually work and protect your body from further infection. Moving on, what we see is that the physiological effects of stress when sustained over time will weakened both aspects of the immune system,

Click

where subsequently this immunosuppression will increase susceptibility to disease because of the body's diminished ability to fight invading antigens or damaged cells. With this in mind, we will now go over some of the research that has allowed us to make these conclusions, ultimately linking both psychological and subsequently your physical health.

Slide 4: Stress and the Immune System

Research for many animal studies has shown that both psychological and physical stressors have had effects on the immune system. In particular, stressors on animals, including

Click

mental stressors, maternal stressors, inescapable shock, abrupt

temperature change, loud noise, and many more. Following this, what all these studies have shown

Click

is that they've seen a reduction in responses to antigens, a reduction in the number of immune cells present, and an overall decrease of immune system function.

Click

Following this, some studies have looked at naturally occurring stressors in human subjects and correlated changes in these individuals' respective immune system functioning. Natural occurring stressors

Click

such as final exams, sleep deprivation, loud noise, divorce, and caring for an Alzheimer's or AIDS patient have all been studied and shown collectively, again, to produce

Click

reductions in immune system response or function.

Click

Following these results, it is important to note that these studies infer that stress can indeed cause reduction in immune system functioning, but it has not told us whether or not this necessarily effects the actual health of the individual. This last question is asked and answered in the following 2 experiments we're going to look at.

Click

In the first experiment, formed in 1995, two different groups were assembled. The first group, group A, was of individuals

who were currently the primary care providers for individuals with Alzheimer's disease and the second group, group B, was a control group. So this presumed that those taking care of individuals with Alzheimer's disease would have higher levels of psychological stress. Following this,

Click

each individual within each group was given a small puncture wound and followed up by assessing 2 separate factors.

Click

The first was testing for the concentration for different immune variables in the blood, that's measuring the immune system response. And the second looked at the actual wound healing process, so the amount of time it actually took for the small puncture wound to heal, thus measuring the actual direct health of the individuals.

Click

In both cases what they found, first pertaining to the immune variables in the blood, was that group A patients had significantly fewer than group B. As well with wound healing, it actually took much longer for group A to have these small wounds heal than those in group B. This suggests that stress does induce diminished effects in the immune system, subsequently resulting, as shown here, directly effecting the health of the individual as well. Where here it is exemplified by actual healing of the small puncture wound.

Click

Following this in the second study, researchers took a group of

individuals and assessed them on 3 aspects of their lives. These were their self-reported amount of perceived stress that they experienced, the amount of external stressors as determined by the researchers, and then finally the social networks they had available to them. They then exposed individuals to the common cold

Click

and determined their susceptibility to it. In conclusion, they determined that the most prominent predictor of whether or not an individual got sick was their perceived level of stress.

Click

This tells us that it is the individual's own subjective experience of the level of stress they're experiencing that determines its effect on the immune system and thus their health.

Slide 5: Stress and the Immune Response

That concludes this tricky topic looking at stress and the immune system. Thank you for listening.

To return to video, click here

Tricky Topic: Diagnosing Psychological Disorders

Slide 1: Diagnosis

Diagnosing psychological disorders is a tricky topic indeed, but before we dive into the issues surrounding diagnosis, it's important to first consider a more basic question: How can we

distinguish different behaviour from disordered behaviour.
Let's consider some historical examples of extreme behaviour, and evaluate these cases as different or disordered.

Slide 2: Different or Disordered

Take post-impressionistic Dutch painter Vincent Van Gogh, he's one of the best known and most prolific artists of his time. He created over 2000 works of art, in a career that lasted only ten years. This painting entitled" Self-Portrait with Bandaged Ear and Pipe" is a glimpse into his unusual behaviour. Van Gogh did this painting after having an argument with a friend, and, in a fit of rage, took a razor and cut off the lower portion of his left ear. He then wrapped the earlobe in a newspaper and gave it to a prostitute named Rachel, telling her to "keep this object carefully"

So for a bunch of reasons, van Gogh was certainly different than most other people: on the one hand he produced some of the most influential works of art. But in his personal life he was prone to extreme and unstable behaviour. The painting above is one demonstration of his self-harming behaviour, and he eventually died by suicide.

There is much speculation about the cause of Van Gogh's unusual behaviour, he had several major depressive periods as well as manic and psychotic episodes, so most people agree that he likely suffered from mental illness.

Let's consider another case.

Click

Witold Pilecki (VEE-Told PILET-SKI) was a Polish soldier and

founder of the resistance movement in German-occupied Poland. He was VOLUNTARILY imprisoned at Auschwitz in order to secretly report on what was happening there. He stayed for 2.5 years and later escaped. This behaviour is certainly different than what most people would do. This mugshot here however is NOT from his time at Auschwitz, but when he returned back to Poland, and was accused of treason.

Click

He was imprisoned, tortured, and executed, not by the Nazis, but by the Soviet-backed Polish government. This photo was taken at his trial, and although he doesn't look happy, he also doesn't look disheartened.

Like Van Gogh, Pilecki's behaviour intentionally caused him harm, no doubt about it. But the circumstances and motivation for his actions means that history remembers him as heroic, not disordered.

These two examples highlight the challenge in distinguishing different (in the case of Pilecki) from disordered (in the case of Van Gogh).

Slide 3: The Medical Model

The current theory and practice of diagnosing mental illness has been heavily influenced by the MEDICAL model, which states that mental illness is best diagnosed and treated as a MEDICAL illness

Click

This perspective on mental illness contrasts earlier views that

considered mental illness to be caused by moral weakness or even demon possession and treatments often involved extreme measures like drilling holes in the head to release evil spirits, like in this 5000-year old skull

The MEDICAL MODEL is certainly a move in the right direction based on the evidence we have about the biological basis of psychological disorders, but the medical model presents some of its own challenges.

Slide 4: Difficulty in Diagnosis

Let's take an example of a clear, physical medical problem, a deep cut in the finger. A physician can tell, without even talking to the patient, what's wrong and how to treat it – clean the wound to prevent infection, stitch it up, and bandage it. Easy. But some physical conditions aren't so obvious just by looking at someone.

Click

Take a heart arrythmia, or irregular heart beat. You can't tell just by looking at someone whether they have a heart arrythmia,. A doctor can talk to the patient, and get some idea about symptoms. But it's not as obvious what's wrong, like with a finger wound. Using a simple device, like a stethoscope, or an ear to the chest, lets the physician know what's going on.

Click

What about someone suffering depression? Certainly you can tell by looking at this man that there's something wrong, but maybe his hockey team just lost the final. Maybe he'll get over it. Maybe he's been feeling this way every day for months.

Clearly, It's necessary to TALK to the person for some time to differentiate DIFFERENT from DISORDERED so diagnosing psychological disorders involves a bit of a judgment call. We can't tell just by looking at someone what's going on, and we don't have any devices to tell us definitively what's wrong.

So what information do diagnosticians like psychiatrists and psychologists use to make their decisions?

Slide 5: History of Diagnosis

One of the first attempts to provide some guidelines about diagnosis was by German psychiatrist Emil Kraepelin. In his publication, Compendium der Psychiatrie in 1883, he put disorders into categories so that diagnosis could be standardized and measured. It wasn't until 1952 that a similar attempt was made in North America by the American Psychiatric Association (or APA) with the Diagnostic and Statistical Manual of Mental Disorders. The DSM has become the standard in NA for psychiatrists, psychologists, medical insurance companies, and others involved with diagnosis. Let's look at the history.

Slide 6: A Work in Progress

The DSM can be, and should be, considered a work in progress. The 1952 edition was the 1st NA classification, and was about 130 pages in length.

Click

The DSM II was published in 1968, with some modifications

to the original, but not a lot added to the length of the document.

Click

The DSM III came out in 1980, with a revision, the DSM III R, in 1987. This was revamped to make the guidelines consistent with other tools, like the International Classification of Diseases, or ICD, used by the WHO. This update greatly increased the size of the document and the number of disorders.

Click

The DSM IV came out it 1994, followed by its revision the DSM IV TR (for text revision) in 2000. This attempted to provide clearer diagnostic criteria and emphasized an empirical, evidence-based approach. This greatly increased the length of to 886 pages.

Click

Most recently the DSM 5, which ditched the Roman numerals, came out in 2013 and there were some changes to how disordered behaviour is viewed. In previous versions there were separate axes to consider, but this was replaced by a dimensional approach that places behaviours, thoughts, and emotions along a continuum. This most recent revamp also increased the length, so the current version is 947 pages in length.

Although the DSM is a useful tool for treatment providers, it is not without criticism.

Slide 7: Criticisms of the DSM

One criticism is that the DSM medicalizes normal human behaviour, by labelling normal reactions to life events, such as sadness after losing a loved one, as mental illness. (CLICK) The DSM 5 did make an attempt to address this to some extent by introducing a dimensional approach, so diagnosis considers the grey area and is not based strictly on ”yes” or “no” categories. However the dimensional tools have only been developed for some but not all disorders.

Click

Another criticism of relying on the DSM for diagnosis is that it has a strong North American perspective, and some argue that the American Psychiatric Association (APA) has had too much influence. Another classification system developed by the World Health Organization is the International Classification of Diseases or ICD. This is used for diagnosis of all sorts of disorders, not just mental illness, and has also gone through many revisions. The ICD-11 was developed in 2018 and takes effect in 2022.

Click

Lastly, some take issue with the idea of mental illness altogether because it ignores moral and social norms, which have a big influence on whether behaviour is considered abnormal or not. Thomas Szasz was an American psychiatrist and academic who challenged the very idea of mental illness in his books The Myth of Mental Illness and The Manufacture of Madness. He argued that mental illnesses should be considered problems of living rather than defined diseases. For instance,

poverty is associated with substance abuse, but the DSM considers addictive disorders as a problem with the individual, not society.

Slide 8: Stigma of Mental Illness

Another problem in diagnosing mental illness is the stigma surrounding it, because as a society we have a tendency to judge people with psychological problems and this can lead to negative stereotypes.

This is an enormous barrier since it means that people often don't want to admit they're suffering from mental illness and might be hesitant to seek professional help. It also means that people might not get social support they need from their friends and family, which is really, really important in overcoming psychological disorders.

A number of initiatives, like Bell's Let's Talk Mental Illness, have tried to raise awareness and reduce stigma and has been championed by Canadian Olympian Clara Hughes. She won medals in both cycling and speed skating but suffered from bouts of depression and struggled with alcoholism throughout her life. By talking openly about her own struggles, and how sports helped her overcome them, she is trying to change the way that society views mental illness.

Slide 9: Diagnosis

So this summarizes both the history of diagnosing psychological disorders, and some of the challenges faced in trying to make a meaningful diagnosis.

To return to video, click here

Tricky Topic: Diathesis-Stress

Slide 1: Diathesis-Stress

The diathesis-stress model of mental illness is an old idea described by many different names. Essentially it tries to address the age-old debate of what causes illness, is it nature or nurture? Or can we find the best explanation if we consider both?

There are a number of explanations for causes of psychological disorders, and one disorder that has received a lot of attention is depression. After so many years of research, we're starting to get some hints that depression has multiple causes.

Slide 2: Diathesis + Stress

We know that family history is a risk factor for depression, NO DOUBT ABOUT IT, and certain genes have been identified as culprits, so biological make-up appears to be important. Also, there have also been a whole slew of life events associated with episodes of depression, and what these events all share in common is that they're stressors.

Diathesis is the Greek word for "predisposition" and the diathesis-stress model includes both biological AND environmental influences on developing a psychological disorder. It suggests that biology, or NATURE, and psychology, or NURTURE INTERACT to influence the occurrence of mental illness.

Slide 3: Research Question

One study that directly tested the diathesis-stress model attempted to answer the following question:

Why do stressful experiences trigger depression in some people but not others?

These researchers conducted a large scale, longitudinal study to look at the influences of genes and life events. They focused on the serotonergic system since it's been implicated in depression.

Click

This is a schematic of a typical synapse, where neurotransmitter is released and binds to receptors on the postsynaptic side.

Click

This here is the serotonin transporter, which is the recycling protein that takes serotonin out of the synapse and repackages it into vesicles. IT turns out that the gene that makes this transporter protein comes in two forms,

Click

short and long, which work with slightly different efficiencies. We get one copy of this gene from each of our parents, which means there are three possible combinations of these genes,

Click

short-short, short-long, and long-long.

So how does this little tiny protein made by different forms of a gene tell us anything about stress and depression? Let's have a look at the study design.

Slide 4: Study Design

This diathesis-stress study was part of a much larger Dunedin Multidisciplinary Health and Development Study, conducted in New Zealand. This study is unique because it uses a longitudinal design – following participants for decades and has at least an 80% participation rate, which is unheard of with this large a sample over this long a time period. However, the researchers were able to get the participants engaged and on board, so they've been able to ask lots of interesting questions as new information has become available.

In this particular study, participants were 1037 people from a 1972 birth cohort, 847 of which were followed up every two years when they were kids, and then every 3-5 years from adolescence. For this study the researchers focused on these people when they were young adults. They took DNA samples at age 26,

Click

so they could find out which serotonin transporter genes they had, and also measured depression symptoms through a clinical interview.

Click

They compared this to life events that happened between the ages of 21-26, which was collected using a life history calendar. And they found something very interesting.

Slide 5: Findings

In this figure, the number of stressful life events is shown on the x-axis on the bottom, and the likelihood of a depressive

episode is represented on the y-axis on the left.
Click
For those in the cohort with low levels of life stress, there was a very low incidence of depression, regardless of the types of serotonin transporter genes. HOWEVER, this was very different for people who reported higher levels of stress, when genes REALLY seem to matter. With 4 or more stressful life events, those with two copies of the short gene were most likely to get depression
Click
followed by those that had one short and one long, and finally those that had two long copies of the gene.

Slide 6: Support for Diathesis-Stress

There is mounting support for this nature plus nurture explanation for many disorders, in addition to depression, like Alzheimer's disease, schizophrenia, and ADHD. Some scientists now think diathesis-stress might explain the large individual vulnerability in mental illness.

Slide 7: Diathesis-Stress

Using a unique sample of participants followed over time allowed researchers to test the idea of stress-diathesis in the development of depression, but this is becoming accepted as a model to consider in the development of other psychological and physical disorders.

To return to video, click here

Tricky Topic: Causes of Schizophrenia

Slide 1: Causes of Schizophrenia

Schizophrenia is one of the most debilitating psychological disorders so there's a lot of interest in trying to identify potential causes. It's categorized as a psychotic disorder, so we'll describe some of the general characteristics of these types of disorders and their symptoms before focusing on causation.

Slide 2: Psychotic Disorders

Psychotic disorders are disorders of thought and perception and in particular an inability to distinguish between what's real and what's imagined. Sometimes we all think things happened in a way they didn't, or hear or see things that aren't actually there. For most of us. These unusual situations are normal but rare. In people with psychotic disorders these false beliefs and disconnection from reality become pervasive and debilitating.

Click

Schizophrenia is the best known and the most prevalent of the psychotic disorders and means SPLIT MIND, meaning the mind is split from reality. This is best illustrated by reviewing the symptoms of this disorder.

Slide 3: Symptoms of Schizophrenia

The DSM 5 diagnostic criteria for schizophrenia include five symptoms.

Delusions are thoughts and beliefs that aren't consistent with reality. Probably the most problematic are paranoid delusions,

where the schizophrenic person believes that others mean to cause harm. However, delusions can also involve exaggerated claims of power or knowledge, such as claims of mind reading ability or communication with higher powers. These are called delusions of grandeur.

Click

Hallucinations involve false sensory perceptions, most often auditory in the form of hearing voices, but they can also be visual or tactile sensations. These first two symptoms often prompt people to seek treatment.

Click

Another symptom is disorganized speech, such as tangential speech where the speaker loses focus and wanders without returning to the original topic. Disorganized speech can also take the form of "word salads" where the speaker follows grammatical rules but makes little sense. According to the DSM, a confirmed diagnosis of schizophrenia must include one of these first three symptoms.

Click

Disorganized or in some cases, catatonic behaviour, where the person remains unresponsive and immobile for long periods of time, is another symptom of schizophrenia.

Because these symptoms involve the PRESENCE of thoughts and behaviours characteristic of schizophrenia, and are NOT commonly seen in people without the disorder,

Click

they are referred to as POSITIVE SYMPTOMS. The fifth

category in the DSM diagnostic criteria is NEGATIVE symptoms

Click

which refers to the ABSENCE of behaviours displayed by non-schizophrenics, such as reduced emotional expression, social withdrawal, low motivation, and lack of pleasure. These negative symptoms are present in 20-40% of people with schizophrenia, and tend to be difficult to treat.

Although not officially included in the DSM diagnostic criteria, about 80% of schizophrenics experience cognitive symptoms or problems with information processing. This includes

Click

impairments in verbal memory, working memory, processing speed, and attention. Although these symptoms are common, they're difficult to confirm in a diagnostic interview, since catching them requires intensive cognitive testing, which requires special training to administer and can take hours to complete.

These three sets of symptoms are widespread, so it's a good bet that this disorder affects the functioning of the brain in a big way, so not surprisingly, there are multiple proposed causes. Most explanations of the causes of schizophrenia combine nature and nurture.

Slide 4: Nature and Nurture Explanations of Schizophrenia

There's a strong heritable component to schizophrenia, since

there's increased risk if first degree relatives have the disorder. There have been over 19 potential genes identified, but that's not to say that certain genes CAUSE the disorder.
Click
Different disruptive early life events have also been implicated as a cause for schizophrenia, especially if they happen at critically important developmental periods since the young brain appears to be vulnerable. So having a combination of family history with certain negative early life events greatly increases risk for the disorder. So what specifically are some of these early life events?

Slide 5: Early Life Events

There is a well-demonstrated link between many types of early life abuse or neglect and psychotic symptoms. A child who experiences physical, emotional, or sexual abuse is more likely to develop schizophrenia than children who don't, particularly if they have a parent with the disorder. Events that happen before birth are also associated with increased risk, so maternal health during pregnancy has also been the focus of research
Click
Certain infections such as toxoplasmosis, rubella, herpes are associated with increased risk as well as pre-natal depression. Heavy use of psychoactive drugs, particularly in adolescence also raises concern
Click
since there is a well-established association between early marijuana use and later psychosis. Marijuana use in early

adolescence increases the risk of later developing schizophrenia or other psychotic disorder roughly 5-10 times, although this does not seem to be the case for people who start using marijuana late in life. This research is important with the plans for legalization of recreational use in Canada, and has led to much discussion around what the legal age should be.

It's important to note that these risk factors are just that, they increase RISK. Many people experience adverse events in childhood, their mothers contract infections while pregnant, and they used marijuana as young adolescents, but never go on to develop schizophrenia. However, each of these risk factors, paired with a family history of the disorder makes it more likely to occur.

Clearly schizophrenia itself is complex, and the potential causes are many and often debated. What is agreed upon however, is that this disorder affects brain functioning. We'll consider some of the neuroanatomical and neurochemical abnormalities observed with the disorder.

Slide 6: Schizophrenia & the Brain

Schizophrenia is associated with an overall reduction in brain volume compared to people without the disorder. Although there is some debate about the exact nature of these brain differences and whether they're a cause or consequence of the disease, several areas have been consistently found to be smaller: the prefrontal cortex in the frontal lobes, the superior part of the temporal lobe, and several limbic areas not visible in this image, the anterior cingulate cortex, the hippocampus,

and the amygdala.

One of the most striking consequences of this loss of brain tissue in schizophrenics is enlarged ventricles, a hallmark feature of schizophrenia.

Slide 7: Enlarged Ventricles

Ventricles are the spaces in the brain that produce cerebral spinal fluid. These images are brain scans of two identical twin brothers; the unaffected brother on the left did not show symptoms of schizophrenia, while the affected brother on the right did. The arrows are pointing to the butterfly-shaped VENTRICLES, which are clearly much larger in the affected twin. Keep in mind that larger ventricles means less surrounding brain.

The loss of brain tissue in schizophrenia shows up quite early, and there's evidence that it might precede the appearance of symptoms, so some believe that this neuroanatomical change might be an important causal factor of the disease. In addition to these potential neuroantomical causes, there are also well-accepted neurochemical changes in schizophrenia that contribute to symptoms. There are two major neurotransmitter systems implicated in symptoms of schizophrenia.

Slide 8: Neurochemistry of Schizophrenia

The dopamine hypothesis is based on two pieces of evidence. First, drugs that trigger large amounts of dopamine release in the brain, like amphetamines, actually trigger symptoms

similar to schizophrenia, particularly hallucinations and delusions. Second, dopamine antagonists, drugs that block dopamine receptors, are effective in treating many symptoms of the disorder, like hallucinations and delusions. There are some problems with the dopamine hypothesis however, in that it seems to play a role in positive symptoms, but does not seem to explain the other symptoms.

Click

More recent research has suggested that glutamate deficiencies contribute to schizophrenia since drugs that block the NMDA glutamate receptor, like PCP (also known as angel dust) and ketamine (also known as vitamin K) cause hallucinations ad other symptoms, so it shouldn't be surprising that glutamate might play a causal role. The glutamate story is somewhat complicated since the effects of low NMDA activity in some parts of the brain appears to result in ENHANCED amounts glutamate in other areas. Therefore drugs that reduce the glutamate activity at non-NMDA receptors have been considered as possible treatments, although none of these are currently used as standard treatment. Glutamate seems to be involved in ALL of the different types of symptoms of schizophrenia,

Click

positive, negative, and cognitive and so glutamate drugs, possibly co-administered with dopamine antagonists, might prove to be useful in the future. A note of caution however, that glutamate is the most abundant excitatory

neurotransmitter in the brain, involved in widespread functions, so altering its activity in the human brain to treat ONLY schizophrenic symptoms is not straightforward.

Slide 9: Causes of Schizophrenia

So although there's no clear answer about what causes schizophrenia, there are a number of hints that genetics, early life environment, neuroanatomy, as well as neurochemistry are all possible contributors. This information has directed how we think about schizophrenia and have guided treatment approaches.

To return to video, click here

Tricky Topic: Mood vs. Personality Disorders

Slide 1: Mood vs. Personality Disorders

Today, we're going to look at psychological disorders. We're going to focus on personality disorders and mood disorders. We'll look at how they're different and what each entail.

Slide 2: Personality vs. Mood Disorders

First, we have to understand the fundamental differences between personality disorders and mood disorders. A personality disorder is a maladaptive and inflexible pattern of cognition, emotion, and behaviour, within an individual.

Another way to put this is that personality disorders are fundamental differences in how a person experiences or deals with emotions, how they interact with others, and how they think about problems or interpret situations. It's important to note that personality disorders generally develop in late childhood and adolescence and continue into adulthood, as they are often permanent in nature. In contrast to personality disorders, mood disorders are a category of psychological disorders characterized by severe disturbances in emotional behaviour. And remember that in order for someone to be diagnosed with a disorder, their feelings or patterns of behaviour must either be causing significant distress in the affected individual or be significantly negatively affecting their day-to-day functioning.

Slide 3: Personality Disorders

First, we will look at personality disorders, of which there are 3 distinct clusters.

Slide 4: Odd-eccentric

The first cluster is odd/eccentric, of which there are 3 subtypes. The first is schizoid personality disorder, and this is someone who does not want close relationships, is emotionally aloof, reclusive, and often humourless. This is an individual who really wants to live a solitary life. The second subtype is schizotypal, which is someone who is really isolated and asocial, someone who has odd thoughts and beliefs. For example, this individual might look at stories on tv and in

the news and believe that these stories are about them, even though they have no relation at all to the stories being shown. The third subtype is paranoid personality disorder, and this is someone who is extremely suspicious and mistrustful of people in both ways that are unwarranted and not adaptive. An example here would be someone who holds unwarranted grudges for an unusually long period of time.

Slide 5: Dramatic-emotional

The second cluster of personality disorders are dramatic emotional, of which there are 4 subtypes. The first is histrionic personality disorder. This is someone who wants to be the centre of attention at all times, and will achieve this either through dramatic, seductive, flamboyant, or extremely exaggerated behaviours directed towards others. The second subtype is borderline personality disorder. This is an individual with out of control emotions, as well as having a fear of being abandoned by others. By doing this, these people will often oscillate between idolizing and despising people who they are close with. The third subtype is narcissistic personality disorder. This describes an individual who has extremely positive self-image, is extremely arrogant, and has exaggerated self-centred thoughts and ideas. The fourth type is antisocial personality disorder, and this is someone who is extremely impulsive, deceptive, often violent and ruthless, and callous in their behaviour. This is a very serious and potentially dangerous disorder. However, it's really important not to confuse antisocial personality disorder with someone who is

asocial, where being asocial just means someone who is shy and does not necessarily enjoy themselves in social situations.

Slide 6: Anxious-fearful

The third and final cluster of personality disorders is anxious/fearful, of which there are 3 subtypes. However, in general, this third cluster is described by someone who has a persistent high level of anxiety and nervousness as well as fear in many different situations and contexts. The first subtype is avoidant personality disorders, and this is someone who is so afraid of being criticized that they will avoid interacting with others and become completely socially isolated. The second is dependent personality disorder. This is someone who has a great fear of being rejected, resulting in the development of extremely clingy and dependent relationships with others such that they only feel safe when in these relationships with others. The third is obsessive compulsive personality disorder, which is someone who is very rigid in their habits and tend to be extreme perfectionists. This is similar to but much more general than OCD, or obsessive-compulsive disorder. Here we are looking at obsessive compulsive personality disorder, which is different than obsessive compulsive disorder, where obsessive compulsive disorder is a CLINICAL disorder, and is much more specific to certain actions, such as cleaning, or tapping a certain amount of times. On the other hand, obsessive compulsive personality disorder is much more general to all aspects of one's lives.

Slide 7: Depression

Now we'll look at mood disorders. Mood disorders are a category of psychological disorders characterized by a severe disturbance in one's emotional behaviour. These disturbances in emotional behaviour are so severe that they prevent people from functioning normally. We're going to look at 2 common mood disorders, those being depression and bipolar disorder. First, looking at depression, it's important to note that it manifests differently in different people. However, in general, it can be categorized as any combination of intense sadness and anxiety and extreme apathy and discontent. So, the first type that we're going to look at is major depressive disorder. This is a mood disorder characterized by pervasive low mood, lack of motivation, low energy, and feelings of worthlessness and guilt that lasts for at least 2 consecutive weeks. This is also often associated with sleep disturbances, such that people will suffer either from insomnia or hypersomnia, which is an excess of sleep. More than often, it reoccurs in someone's life. It's very important to highlight that this is more than just the blues. When we look at major depressive disorder, we're talking about a life-altering changes in one's behaviour, accompanied by a deep apathy and withdrawal from one's life. This can be a major risk factor for suicide. Dysthymia, on the other hand, is a form of depression that is milder in intensity than major depressive disorder. The symptoms are the same as the former, however, they are less intense. Clinical depression

occurs in about 12% of Canadian adults at some point in their lives, so it is quite pervasive.

Slide 8: Causes of Depression

When looking at the causes of depression, it's important to understand that there are both external and internal factors that increase the likelihood of experiencing a depressive episode and there was a study done in 2003 by Caspi and colleagues that illustrated these points. To briefly explain this experiment, they measured both the number of stressful life events that participants experienced, representing extrinsic factors, and a person's genetic propensity for depression, representing intrinsic factors. This experiment showed that it was an interaction between BOTH extrinsic stressful life events AND intrinsic genetics that determines one's probability of experiencing depression.

Slide 9: Bipolar Disorder

The second type of mood disorder that we'll discuss is bipolar disorder. This is characterized by extreme periods of depression that alternate with episodes of highly elevated mood and intense activity, referred to as mania. During manic episodes, people will typically experience a huge spike in energy, sleeplessness, delusions of grandeur, racing thoughts, and impulsivity. However, a common misconception about bipolar disorder is that individuals with bipolar disorder frequently alternate between high and low mood, even multiple times per day or hour. The reality is that the

depressive phases and manic phases last for extended periods of time. A patient may experience depression for months and then mania for a month.

Slide 10: Causes of Bipolar Disorder

Just like depression, there are both external and internal factors that increase the likelihood of experiencing bipolar disorder. External factors include the external environment during development, starting as early as the fetal stage. For example, fetuses exposed to large amounts of alcohol are put at increased risk for developing bipolar disorder later in life. In terms of internal factors, many have been identified, including a genetic component to bipolar disorder. In twin studies, results have shown that if one twin has bipolar disorder, there is a 40-70% chance that the other will also at some point in their life experience bipolar disorder.

Slide 11: Mood vs. Personality Disorders

That concludes tricky topic, covering different types of mood and personality disorders and how they differ from one another.

To return to video, click here

Tricky Topic: Psychological Treatments

Slide 1: Psychological Treatments

Welcome to the Tricky Topic on psychological treatments. In

this tricky topic we will take specifically about a number of different types of treatments for psychological disorders that fall under the category of psychological-type treatments.

Slide 2: Treatment of Psychological Disorders

Treatments for psychological disorders can be broken down into 3 broad categories. These are psychological treatments, including various approaches like psychodynamic, humanistic, behavioural, cognitive-behavioural, and group, which we will discuss today. The second category of treatment for psychological disorders is biological treatments, which includes things like drug therapy, psychosurgery, and electric and magnetic therapies. And finally, we can combine these two approaches for things like integrative therapies, and mindfulness and psychotherapy to try and maximize the efficacy of biological and psychological treatments so that an individual can have the best chances of recovery.

Click

For this tricky topic, however, we will be focusing on the psychological treatments.

Slide 3: Psychodynamic Theory

Let's first take a look at the psychodynamic approach. The psychodynamic approach was first developed by one of the most famous early psychologists – Sigmund Freud. Since its inception, psychodynamic theory has undergone a number of changes, but at its core it still focuses on tapping into a person's unconscious thoughts and feelings and interpreting

their meaning with the help of the therapist.

One of the most common techniques employed by therapists using the psychodynamic approach is something called "free association". Free association simply involves having the individual just start talking about whatever comes to their mind – they don't need to understand it or interpret it, they just need to talk. Some therapists will then try to "interpret" the underlying meaning behind these statements, while others use this technique simply to relax the client and help them to become more comfortable with the situation.

Slide 4: Humanistic Theory

Humanistic theory is based around the central ideas of empathy and helping an individual reach their greatest potential. The purpose of the therapist is to listen, empathetically, and ensure that the client feels listened to and not judged in any way. The hope is that through this unconditional positive regard from the therapist, the client will start to see themselves as having more self-worth and potential to achieve their goals.

Slide 5: Behavioural Therapy

Behavioural therapy is very different from both psychodynamic and humanistic approaches in that the primary focus is on changing the behaviour rather than the thoughts and feelings. Behavioural therapists use a number of different techniques to change behaviour, relying on the principles of operant and classical conditioning approaches.

Some examples include token economies (essentially reinforcing good behaviour with a token that can then be exchanged for some kind of privilege) – often used with children.

And systematic desensitization – a process that is often used to treat issues like phobias. Desensitization involves exposing an individual to increasing more intense versions of the thing they fear, allowing the person to experience the fear but face the item long enough that they can then return to a state of relaxation. Once a person becomes comfortable with the stimulus, the therapist increases the intensity and repeats the process.

Slide 6: Cognitive and Cognitive Behavioural Therapy

Cognitive and cognitive behavioural therapies are very popular forms of treatment for psychological disorders. And, as we'll see in a moment, are considered some of the most effective treatments available for many types of disorders.

Cognitive therapy involves the therapist working with the client to identify the maladaptive thoughts and then challenges them – helping them to eventually fix these erroneous thoughts.

Cognitive-behavioural therapy is just like it sounds – it incorporates the techniques from both cognitive therapy and behavioural therapy to modify a person's maladaptive thoughts and behaviours. For example, it might involve having a person identify their erroneous thoughts, but then going

the extra step of introducing a reward (a technique from the behavioural camp) to reinforce the modified behaviour.

Slide 7: Group Therapy

Finally, group therapy involves a group of individuals with a similar challenge or issue, coming together and meeting as a group with a therapist. Through discussion, individuals in the group get to share their experiences, hear others experiences (helping them to realize they're not alone) and learn how each individual is coping with their challenges or working through them.

Group therapy can be an excellent source of support and allow a venue to air frustrations or work through problems with others.

Slide 8: Efficacy of Treatments

So, how well do these treatments actually work?

This graph, originally created by Epp and Dobson in 2010 and later reproduced by Beck and Dozois in 2011, outlines the efficacy of CBT and exposure therapies in treating a number of different psychological disorders. We can see here if we look at the absolute efficacy of some of these different types of treatments, Two pluses means it is the number one best treatment for that disorder and one plus means there is evidence that this treatment has positive effects. So we can see, for example, that for specific phobias, exposure therapy is the best possible approach that we can be using for this specific disorder. Same with panic disorders, exposure therapy

works very well. And then you can see a number of disorders where cognitive behaviour therapy is really quite an effective treatment, for things like depression, bulimia, eating disorders, schizophrenia.
Click
And we also look at the efficacy relative to some of the biological approaches like medication, in many cases cognitive behavioural therapy is just as good if not better than medications. So we know that CBT is incredibly effective for many types of disorders and often times is used in addition to or paired with a biological treatment to try and get the most out of that treatment and to try and help and individual as much as possible.

Slide 9: Psychological Treatments
In this tricky topic, we've briefly covered some of the approaches to psychological treatment of disorders. Thank you for listening.

To return to video, click here

Tricky Topic: Biological Treatments

Slide 1: Biological Treatments
Today we're going to look at the biological treatment of depression, specifically using drugs to treat depression. A number of psychological disorders have been shown to correlate with brain changes and specific neurotransmitter

signalling pathways. Therefore, many treatments focus on drug therapies aiming to restore neurotransmitter signalling back to biologically normal levels. It's important to note that the drugs used to treat psychological disorders are the second most prescribed drug class in Canada, where the largest drug class prescribed is for cardiovascular disease.

Slide 2: Depression and Monoamine Neurotransmitters

Depression has been shown to correlate with a decrease in serotonin as well as other monoamine neurotransmitters in the brain.

Click

As just explained, many therapeutic approaches have used drug therapy to try and restore monoamine neurotransmitter levels within the synaptic cleft to a functional level.

Click

There are 4 main monoamine neurotransmitters that have major roles throughout the brain. Decreased levels of these monoamines have been shown to correlate with depression. These are serotonin, dopamine, norepinephrine, and epinephrine. They're classified by the fact that they share common synthesis pathways and all possess a common amino functional group in their chemical structure- each is an amine containing only one amino group.

Click

As previously mentioned, each of these specific neurotransmitters have very wide-spread distributions throughout the brain.

Click

When we first look at serotonin, we see a wide distribution throughout the midbrain, frontal cortex, and throughout the entire cortex as well as the cerebellum.

Click

Following that, if we look at dopamine, it has a lot of diffusion throughout the midbrain as well as the frontal cortex.

Click

Norepinephrine again like serotonin is found throughout the entire brain in all major structures.

Click

And then finally epinephrine is mostly concentrated in the brain stem.

Click

A decrease in monoamine neurotransmitter release in the brain is believed to be the main molecular mechanism by which depression manifests in the brain. Currently there are 3 main antidepressant drug classes that work to increase monoamine transmitter levels in the brain. Those 3 classes are monoamine oxidase inhibitors, tricyclic antidepressants, and selective serotonin reuptake inhibitors.

Click

Each class differs from one another in 2 main ways. The first being its specificity and the second being its mechanism of action. The next question following this would be how do these specific drug classes increase monoamine neurotransmitter levels in the brain? Before looking at how

these specific antidepressant drugs work, we first need to review the basic mechanisms guiding synaptic transmission, reception, and degradation of monoamine neurotransmitters.

Slide 3: Synapse

If we look at our synapse, what we see is, in the order of events of synaptic release, we first have our monoamine neurotransmitter that is loaded into presynaptic vesicles in the terminal of the presynaptic axon. These synaptic vesicles are then taken to the membrane where they fuse, resulting in the release of these neurotransmitters into the synaptic cleft. At this point, these monoamine neurotransmitters will bind to postsynaptic receptors, causing a response in the postsynaptic cell. Following this, these receptors will either become saturated, or they release this monoamine neurotransmitter back into the synaptic cleft, where it will then be reuptaken by reuptake transporters.

Slide 4: Monoamine oxidase Inhibitors

Once back inside the presynaptic cell, these monoamine neurotransmitters will then be degraded by monoamine oxidase. Monoamine oxidase is an enzyme that breaks down any monoamine neurotransmitters so that it can be resynthesized as the cell needs it and then the cycle continues.

Click

If we look at our first drug class, that's the monoamine oxidase inhibitors, which reduce the actions of the enzyme monoamine oxidase. As just discussed, this is a major enzyme

in the breakdown of monoamine neurotransmitters. By blocking monoamine oxidase, there will be an increase in monoamine neurotransmitters available,
Click
ultimately leading to increased release in the synaptic cleft
Click
and subsequent receptor binding and therefore a greater response than normally elicited by the lower levels of these monoamine neurotransmitters when monoamine oxidase is allowed to be active.

Slide 5: Tricyclic Antidepressants

The second class is tricyclic antidepressants. These specifically block presynaptic reuptake of serotonin and norepinephrine in particular. When this happens, this causes, again,
Click
a build-up of these monoamine neurotransmitters, specifically serotonin and norepinephrine in the synaptic cleft
Click
and subsequently increased binding to the postsynaptic receptors.

Slide 6: Selective Serotonin Reuptake Inhibitors (SSRIs)

Finally, the third class is selective serotonin reuptake inhibitors. These are really interesting because there is a lot of evidence put forth that suggested that the monoamine neurotransmitter serotonin is especially and more significantly than the others involved in depression. This drug was

developed that selectively targets serotonin, resulting in the selective increase of serotonin in the synaptic cleft. The aim was to result in a drug that still produced beneficial results for the treatment of depression while reducing side effects. Due to the blockage reuptake pumps that transport serotonin
Click
we have an increase of serotonin in the synaptic cleft,
Click
and then an increase in the binding to these postsynaptic receptors, trying to bring them back to the normal endogenous levels or the normal endogenous effect of serotonin that would be present in the brain of an individual that is not suffering from depression.

Slide 7: Depression and Monoamine Neurotransmitters

In summary, there are 3 major drug therapies for treating depression. Each will have its own unique selectivity and mechanism of action, as we just reviewed. They all result in an increase of neurotransmitter in the synaptic cleft, thus strengthening and prolonging each neurotransmitter's respective post synaptic response
Click
In terms of monoamine oxidase inhibitors, they selectively target monoamine oxidase and result in an increase in the level of all monoamines in the synaptic cleft.
Click
Following this, tricyclic antidepressants target the reuptake transporters, specifically for serotonin and norepinephrine,

resulting in their increase in the synaptic cleft.

Click

Finally, the selective serotonin reuptake inhibitors are selective to serotonin reuptake transporters and only result in an increase of serotonin in the synaptic cleft.

Slide 8: Non-specific Effects

Before concluding, it's important to note that there can be many potential associated problems of antidepressants due to nonspecific drug effects in the body. This is due to the route of administration of these drug classes. When a drug is taken orally in pill form, it must enter the bloodstream via the gastrointestinal track, where it is then free to diffuse throughout the entire body, including the brain, which is where the desired target is in this case for depression. If we look at these 3 drug classes, they each have specific side effects associated with them.

Click

The first being monoamine oxidase inhibitors, which interact with many foods and drugs, specifically over the counter drugs, which can cause dangerous increases in BP.

Click

Tricyclic antidepressants also have effects on other neurotransmitters, such as acetylcholine and histamine signalling pathways, leading to dry mouth, irritability, confusion, and constipation.

Click

And then finally, the selective serotonin reuptake inhibitors

can produce side effects like agitation, insomnia, nausea, and difficulty achieving orgasm.

Slide 9: Biological Treatments

That concludes this tricky topic looking at biological treatments of depression.

To return to video, click here

APPENDIX: REVIEW QUESTION ANSWERS

Answer Key: Introduction to Psychology

1. D 2. C 3. D 4. B 5. C 6. D 7. A 8. A 9. C 10. B 11. D 12. D 13. B 14. D 15. C

16. Psychology courses deal with a number of issues that are helpful in a variety of settings. The text made mention of the types of skills as well as the knowledge base with which students of psychology become familiar. As mentioned in the link to learning, psychology is often helpful/valued in fields in which interacting with others is a major part of the job.

17. One goal of psychology is the study of the mind. Science cannot directly study the mind, because it is not a form of matter or energy. This might create some skepticism about the scientific nature of psychology.

18. In its early days, psychology could be defined as the scientific study of mind or mental processes. Over time, psychology began to shift more towards the scientific study

of behaviour. However, as the cognitive revolution took hold, psychology once again began to focus on mental processes as necessary to the understanding of behaviour.

19. Behaviourists studied objectively observable behaviour partly in reaction to the psychologists of the mind who were studying things that were not directly observable.

20. Although the different perspectives all operate on different levels of analyses, have different foci of interests, and different methodological approaches, all of these areas share a focus on understanding and/or correcting patterns of thought and/or behaviour.

21. Many people have questioned how ethical this particular research was. Although no one was actually harmed in Milgram's study, many people have questioned how the knowledge that you would be willing to inflict incredible pain and/or death to another person, simply because someone in authority told you to do so, would affect someone's self-concept and psychological health. Furthermore, the degree to which deception was used in this particular study raises a few eyebrows.

22. An undergraduate education in psychology hones critical thinking skills. These skills are useful in many different work settings.

23. The graduate degree would be a stronger guarantee of working in a psychology-related field and one would have greater control over the specialty of that work. It would allow

one to practice in a clinical setting. In general, it would allow someone to work in a more independent or supervisory capacity.

Click here to return to questions

Answer Key:Psychological Research

1. D 2.B 3.B 4. D 5. B 6. C 7. C 8. A 9. D 10. B 11. D 12. C 13. D 14. A 15. D 16. A 17. D 18. B 19. C 20. D 21. B 22. B 23. C 24. A

25. There is probably tremendous political pressure to appear to be hard on drugs. Therefore, even though D.A.R.E. might be ineffective, it is a well-known program with which voters are familiar.
26. This cyclical, self-correcting process is primarily a function of the empirical nature of science. Theories are generated as explanations of real-world phenomena. From theories, specific hypotheses are developed and tested. As a function of this testing, theories will be revisited and modified or refined to generate new hypotheses that are again tested. This cyclical process ultimately allows for more and more precise (and presumably accurate) information to be collected.
27. Case studies might prove especially helpful using individuals who have rare conditions. For instance, if one

wanted to study multiple personality disorder then the case study approach with individuals diagnosed with multiple personality disorder would be helpful.

28. The behaviour displayed on these programs would be more realistic if the cameras were mounted in hidden locations, or if the people who appear on these programs did not know when they were being recorded.

29. Longitudinal research would be an excellent approach in studying the effectiveness of this program because it would follow students as they aged to determine if their choices regarding alcohol and drugs were affected by their participation in the program.

30. Answers will vary. Possibilities include research on hiring practices based on human resource records, and research that follows former prisoners to determine if the time that they were incarcerated provided any sort of positive influence on their likelihood of engaging in criminal behaviour in the future.

31. The cereal companies are trying to make a profit, so framing the research findings in this way would improve their bottom line. However, it could be that people who forgo more fatty options for breakfast are health conscious and engage in a variety of other behaviours that help them maintain a healthy weight.

32. Using the word protects seems to suggest causation as a function of correlation. If the headline were more accurate, it would be less interesting because indicating that two things

are associated is less powerful than indicating that doing one thing causes a change in the other.

33. If research is limited to students enrolled in Introduction to Psychology courses, then our ability to generalize to the larger population would be dramatically reduced. One could also argue that students enrolled in Introduction to Psychology courses may not be representative of the larger population of college students at their school, much less the larger general population.

34. Anonymity protects against personal biases interfering with the reviewer's opinion of the research. Allowing the reviewer to remain anonymous would mean that they can be honest in their appraisal of the manuscript without fear of reprisal.

35. In general, the fact that consent cannot be obtained from animal research subjects places extra responsibility on the researcher to ensure that the animal is treated as humanely as possible and to respect the sacrifice that the animal is making for the advancement of science. Like human research, the animals themselves should also receive some of the benefits of the research, and they do in the form of advanced veterinary medicine, and so on.

36. The research should be designed in such a way to adhere to the principles described in this section depending on the type of study that was proposed.

Click here to return to questions

Answer Key: Biological Basis of Behaviour

1. D 2. C 3. B 4. A 5. B 6. C 7. D 8. D 9. D 10. C 11. B 12. D

13. As a reuptake inhibitor, cocaine blocks the normal activity of dopamine at the receptor. The function causing more dopamine to be released into the synapse is agonist because it mimics and strengthens the effect of the neurotransmitter. Cocaine would be considered an agonist because by preventing the enzymatic degradation of the neurotransmitters, it increases the potential time that these neurotransmitters might be active in the synapse.
14. The action potential is initiated by an influx of Na+ into the neuron. If this process is prevented, then no action potentials in neurons in a given area will occur. Therefore, any painful stimuli would not result in action potentials carrying that information to the brain.
15. Most of these effects directly impact energy availability and redistribution of key resources and heightened sensory capacity. The individual experiencing these effects would be better prepared to fight or flee.
16. The same limitations associated with any case study would apply here. In addition, it is possible that the damage caused changes in other areas of the brain, which might contribute to the behavioural deficits. Such changes would not necessarily

be obvious to someone performing an autopsy, as they may be functional in nature, rather than structural.
17. The most viable techniques are fMRI and PET because of their ability to provide information about brain activity and structure simultaneously.
Click here to return to questions

Answer Key: Sensation & Perception

1. A 2. C 3. D 4. B 5. B 6. A 7. D 8. D 9. D 10. C 11. A 12. B 13. D 14. B 15. D 16. C 17. D 18. B 19. C 20. A 21. D 22. C 23. A 24. B 25. D

26. This would be a good time for students to think about claims of extrasensory perception. Another interesting topic would be the phantom limb phenomenon experienced by amputees.

27. There are many potential examples. One example involves the detection of weight differences. If two people are holding standard envelopes and one contains a quarter while the other is empty, the difference in weight between the two is easy to detect. However, if those envelopes are placed inside two textbooks of equal weight, the ability to discriminate which is heavier is much more difficult.

28. Other species have evolved to best suit their particular

environmental niches. For example, the honeybee relies on flowering plants for survival. Seeing in the ultraviolet light might prove especially helpful when locating flowers. Once a flower is found, the ultraviolet rays point to the centre of the flower where the pollen and nectar are contained. Similar arguments could be made for infrared detection in snakes as well as for the differences in audible ranges of the species described in this section.

29. Once again, one could make an evolutionary argument here. Given that the human voice falls in this middle range and the importance of communication among humans, one could argue that it is quite adaptive to have an audible range that centres on this particular type of stimulus.

30. The trichromatic theory of colour vision and the opponent-process theory are not mutually exclusive. Research has shown they apply to different levels of the nervous system. For visual processing on the retina, trichromatic theory applies: the cones are responsive to three different wavelengths that represent red, blue, and green. But once the signal moves past the retina on its way to the brain, the cells respond in a way consistent with opponent-process theory.

31. Colour vision probably serves multiple adaptive purposes. One popular hypothesis suggests that seeing in colour allowed our ancestors to differentiate ripened fruits and vegetables more easily.

32. Sound localization would have allowed early humans to locate prey and protect themselves from predators.

33. Pitch of sounds below this threshold could be encoded by the combination of the place and firing rate of stimulated hair cells. So, in general, hair cells located near the tip of the basilar membrane would signal that we're dealing with a lower-pitched sound. However, differences in firing rates of hair cells within this location could allow for fine discrimination between low-, medium-, and high-pitch sounds within the larger low-pitch context.

34. When traveling by car, we often have visual information that suggests that we are in motion while our vestibular sense indicates that we're not moving (assuming we're traveling at a relatively constant speed). Normally, these two sensory modalities provide congruent information, but the discrepancy might lead to confusion and nausea. The converse would be true when traveling by plane or boat.

35. Pain serves important functions that are critical to our survival. As noxious as pain stimuli may be, the experiences of individuals who suffer from congenital insensitivity to pain makes the consequences of a lack of pain all too apparent.

36. Research has shown that women and men do differ in their experience of and tolerance for pain: Women tend to handle pain better than men. Perhaps this is due to women's labor and childbirth experience. Men tend to be stoic about their

pain and do not seek help. Research also shows that gender differences in pain tolerance can vary across cultures.

37. This means that perception cannot be understood completely simply by combining the parts. Rather, the relationship that exists among those parts (which would be established according to the principles described in this chapter) is important in organizing and interpreting sensory information into a perceptual set.

38. Playing on their expectations could be used to influence what they were most likely to see. For instance, telling a story about Peter Rabbit and then presenting this image would bias perception along rabbit lines.

Click here to return to questions

Answer Key: States of Consciousness

1. C 2. D 3. B 4. A 5. C 6. D 7. B 8. B 9. C 10. B 11. A 12. C 13. A 14. B 15. C

16. D 17. A 18. B 19. A 20. B 21. D 22. A

23. Given that rotating shift work can lead to exhaustion and decreased mental efficiency, individuals working under these conditions are more likely to make mistakes on the job. The

implications for this in the health care professions are obvious. Those in health care professions could be educated about the benefits of light-dark exposure to help alleviate such problems.

24. Different species have different evolutionary histories, and they have adapted to their environments in different ways. There are a number of different possible explanations as to why a given species is diurnal or nocturnal. Perhaps humans would be most vulnerable to threats during the evening hours when light levels are low. Therefore, it might make sense to be in shelter during this time. Rodents, on the other hand, are faced with a number of predatory threats, so perhaps being active at night minimizes the risk from predators such as birds that use their visual senses to locate prey.

25. Those individuals (or species) that expend the greatest amounts of energy would require the longest periods of sleep.

26. Researchers could use lesion or brain stimulation techniques to determine how deactivation or activation of a given brain region affects behaviour. Furthermore, researchers could use any number of brain imaging techniques like fMRI or CT scans to come to these conclusions.

27. One evolutionary theory of sleep holds that sleep is essential for restoration of resources that are expended during the demands of day-to-day life. A second theory proposes that our sleep patterns evolved as an adaptive response to predatory risks, which increase in darkness. The first theory has little or

no empirical support, and the second theory is supported by some, though not all, research.

28. The subjective nature of dream analysis is one criticism. Psychoanalysts are charged with helping their clients interpret the true meaning of a dream. There is no way to refute or confirm whether or not these interpretations are accurate. The notion that "sometimes a cigar is just a cigar" (sometimes attributed to Freud but not definitively shown to be his) makes it clear that there is no systematic, objective system in place for dream analysis.

29. Dreaming occurs during REM sleep. One of the hallmarks of this particular stage of sleep is the paralysis of the voluntary musculature which would make acting out dreams improbable.

30. One possible explanation might invoke principles of associative learning. If the bed represents a place for socializing, studying, eating, and so on, then it is possible that it will become a place that elicits higher levels of arousal, which would make falling asleep at the appropriate time more difficult. Answers could also consider self-perpetuating cycle referred to when describing insomnia. If an individual is having trouble falling asleep and that generates anxiety, it might make sense to remove him from the context where sleep would normally take place to try to avoid anxiety being associated with that context.

31. Similarities include muscle atony and the hypnagogic hallucinations associated with narcoleptic episodes. The differences involve the uncontrollable nature of narcoleptic attacks and the fact that these come on in situations that would normally not be associated with sleep of any kind (e.g., instances of heightened arousal or emotionality).

32. One possibility involves the cultural acceptance and long history of alcohol and tobacco use in our society. No doubt, money comes into play as well. Growing tobacco and producing alcohol on a large scale is a well-regulated and taxed process. Given that marijuana is essentially a weed that requires little care to grow, it would be much more difficult to regulate its production. Recent events suggest that cultural attitudes regarding marijuana are changing, and it is quite likely that its illicit status will be adapted accordingly.

33. Given that currently available programs designed to help people quit using tobacco products are not necessarily effective in the long term, programs designed to prevent people from using these products in the first place may be the best hope for dealing with the enormous public health concerns associated with tobacco use.

34. Healthcare and pharmaceutical costs continue to skyrocket. If alternative approaches to dealing with these problems could be developed that would be relatively inexpensive, then the potential benefits are many.

35. Ideally, double-blind experimental trials would be best suited to speak to the effectiveness of meditation. At the very least, some sort of randomized control trial would be very informative.

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Answer Key: Memory

1. C 2. D 3. D 4. A 5. C 6. B 7. D 8. A 9. C 10. B 11. A 12. A

13. Both are types of long-term memory. Explicit memories are memories we consciously try to remember and recall. Explicit memory is also called declarative memory and is subdivided into episodic memory (life events) and semantic memory (words, ideas, and concepts). Implicit memories are memories that are not part of our consciousness; they are memories formed from behaviours. Implicit memory is also called non-declarative memory and includes procedural memory as well as things learned through classical conditioning.

14. According to the Atkinson-Shiffrin model, memory is processed in three stages. The first is sensory memory; this is very brief: 1–2 seconds. Anything not attended to is ignored. The stimuli we pay attention to then move into our short-term memory. Short-term memory can hold approximately 7 bits of information for around 20 seconds. Information here is either

forgotten, or it is encoded into long-term memory through the process of rehearsal. Long-term memory is the permanent storage of information—its capacity is basically unlimited.

15. Information is encoded through automatic or effortful processing. Automatic processing refers to all information that enters long-term memory without conscious effort. This includes things such as time, space, and frequency—for example, your ability to remember what you ate for breakfast today or the fact that you remember that you ran into your best friend in the supermarket twice this week. Effortful processing refers to encoding information through conscious attention and effort. Material that you study for a test requires effortful processing.

16. Because your hippocampus seems to be more of a processing area for your explicit memories, injury to this area could leave you unable to process new declarative (explicit) memories; however, even with this loss, you would be able to create implicit memories (procedural memory, motor learning and classical conditioning).

17. There are two types of interference: retroactive and proactive. Both are types of forgetting caused by a failure to retrieve information. With retroactive interference, new information hinders the ability to recall older information. With proactive interference, it's the opposite: old information hinders the recall of newly learned information.

18. There are two types of amnesia: retrograde and anterograde. Both involve the loss of long-term memory that occurs as the result of disease, physical trauma, or psychological trauma. With anterograde amnesia, you cannot remember new information; however, you can remember information and events that happened prior to your injury. Retrograde amnesia is the exact opposite: you experience loss of memory for events that occurred before the trauma.

19. The self-reference effect is the tendency an individual to have better memory for information that relates to oneself than information that is not personally relevant. You can use the self-reference effect to relate the material to something you have already learned for another class, or think how you can apply the concepts to your life. When you do this, you are building a web of retrieval cues that will help you access the material when you want to remember it.

20. You remind her about Ebbinghaus's forgetting curve: the information you learn drops off rapidly with time. Even if you think you know the material, you should study it again right before test time to increase the likelihood the information will remain in your memory. Overlearning can help prevent storage decay.

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Answer Key: Learning

1 . C 2. B 3. A 4. D 5. B 6. D 7. A 8. B 9. D 10. B 11. A 12. B 13. B 14. D 15. A 16. C

17. Both classical and operant conditioning involve learning by association. In classical conditioning, responses are involuntary and automatic; however, responses are voluntary and learned in operant conditioning. In classical conditioning, the event that drives the behaviour (the stimulus) comes before the behaviour; in operant conditioning, the event that drives the behaviour (the consequence) comes after the behaviour. Also, whereas classical conditioning involves an organism forming an association between an involuntary (reflexive) response and a stimulus, operant conditioning involves an organism forming an association between a voluntary behaviour and a consequence.

18. A reflex is a behaviour that humans are born knowing how to do, such as sucking or blushing; these behaviours happen automatically in response to stimuli in the environment. Learned behaviours are things that humans are not born knowing how to do, such as swimming and surfing. Learned behaviours are not automatic; they occur as a result of practice or repeated experience in a situation.

19. The food being toasted is the UCS; the sound of the toaster

popping up is the CS; salivating to the sound of the toaster is the CR.

20. In stimulus generalization, an organism responds to new stimuli that are similar to the original conditioned stimulus. For example, a dog barks when the doorbell rings. He then barks when the oven timer dings because it sounds very similar to the doorbell. On the other hand, stimulus discrimination occurs when an organism learns a response to a specific stimulus, but does not respond the same way to new stimuli that are similar. In this case, the dog would bark when he hears the doorbell, but he would not bark when he hears the oven timer ding because they sound different; the dog is able to distinguish between the two sounds.

21. This occurs through the process of acquisition. A human or an animal learns to connect a neutral stimulus and an unconditioned stimulus. During the acquisition phase, the neutral stimulus begins to elicit the conditioned response. The neutral stimulus is becoming the conditioned stimulus. At the end of the acquisition phase, learning has occurred and the neutral stimulus becomes a conditioned stimulus capable of eliciting the conditioned response by itself.

22. A Skinner box is an operant conditioning chamber used to train animals such as rats and pigeons to perform certain behaviours, like pressing a lever. When the animals perform the desired behaviour, they receive a reward: food or water.

23. In negative reinforcement you are taking away an undesirable stimulus in order to increase the frequency of a certain behaviour (e.g., buckling your seat belt stops the annoying beeping sound in your car and increases the likelihood that you will wear your seatbelt). Punishment is designed to reduce a behaviour (e.g., you scold your child for running into the street in order to decrease the unsafe behaviour.)

24. Shaping is an operant conditioning method in which you reward closer and closer approximations of the desired behaviour. If you want to teach your dog to roll over, you might reward him first when he sits, then when he lies down, and then when he lies down and rolls onto his back. Finally, you would reward him only when he completes the entire sequence: lying down, rolling onto his back, and then continuing to roll over to his other side.

25. Prosocial modelling can prompt others to engage in helpful and healthy behaviours, while antisocial modelling can prompt others to engage in violent, aggressive, and unhealthy behaviours.

26. Cara is more likely to drink at the party because she has observed her parents drinking regularly. Children tend to follow what a parent does rather than what they say.

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Answer Key: Language & Intelligence

1. B 2. C 3. B 4. C 5. D 6. C 7. D 8. B 9. A 10. B 11. A 12. C 13. D 14. A 15. C 16. B 17. B 18. D 19. D 20. C 21. A 22. B 23. D

24. When attending a basketball game, it is typical to support your team by wearing the team colours and sitting behind their bench.

25. Event schemata are rooted in the social fabric of our communities. We expect people to behave in certain ways in certain types of situations, and we hold ourselves to the same social standards. It is uncomfortable to go against an event schema—it feels almost like we are breaking the rules.

26. People tend to talk about the things that are important to them or the things they think about the most. What we talk about, therefore, is a reflection of our values.

27. Grammatical errors that involve overgeneralization of specific rules of a given language indicate that the child recognizes the rule, even if he or she doesn't recognize all of the subtleties or exceptions involved in the rule's application.

28. Functional fixedness occurs when you cannot see a use for an object other than the use for which it was intended. For example, if you need something to hold up a tarp in the rain, but only have a pitchfork, you must overcome your expectation that a pitchfork can only be used for garden chores

before you realize that you could stick it in the ground and drape the tarp on top of it to hold it up.

29. An algorithm is a proven formula for achieving a desired outcome. It saves time because if you follow it exactly, you will solve the problem without having to figure out how to solve the problem. It is a bit like not reinventing the wheel.

30.You are out with friends and it is getting late. You need to make it home before your curfew, but you don't have a ride home. You need to get in touch with your parents, but your cell phone is dead. So, you enter a nearby convenience store and explain your situation to the clerk. He allows you to use the store's phone to call your parents, and they come and pick you and your friends up, and take all of you home.

31. You are visiting Madrid, Spain, on a language immersion trip. Your Spanish is okay, but you still not sure about some of the facial expressions and body language of the native speakers. When faced with a sticky social situation, you do not engage immediately as you might back home. Instead, you hold back and observe what others are doing before reacting.

32. Since cognitive processes are complex, ascertaining them in a measurable way is challenging. Researchers have taken different approaches to define intelligence in an attempt to comprehensively describe and measure it.

33. The Wechsler-Bellevue IQ test combined a series of subtests that tested verbal and nonverbal skills into a single IQ test in order to get a reliable, descriptive score of intelligence. While the Stanford-Binet test was normed and standardized, it

focused more on verbal skills than variations in other cognitive processes.

34. Twin studies are one strong indication that IQ has a genetic component. Another indication is anecdotal evidence in the form of stories about highly intelligent individuals who come from difficult backgrounds yet still become highly successful adults.

35. Learning disabilities are specific neurological problems within the brain and are separate from intelligence. Intellectual disabilities are pervasive and related to intelligence.

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Answer Key: Lifespan Development

1. C 2. B 3. A 4. B 5. D 6. C 7. D 8. A 9. C 10. B 11. A 12. D 13. B 14. C

15. The nature versus nurture controversy seeks to understand whether our personalities and traits are the product of our genetic makeup and biological factors, or whether they are shaped by our environment, which includes such things as our parents, peers, and culture. Today, psychologists agree that both nature and nurture interact to shape who we become, but the debate over the relative contributions of each continues. An example would be a child learning to walk: Nature

influences when the physical ability occurs, but culture can influence when a child masters this skill, as in Aché culture.

16. Continuous development sees our development as a cumulative process: Changes are gradual. On the other hand, discontinuous development sees our development as taking place in specific steps or stages: Changes are sudden.

17. Children develop at different rates. For example, some children may walk and talk as early as 8 months old, while others may not do so until well after their first birthday. Each child's unique contexts will influence when he reaches these milestones.

18. Assimilation is when we take in information that is comparable to what we already know. Accommodation is when we change our schemata based on new information. An example of assimilation is a child's schema of "dog" based on the family's golden retriever being expanded to include two newly adopted golden retrievers. An example of accommodation is that same child's schema of "dog" being adjusted to exclude other four–legged furry animals such as sheep and foxes.

19. Gilligan criticized Kohlberg because his theory was based on the responses of upper class White men and boys, arguing that it was biased against women. While Kohlberg concluded that women must be deficient in their moral reasoning

abilities, Gilligan disagreed, suggesting that female moral reasoning is not deficient, just different.

20. Egocentrism is the inability to take the perspective of another person. This type of thinking is common in young children in the preoperational stage of cognitive development. An example might be that upon seeing his mother crying, a young child gives her his favourite stuffed animal to make her feel better.

21. Alcohol is a teratogen. Excessive drinking can cause mental retardation in children. The child can also have a small head and abnormal facial features, which are characteristic of fetal alcohol syndrome (FAS). Another teratogen is nicotine. Smoking while pregnant can lead to low-birth weight, premature birth, stillbirth, and SIDS.

22. Prenatal care is medical care during pregnancy that monitors the health of both the mother and fetus. It's important to receive prenatal care because it can reduce complications to the mother and fetus during pregnancy.

23. In the embryonic stage, basic structures of the embryo start to develop into areas that will become the head, chest, and abdomen. The heart begins to beat and organs form and begin to function. The neural tube forms along the back of the embryo, developing into the spinal cord and brain. In the fetal

stage, the brain and body continue to develop. Fingers and toes develop along with hearing, and internal organs form.

24. The particular quality or trait must be part of an enduring behaviour pattern, so that it is a consistent or predictable quality.

25. The sucking reflex is the automatic, unlearned sucking motions that infants do with their mouths. It may help promote survival because this action helps the baby take in nourishment. The rooting reflex is the newborn's response to anything that touches her cheek. When you stroke a baby's cheek she will naturally turn her head that way and begin to suck. This may aid survival because it helps the newborn locate a source of food.

26. With the authoritative style, children are given reasonable demands and consistent limits, warmth and affection are expressed, the parent listens to the child's point of view, and the child initiates positive standards. Children raised by authoritative parents tend to have high self-esteem and social skills. Another parenting style is authoritarian: The parent places a high value on conformity and obedience. The parents are often strict, tightly monitor their children, and express little warmth. This style can create anxious, withdrawn, and unhappy kids. The third parenting style is permissive: Parents make few demands, rarely use punishment, and give their children free rein. Children raised by permissive parents tend

to lack self-discipline, which contributes to poor grades and alcohol abuse. However, they have higher self-esteem, better social skills, and lower levels of depression. The fourth style is the uninvolved parent: They are indifferent, uninvolved, and sometimes called neglectful. The children raised in this parenting style are usually emotionally withdrawn, fearful, anxious, perform poorly in school, and are at an increased risk of substance abuse.

27. Emerging adulthood is a relatively new period of lifespan development from 18 years old to the mid-20s, characterized as a transitional time in which identity exploration focuses on work and love. According to Arnett, changing cultural expectations facilitate the delay to full adulthood. People are spending more time exploring their options, so they are delaying marriage and work as they change majors and jobs multiple times, putting them on a much later timetable than their parents.

28. The first stage is denial. The person receives news that he is dying, and either does not take it seriously or tries to escape from the reality of the situation. He might say something like, "Cancer could never happen to me. I take good care of myself. This has to be a mistake." The next stage is anger. He realizes time is short, and he may not have a chance to accomplish what he wanted in life. "It's not fair. I promised my grandchildren that we would go to Disney World, and now I'll never have the chance to take them." The third stage is bargaining. In this

stage, he tries to delay the inevitable by bargaining or pleading for extra time, usually with God, family members, or medical care providers. "God, just give me one more year so I can take that trip with my grandchildren. They're too young to understand what's happening and why I can't take them." The fourth stage is depression. He becomes sad about his impending death. "I can't believe this is how I'm going to die. I'm in so much pain. What's going to become of my family when I'm gone?" The final stage is acceptance. This stage is usually reached in the last few days or weeks before death. He recognizes that death is inevitable. "I need to get everything in order and say all of my good-byes to the people I love."

29. Hospice is a program of services that provide medical, social, and spiritual support for dying people and their families.

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Answer Key: Emotion & Motivation

1. B 2. C 3. D 4. A 5. C 6. D 7. C 8. C 9. A 10. D 11. B 12. A 13. C 14. B

15. The idea of optimal levels of arousal is similar to a drive theory of motivation. Presumably, we all seek to maintain some intermediate level of arousal. If we are underaroused, we

are bored. If we are overaroused, we experience stress. The rides at an amusement park would provide higher arousal (however, we would hope that these rides don't actually pose significant threats to personal safety that would lead to a state of panic) to push us toward our own optimal level of arousal. Individuals at the park would choose different rides based on their specific arousal thresholds; for example, one person might find a simple water ride optimally arousing and an extreme roller coaster overarousing, while others would find the extreme roller coaster optimally arousing.

16. We would expect to see a shift from learning for the sake of learning to learning to earn some reward. This would undermine the foundation upon which traditional institutions of higher education are built. For a student motivated by extrinsic rewards, dependence on those may pose issues later in life (post-school) when there are not typically extrinsic rewards for learning.

17. These disorders are closely associated with sociocultural emphasis on a thin-ideal that is often portrayed in media. Given that non-Caucasians are under-represented in popular media in the West and that the thin-ideal is more heavily emphasized for women, this particular group is most vulnerable.

18. Given the stigma associated with being non-heterosexual, participants who openly identify as homosexual or bisexual in

research projects may not be entirely representative of the non-heterosexual population as a whole.

19. Answers may vary, but it should be indicated that something more than self-reports of successful conversion would be necessary to support such a claim. Longitudinal, objective demonstrations of a real switch in both erotic attraction and the actual behaviour in which the individual engaged would need to be presented in addition to assurances that this type of therapy was safe.

20. The James-Lange theory would predict that I would not feel fear because I haven't had the physiological arousal necessary to induce that emotional state.

21. The research that exists is correlational in nature. It could be the case that reduced hippocampal volume predisposes people to develop PTSD or the decreased volume could result from PTSD. Causal claims can only be made when performing an experiment.

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Answer Key: Personality

1. D 2. D 3. D 4. A 5. B 6. B 7. C 8. C 9. B 10. A 11.B 12. B 13. D 14. B 15. B 16. D 17. A 18. D 19. B 20. A 21. A 22. B 23. A

24. The particular quality or trait must be part of an enduring behaviour pattern, so that it is a consistent or predictable quality.

25. Extroverts are energized by social engagement. Introverts are recharged by solitary time.

26. Horney disagreed with the Freudian idea that women had penis envy and were jealous of a man's biological features. Horney discussed that the jealousy was more likely culturally based, due to the greater privileges that males often have, and that differences between men and women's personalities were cultural, not biologically based. Horney also suggested that men may have womb envy, because men cannot give birth.

27. People who have high self-efficacy believe that their efforts matter. They perceive their goals as being within reach; have a positive view of challenges, seeing them as tasks to be mastered; develop a deep interest in and strong commitment to the activities in which they are involved; and quickly recover from setbacks. Conversely, people with low self-efficacy believe their efforts have little or no effect, and that outcomes are beyond their control. They avoid challenging tasks because they doubt their abilities to be successful; tend to focus on failure and negative outcomes; and lose confidence in their abilities if they experience setbacks.

28. Skinner disagreed with Freud's idea that childhood plays

an important role in shaping our personality. He argued that personality develops over our entire life, rather than in the first few years of life as Freud suggested. Skinner said that our responses can change as we come across new situations; therefore, we can see more variability over time in personality.

29. An easygoing parent may be irritated by a difficult child. If both parent and child have difficult temperaments, then conflicts in the parent-child relationship might result quite often.

30. The Big Five traits are relatively stable over our lifespan with a tendency for the traits to increase or decrease slightly. Researchers have found that conscientiousness increases through young adulthood into middle age, as we become better able to manage our personal relationships and careers. Agreeableness also increases with age, peaking between 50 to 70 years. However, neuroticism and extroversion tend to decline slightly with age.

31. A person with a high score on agreeableness is typically pleasant, cooperative, trustworthy and good-natured. People who score low on agreeableness tend to be described as rude and uncooperative. They may be difficult with which to work.

32. Since culture influences one's personality, then Western ideas about personality may not be applicable to people of other cultures. In addition, Western-based measures of

personality assessment may not be valid when used to collect data on people from other cultures.

33. They can help an employer predict a candidate's reactions and attitudes to various situations they might encounter on the job, thus helping choose the right person for the job. This is particularly important in hiring for a high-risk job such as law enforcement. Personality tests can also reveal a potential employee's desirable qualities such as honesty, motivation, and conscientiousness.

34. A projective test could give the clinician clues about dreams, fears, and personal struggles of which the client may be unaware, since these tests are designed to reveal unconscious motivations and attitudes. They can also help clinicians diagnose psychological disorders.

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Answer Key: Social Psychology

1. D 2. C 3. B 4. B 5. B 6. A 7. C 8. D 9. B 10. C 11. A 12. D 13. B 14. D 15. C 16. C 17. A 18. D 19. C 20. B 21. B 22. D 23. C 24. B 25. A 26. D 27. C 28. B

29. A situationism view is that our behaviours are determined by the situation—for example, a person who is late for work claims that heavy traffic caused the delay. A dispositional view is that our behaviours are determined by personality

traits—for example, a driver in a road rage incident claims the driver who cut her off is an aggressive person. Thus, a situational view tends to provide an excuse for inappropriate behaviour, and a dispositional view tends to lay blame for inappropriate behaviour

30. People from individualistic cultures would tend to attribute athletic success to individual hard work and ability. People from collectivistic cultures would tend attribute athletic success to the team working together and the support and encouragement of the coach.

31. The good guards were fulfilling their social roles and they did not object to other guards' abusive behaviour because of the power of the situation. In addition, the prison supervisor's behaviour sanctioned the guards' negative treatment of prisoners. The prisoners were not weak people; they were recruited because they were healthy, mentally stable adults. The power of their social role influenced them to engage in subservient prisoner behaviour. The script for prisoners is to accept abusive behaviour from authority figures, especially for punishment, when they do not follow the rules.

32. Social roles were in play as each participant acted out behaviours appropriate to his role as prisoner, guard, or supervisor. Scripts determined the specific behaviours the guards and prisoners displayed, such as humiliation and passivity. The social norms of a prison environment sanctions

abuse of prisoners since they have lost many of their human rights and became the property of the government. This experiment can be applied to other situations in which social norms, roles, and scripts dictate our behaviour, such as in mob behaviour. A more recent example of similar behaviour was the abuse of prisoners by American soldiers who were working as prison guards at the Abu Ghraib prison in Iraq.

33. One example is choosing which college to attend—the public school close to home or the Ivy League school out of state. Since both schools are desirable, the student is likely to experience cognitive dissonance in making this decision. In order to justify choosing the public school close to home, the student could change her cognition about Ivy League school, asserting that it is too expensive and the quality of education at the public school is just as good. She could change her attitude toward the Ivy League school and determine that the students there are too stuffy and wouldn't make good classmates.

34. Imagine that you work for an advertising agency, and you've been tasked with developing an advertising campaign to increase sales of Bliss Soda. How would you develop an advertisement for this product that uses a central route of persuasion? How would you develop an ad using a peripheral route of persuasion?

35. Outsiders can serve as a quality control by offering diverse views and views that may differ from the leader's opinion. The

outsider can also remove the illusion of invincibility by having the group's action held up to outside scrutiny. An outsider may offer additional information and uncover information that group members withheld.

36. In social loafing individual performance cannot be evaluated; however, in social facilitation individual performance can be evaluated. Social loafing and social facilitation both occur for easy or well-known tasks and when individuals are relaxed.

37. In the United States, many people believe that sexual orientation is a choice, and there is some debate in the research literature as to the extent sexual orientation is biological or influenced by social factors. Because race and gender are not chosen, many Americans believe it is unfair to negatively judge women or racial minority groups for a characteristic that is determined by genetics. In addition, many people in the United States practice religions that believe homosexuality is wrong.

38. One way in which they might do this is to selectively attend to information that would bolster their argument. Furthermore, they may actively seek out information to confirm their assertions.

39. Hostile aggression is intentional with the purpose to inflict pain. Hostile aggression is often motivated by anger. In

contrast, instrumental aggression is not motivated by anger or the intention to cause pain. Instrumental aggression serves as a means to reach a goal. In a sense it is a more practical or functional form of aggression, whereas hostile aggression is more emotion-driven and less functional and rational.

40. Cyberbullying is difficult to prevent because there are so many forms of media that adolescents use and are exposed to. The Internet is virtually everywhere: computers, phones, tablets, TVs, gaming systems, and so on. Parents likely do not monitor all of their children's use of the Internet, thus their children could be exposed to cyberbullying without their knowledge. Cyberbullying is difficult to detect because it can be done anonymously. Cyberbullies can use pseudonyms and can attack victims in untraceable ways, such as hacking into Facebook accounts or making Twitter posts on their behalf.

41. Proximity is a major situational factor in relationship formation; people who have frequent contact are more likely to form relationships. Whether or not individuals will form a relationship is based on non-situational factors such as similarity, reciprocity, self-disclosure, and physical attractiveness. In relationships, people seek reciprocity (i.e., a give and take in costs and benefits), self-disclosure of intimate information, and physically attractive partners.

42. Traits that promote reproduction in females warmth, affection, and social skills; women with these traits are

presumably better able to care for children. Traits that are desired in males include achievement, leadership qualities, and job skills; men with these traits are thought to be better able to financially provide for their families.

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Answer Key: Stress & Health

1. D 2. B 3. A 4. D 5. D 6. C 7. C 8. B 9. C 10. A 11. A 12. D 13. A 14. C 15. D 16. A 17. B 18. C 19. C 20. D

21. One example is divorce. People may perceive a divorce as a threat if they believe it will result in loneliness, change of lifestyle (due to loss of additional income), or humiliation in the eyes of their family. However, divorce may be perceived as a challenge if they view it as an opportunity to find somebody more compatible, and if they consider the process of finding a new partner a pleasant one, perhaps involving mystery and excitement.

22. One example is when somebody's spouse dies or is unexpectedly diagnosed with a fatal disease. In both cases, the stress experienced by the surviving spouse would be intense, continuous, and—according the general adaptation syndrome—would eventually increase vulnerability to illness or disease (exhaustion stage).

23. For example, many people look forward to celebrating the

Christmas holiday, but it can be stressful in that it requires some degree of readjustment. Getting together with family may bring eustress, while the schedule and travel demands of may bring distress. Giving gifts to others and seeing their enjoyment may bring eustress, but the financial burden associated with buying presents could produce distress. Each of these things requires making some minor adjustments to one's life, and thus is considered somewhat stressful.

24. Type A was conceptualized as a behavioural style characterized by competitiveness, time urgency, impatience, and anger/hostility. It was later discovered, however, that anger/hostility seems to be the dimension that most clearly predicts heart disease.

25. The results of the study showed that people exposed to the virus were more likely to develop a cold if they had high stress scores. The implication of this finding is that during stressful times, like final exam weeks, the immune system becomes compromised. Thus, it's much easier to get sick during these periods because the immune system is not working at full capacity.

26. Emotion-focused coping would likely be a better coping strategy in situations in which a stressor is uncontrollable, or in which nothing could otherwise be done about it, such as a fatal illness.

27. Social support seems to have a direct effect on immune system functioning. Social support can affect health indirectly by influencing health-related behaviours, such as exercise and eating properly

28. Answers will vary, but may include mentioning things that boost positive emotions (the pleasant life), developing and using skills and talents (the good life), and using one's talents to help others (the meaningful life).

29. These individuals' affective forecasting is such that they believe their lives would be immeasurably happier if they won the lottery. Although winning would certainly lead to a surge of euphoria in the short term, long term they would likely adjust, and their happiness levels would likely return to normal. This fact is lost on most people, especially when considering the intensity and duration of their emotions following a major life event.

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Answer Key: Psychological Disorders

1. A 2. B 3. D 4. A 5. A 6. C 7. B 8. C 9. A 10. C 11. D 12. A 13. A 14. A 15. C 16. B 17. D 18. C 19. B 20. C 21. A

22. Just because something is atypical or unusual does not mean it is disordered. A person may experience atypical inner experiences or exhibit unusual behaviours, but she would not be considered disordered if they are not distressing, disturbing, or reflecting a dysfunction. For example, a classmate might stay up all night studying before exams; although atypical, this behaviour is unlikely to possess any of the other criteria for psychological disorder mentioned previously.

23. The DSM-5 is the classification system of psychological disorders preferred by most U.S. mental health professionals, and it is published by the American Psychiatric Association (APA). It consists of broad categories of disorders and specific disorders that fall within each category. Each disorder has an explicit description of its symptoms, as well as information concerning prevalence, risk factors, and comorbidity. The DSM-5 provides a common language that enables mental health professionals to communicate effectively about sets of symptoms.

24. The ICD is used primarily for making clinical diagnoses and more broadly for examining the general health of populations and monitoring the international prevalence of diseases and other health problems. While the DSM is also used for diagnostic purposes, it is also highly valued as a research tool. For example, much of the data regarding the etiology and treatment of psychological disorders are based on diagnostic criteria set forth in the DSM.

25. The perspective one uses in explaining a psychological disorder consists of assumptions that will guide how to best study and understand the nature of a disorder, including its causes, and how to most effectively treat the disorder.

26. Learning theories suggest that some anxiety disorders, especially specific phobia, can develop through a number of learning mechanisms. These mechanisms can include classical and operant conditioning, modelling, or vicarious learning. Cognitive theories, in contrast, assume that some anxiety disorder, especially panic disorder, develop through cognitive misinterpretations of anxiety and other symptoms.

27. Each of the three disorders is characterized by repetitive thoughts and urges, as well as an uncontrollable need to engage in repetitive behaviour and mental acts. For example, repetitive thoughts include concerns over contamination (OCD), imaged physical defects (body dysmorphic disorder), and over discarding one's possessions (hoarding disorder). An uncontrollable need to engage in repetitive behaviours and mental acts include persistent hand-washing (OCD), constantly looking in the mirror (body dysmorphic disorder), and engaging in efforts to acquire new possessions (hoarding disorder).

28. Risk factors associated with PTSD include gender (female), low socioeconomic status, low intelligence, personal and family history of mental illness, and childhood abuse or

trauma. Personality factors, including neuroticism and somatization, may also serve as risk factors. Also, certain versions of a gene that regulates serotonin may constitute a diathesis.

29. This kind of research is important because it enables investigators to identify potential warning signs that predict the onset of schizophrenia. Once such factors are identified, interventions may be developed.

30. Several explanations are possible. One explanation is that perhaps there is little scientific interest in this phenomenon, maybe because it has yet to gain consistent scientific acceptance. Another possible explanation is that perhaps the dissociative amnesia was fashionable at the time publications dealing with this topic peaked (1990s); perhaps since that time it has become less fashionable.

31. Genetic factors appear to play a major role in the development of both ADHD and autism spectrum disorder: studies show higher rates of concordance among identical twins than among fraternal twins for both disorders. In ADHD, genes that regulate dopamine have been implicated; in autism spectrum disorder, de novo genetic mutations appear to be important. Imaging studies suggest that abnormalities in the frontal lobes may be important in the development of ADHD. Parenting practices are not connected to the development of either disorder. Although environmental

toxins are generally unimportant in the development of ADHD, exposure to cigarette smoke during the prenatal period has been linked to the development of the disorder; a number of environmental factors are thought to be associated with an increased risk for autism spectrum disorder: exposure to pollutants, an urban versus rural residence, and vitamin D deficiency. Although some people continue to believe that MMR vaccinations can cause autism spectrum disorder (due to an influential paper that was later retracted), there is no scientific evidence that supports this assertion.

32. The environment is likely to be very instrumental in determining the likelihood of developing antisocial personality disorder. Research has shown that adverse family environments (e.g., divorce or marital problems, legal problems, and drug use) are connected to antisocial personality disorder, particularly if one is genetically vulnerable. Beyond one's family environment, peer group delinquency and community variables (e.g., economic deprivation, community disorganization, drug use, and the presence of adult antisocial models) heighten the risk of violent behaviour.

Click here to return to questions

Answer Key: Treatment

1. B 2. A 3. A 4. C 5. A 6. C 7. D 8. C 9. A 10. A 11. B 12. D 13. C 14. D

15. Beginning in the Middle Ages and up until the mid-20th century, the mentally ill were misunderstood and treated cruelly. In the 1700s, Philippe Pinel advocated for patients to be unchained, and he was able to affect this in a Paris hospital. In the 1800s, Dorothea Dix urged the government to provide better funded and regulated care, which led to the creation of asylums, but treatment generally remained quite poor. Federally mandated deinstitutionalization in the 1960s began the elimination of asylums, but it was often inadequate in providing the infrastructure for replacement treatment.

16. Frank is severely depressed. He lost his job one year ago and has not been able to find another one. A few months after losing his job, his home was foreclosed and his wife left him. Lately, he has been thinking that he would be better off dead. He's begun giving his possessions away and has purchased a handgun. He plans to kill himself on what would have been his 20th wedding anniversary, which is coming up in a few weeks.

17. I would recommend psychodynamic talk therapy or cognitive therapy to help the person see how her thoughts and behaviours are having negative effects.

18. In an individual therapy session, a client works one-on-one with a trained therapist. In group therapy, usually 5–10 people meet with a trained group therapist to discuss a common issue, such as divorce, grief, eating disorder, substance abuse, or anger management.

19. The rationale behind using group therapy for addiction treatment is that addicts are much more likely to maintain sobriety when treatment is in a group format. It has been suggested that it's due to the rewarding and therapeutic benefits of the group, such as support, affiliation, identification, and even confrontation. Because this client is single, he may not have family support, so support from the group may be even more important in his ability to recover and maintain his sobriety.

20. One reason may be that her culture views having a mental illness as a stigma. Additionally, perhaps she doesn't have insurance and is worried about the cost of therapy. She could also be afraid that a White counsellor would not understand her cultural background, so she would feel uncomfortable sharing things. Also, she may believe she is self-reliant and tell herself that she's a strong woman who can fix this problem on her own without the help of a therapist.

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Biological Basis of Behaviour

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