Introduction to Psychology

Introduction to Psychology

PSY 101

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This text is a derivative of *Psychology 2e*, Noba Project, and Lumen Learning. Modification, adaptation, and original content authored by: Prof. Julie Lazzara

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Acknowledgements

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The textbook can be downloaded in different formats on the homepage of the book at no cost.

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About *Psychology 2e*

Psychology 2e is designed to meet scope and sequence requirements

for the single-semester introduction to psychology course. The book offers a comprehensive treatment of core concepts, grounded in both classic studies and current and emerging research. The text also includes coverage of the DSM-5 in examinations of psychological disorders. *Psychology 2e* incorporates discussions that reflect the diversity within the discipline, as well as the diversity of cultures and communities across the globe. *Psychology 2e* is licensed under a Creative Commons Attribution 4.0 International (CC BY) license, which means that you can distribute, remix, and build upon the content, as long as you provide attribution to OpenStax and its content contributors.

The first edition of *Psychology* has been used by thousands of faculty and hundreds of thousands of students since its publication in 2015. OpenStax mined our adopters' extensive and helpful feedback to identify the most significant revision needs while maintaining the organization that many instructors had incorporated into their courses. Specific surveys, pre-revision reviews, and customization analysis, as well as analytical data from OpenStax partners and online learning environments, all aided in planning the revision.

The result is a book that thoroughly treats psychology's foundational concepts while adding current and meaningful coverage in specific areas. *Psychology 2e* retains its manageable scope and contains ample features to draw learners into the discipline. Structurally, the textbook remains similar to the first edition, with no chapter reorganization and very targeted changes at the section level.

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1. The Science of Psychology

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.

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 behavior. 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).

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 behavior. The primary goals of psychology are to describe, explain, predict, and control behavior.

The earliest records of a psychological experiment go all the way back to the Pharaoh Psamtik I of Egypt in the 7th Century B.C. [Image: Neithsabes, CC0 Public Domain, https://goo.gl/m25gce]

Learning Objectives

- Describe the precursors to the establishment of the science of psychology.
- Identify key individuals and events in the history of American psychology.
- Describe the rise of professional psychology in America.
- Develop a basic understanding of the processes of scientific development and change.

It is always a difficult question to ask, where to begin to tell the story of the history of psychology. Some would start with ancient Greece; others would look to a demarcation in the late 19th century when the science of psychology was formally proposed and instituted. These two perspectives, and all that is in between, are appropriate for describing a history of psychology. For the purposes of this chapter, we will examine the development of psychology in America and use the mid-19th century as our starting point which we refer to as a history of modern psychology.

Psychology is an exciting field and the history of psychology offers the opportunity to make sense of how it has grown and developed. The history of psychology also provides perspective. Rather than a dry collection of names and dates, the history of psychology tells us about the important intersection of time and place that defines who we are. Consider what happens when you meet someone for the first time. The conversation usually begins with a series of questions such as, "Where did you grow up?" "How long have you lived here?" "Where did you go to school?" The importance of history in defining who we are cannot be overstated.

Whether you are seeing a physician, talking with a counselor, or applying for a job, everything begins with a history. The same is true for studying the history of psychology; getting a history of the field helps to make sense of where we are and how we got here.

A Prehistory of Psychology

Precursors to American psychology can be found in philosophy and physiology. Philosophers such as John Locke (1632–1704) and Thomas Reid (1710–1796) promoted empiricism, the idea that all knowledge comes from experience. The work of Locke, Reid, and others emphasized the role of the human observer and the primacy of the senses in defining how the mind comes to acquire knowledge. In American colleges and universities in the early 1800s, these principles were taught as courses on mental and moral philosophy. Most often these courses taught about the mind based on the faculties of intellect, will, and the senses (Fuchs, 2000).

Physiology and Psychophysics

Philosophical questions about the nature of mind and knowledge were matched in the 19th century by physiological investigations of the sensory systems of the human observer. German physiologist Hermann von Helmholtz (1821–1894) measured the speed of the neural impulse and explored the physiology of hearing and vision. His work indicated that our senses can deceive us and are not a mirror of the external world. Such work showed that even though the human senses were fallible, the mind could be measured using the methods of science. In all, it suggested that a science of psychology was feasible.

An important implication of Helmholtz's work was that there is a psychological reality and a physical reality and that the two are not identical. This was not a new idea; philosophers like John Locke had written extensively on the topic, and in the 19th century, philosophical speculation about the nature of mind became subject to the rigors of science.

The question of the relationship between the mental (experiences of the senses) and the material (external reality) was investigated by a number of German researchers including Ernst Weber and Gustav Fechner. Their work was called psychophysics, and it introduced methods for measuring the relationship between physical stimuli and human perception that would serve as the basis for the new science of psychology (Fancher & Rutherford, 2011).

Wilhelm Wundt is considered one of the founding figures of modern psychology. [CC0 Public Domain, https://goo.gl/m25gce]

The formal development of modern psychology is usually credited to the work of German physician, physiologist, and philosopher Wilhelm Wundt (1832–1920). Wundt helped to establish the field of experimental psychology by serving as a strong promoter of the idea that psychology could be an experimental field and by providing classes, textbooks, and a laboratory for training students. In 1875, he joined the faculty at the University of Leipzig and quickly began to make plans for the creation of a program of experimental psychology. In 1879, he complemented his lectures on experimental psychology with a laboratory experience: an event that has served as the popular date for the establishment of the science of psychology.

The response to the new science was immediate and global. Wundt attracted students from around the world to study the new experimental psychology and work in his lab. Students were trained to offer detailed self-reports of their reactions to various stimuli, a procedure known as introspection. The goal was to identify the elements of consciousness. In addition to the study of sensation and perception, research was done on mental chronometry, more commonly known as reaction time. The work of Wundt and his students demonstrated that the mind could be measured and the nature of consciousness could be revealed through scientific means. It was an exciting proposition and one that found great interest in America. After the opening of Wundt's lab in 1879, it took just four years for the first psychology laboratory to open in the United States (Benjamin, 2007).

Scientific Psychology Comes to the United States

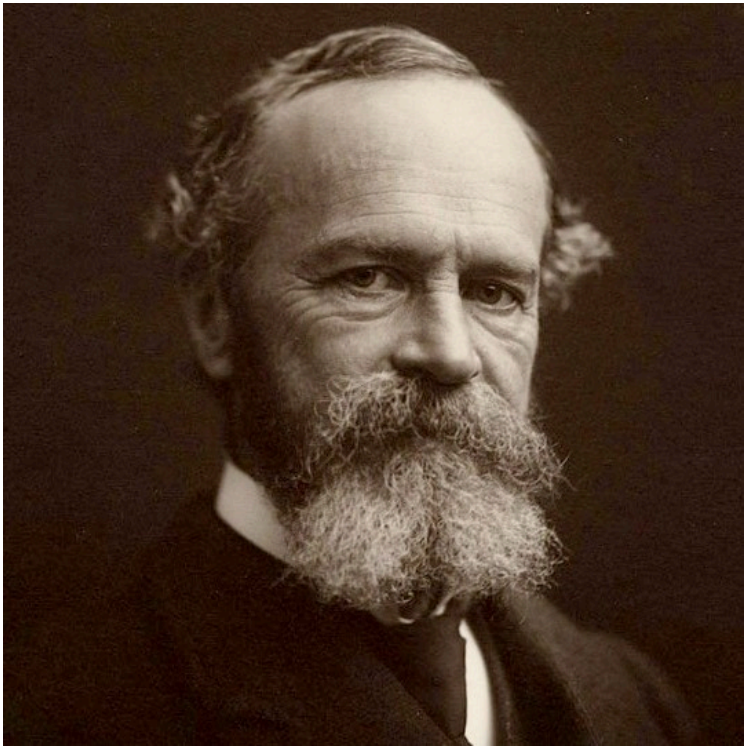
Wundt's version of psychology arrived in America most visibly through the work of Edward Bradford Titchener (1867–1927). A

student of Wundt's, Titchener brought to America a brand of experimental psychology referred to as "structuralism." Structuralists were interested in the contents of the mind—what the mind is. For Titchener, the general adult mind was the proper focus for the new psychology, and he excluded from study those with mental deficiencies, children, and animals (Evans, 1972; Titchener, 1909).

Experimental psychology spread rather rapidly throughout North America. By 1900, there were more than 40 laboratories in the United States and Canada (Benjamin, 2000). Psychology in America also organized early with the establishment of the American Psychological Association (APA) in 1892. Titchener felt that this new organization did not adequately represent the interests of experimental psychology, so, in 1904, he organized a group of colleagues to create what is now known as the Society of Experimental Psychologists (Goodwin, 1985). The group met annually to discuss research in experimental psychology. Reflecting the times, women researchers were not invited (or welcome). It is interesting to note that Titchener's first doctoral student was a woman, Margaret Floy Washburn (1871–1939).

Striking a balance between the science and practice of psychology continues to this day. In 1988, the American Psychological Society (now known as the Association for Psychological Science) was founded with the central mission of advancing psychological science.

Toward a Functional Psychology



William James was one of the leading figures in a new perspective on psychology called functionalism. [Image: Notman Studios, CC0 Public Domain, https://goo.gl/m25gce]

While Titchener and his followers adhered to a structural psychology, others in America were pursuing different approaches. William James, G. Stanley Hall, and James McKeen Cattell were among a group that became identified with "functionalism." Influenced by Darwin's evolutionary theory, functionalists were interested in the activities of the mind—what the mind does. An interest in functionalism opened the way for the study of a wide

range of approaches, including animal and comparative psychology (Benjamin, 2007).

William James (1842–1910) is regarded as writing perhaps the most influential and important book in the field of psychology, *Principles of Psychology*, published in 1890. Opposed to the reductionist ideas of Titchener, James proposed that consciousness is ongoing and continuous; it cannot be isolated and reduced to elements. For James, consciousness helped us adapt to our environment in such ways as allowing us to make choices and have personal responsibility over those choices.

At Harvard, James occupied a position of authority and respect in psychology and philosophy. Through his teaching and writing, he influenced psychology for generations. One of his students, Mary Whiton Calkins (1863–1930), faced many of the challenges that confronted Margaret Floy Washburn and other women interested in pursuing graduate education in psychology. With much persistence, Calkins was able to study with James at Harvard. She eventually completed all the requirements for the doctoral degree, but Harvard refused to grant her a diploma because she was a woman. Despite these challenges, Calkins went on to become an accomplished researcher and the first woman elected president of the American Psychological Association in 1905 (Scarborough & Furumoto, 1987).

G. Stanley Hall (1844–1924) made substantial and lasting contributions to the establishment of psychology in the United States. At Johns Hopkins University, he founded the first psychological laboratory in America in 1883. In 1887, he created the first journal of psychology in America, *American Journal of Psychology*. In 1892, he founded the American Psychological Association (APA); in 1909, he invited and hosted Freud at Clark University (the only time Freud visited America). Influenced by evolutionary theory, Hall was interested in the process of adaptation and human development. Using surveys and questionnaires to study children, Hall wrote extensively on child development and education. While graduate education in psychology was restricted for women in Hall's time, it was all but non-existent for African

Americans. In another first, Hall mentored Francis Cecil Sumner (1895–1954) who, in 1920, became the first African American to earn a Ph.D. in psychology in America (Guthrie, 2003).

James McKeen Cattell (1860–1944) received his Ph.D. with Wundt but quickly turned his interests to the assessment of individual differences. Influenced by the work of Darwin's cousin, Frances Galton, Cattell believed that mental abilities such as intelligence were inherited and could be measured using mental tests. Like Galton, he believed society was better served by identifying those with superior intelligence and supported efforts to encourage them to reproduce. Such beliefs were associated with eugenics (the promotion of selective breeding) and fueled early debates about the contributions of heredity and environment in defining who we are. At Columbia University, Cattell developed a department of psychology that became world-famous also promoting psychological science through advocacy and as a publisher of scientific journals and reference works (Fancher, 1987; Sokal, 1980).

The Growth of Psychology

Throughout the first half of the 20th century, psychology continued to grow and flourish in America. It was large enough to accommodate varying points of view on the nature of mind and behavior. Gestalt psychology is a good example. The Gestalt movement began in Germany with the work of Max Wertheimer (1880–1943). Opposed to the reductionist approach of Wundt's laboratory psychology, Wertheimer and his colleagues believed that studying the whole of any experience was richer than studying individual aspects of that experience. The saying "the whole is greater than the sum of its parts" is a Gestalt perspective. Consider that a melody is an additional element beyond the collection of notes that comprise it. The Gestalt psychologists proposed that the mind often processes information simultaneously rather than

sequentially. For instance, when you look at a photograph, you see a whole image, not just a collection of pixels of color. Using Gestalt principles, Wertheimer and his colleagues also explored the nature of learning and thinking. Most of the German Gestalt psychologists were Jewish and were forced to flee the Nazi regime due to the threats posed on both academic and personal freedoms. In America, they were able to introduce a new audience to the Gestalt perspective, demonstrating how it could be applied to perception and learning (Wertheimer, 1938). In many ways, the work of the Gestalt psychologists served as a precursor to the rise of cognitive psychology in America (Benjamin, 2007).

Behaviorism emerged early in the 20th century and became a major force in American psychology. Championed by psychologists such as John B. Watson (1878–1958) and B. F. Skinner (1904–1990), behaviorism rejected any reference to mind and viewed overt and observable behavior as the proper subject matter of psychology. Through the scientific study of behavior, it was hoped that laws of learning could be derived that would promote the prediction and control of behavior. Russian physiologist Ivan Pavlov (1849–1936) influenced early behaviorism in America. His work on conditioned learning, popularly referred to as classical conditioning, provided support for the notion that learning and behavior were controlled by events in the environment and could be explained with no reference to mind or consciousness (Fancher, 1987).

For decades, behaviorism dominated American psychology. By the 1960s, psychologists began to recognize that behaviorism was unable to fully explain human behavior because it neglected mental processes. The turn toward a cognitive psychology was not new. In the 1930s, British psychologist Frederic C. Bartlett (1886–1969) explored the idea of the constructive mind, recognizing that people use their past experiences to construct frameworks in which to understand new experiences. In the 1950s, Bruner conducted pioneering studies on cognitive aspects of sensation and perception. Brown conducted original research on language and memory, coined the term "flashbulb memory," and figured out how

to study the tip-of-the-tongue phenomenon (Benjamin, 2007). Miller's research on working memory is legendary. His 1956 paper "The Magic Number Seven, Plus or Minus Two: Some Limits on Our Capacity for Processing Information"is one of the most highly cited papers in psychology. A popular interpretation of Miller's research was that the number of bits of information an average human can hold in working memory is 7 ± 2. Around the same time, the study of computer science was growing and was used as an analogy to explore and understand how the mind works. The work of Miller and others in the 1950s and 1960s has inspired tremendous interest in cognition and neuroscience, both of which dominate much of contemporary American psychology.

Applied Psychology in America

In America, there has always been an interest in the application of psychology to everyday life. Mental testing is an important example. Modern intelligence tests were developed by the French psychologist Alfred Binet (1857–1911). His goal was to develop a test that would identify schoolchildren in need of educational support. His test, which included tasks of reasoning and problem solving, was introduced in the United States by Henry Goddard (1866–1957) and later standardized by Lewis Terman (1877–1956) at Stanford University. The assessment and meaning of intelligence has fueled debates in American psychology and society for nearly 100 years. Much of this is captured in the nature-nurture debate that raises questions about the relative contributions of heredity and environment in determining intelligence (Fancher, 1987).

Applied psychology was not limited to mental testing. What psychologists were learning in their laboratories was applied in many settings including the military, business, industry, and education. The early 20th century was witness to rapid advances in applied psychology.

Clinical psychology was also an early application of experimental psychology in America. Lightner Witmer (1867–1956) received his Ph.D. in experimental psychology with Wilhelm Wundt and returned to the University of Pennsylvania, where he opened a psychological clinic in 1896. Witmer believed that because psychology dealt with the study of sensation and perception, it should be of value in treating children with learning and behavioral problems. He is credited as the founder of both clinical and school psychology (Benjamin & Baker, 2004).

Psychology as a Profession

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 Ph.D. in a relevant area of psychology. Literally, Ph.D. 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 Ph.D. 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 1.17).

Figure 1.17Doctoral degrees are generally conferred in formal ceremonies involving special attire and rites. (credit: Public Affairs Office Fort Wainwright)

Once someone earns a Ph.D., 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 1.18).

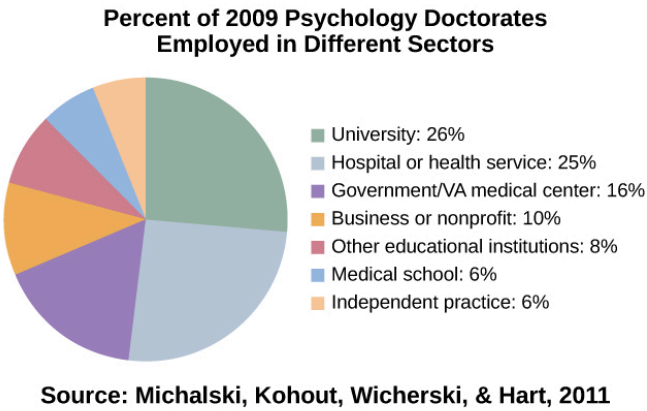


Figure 1.18Individuals earning a Ph.D. in psychology have a range of employment options.

LINK TO LEARNING: Use this interactive tool and explore different careers in psychology based on degree levels to learn more.

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 Ph.D. 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 the application of psychological principles in the clinical context (Norcorss & Castle, 2002).

Regardless of whether earning a Ph.D. or PsyD, in most states, an individual wishing to practice as a licensed clinical or counseling 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 counseling psychologists (Norcross, n.d.). Licensed clinical or counseling 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 counseling, clinical psychologists have a Ph.D. 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 Ph.D. 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 counselors (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 1.1. 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 behavior.

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)

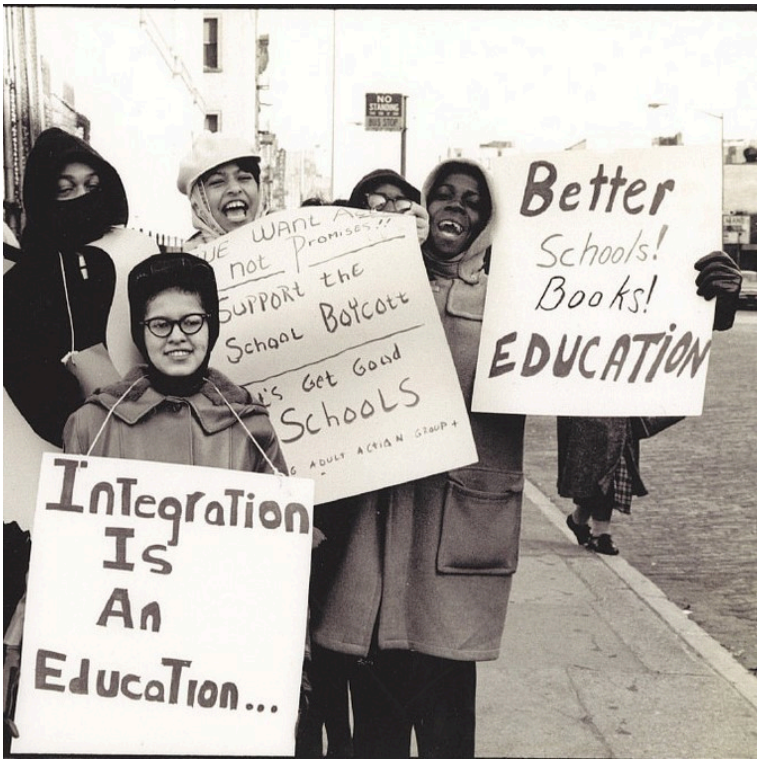
Table 1.1

Although this is what most people see in their mind's eye when asked to envision a "psychologist" the APA recognizes as many as 58 different divisions of psychology. [Image: Bliusa, https://goo.gl/yrSUCr, CC BY-SA 4.0, https://goo.gl/6pvNbx]

Psychology and Society

Given that psychology deals with the human condition, it is not surprising that psychologists would involve themselves in social issues. For more than a century, psychology and psychologists have been agents of social action and change. Using the methods and tools of science, psychologists have challenged assumptions, stereotypes, and stigma. Founded in 1936, the Society for the

Psychological Study of Social Issues (SPSSI) has supported research and action on a wide range of social issues. Individually, there have been many psychologists whose efforts have promoted social change. Helen Thompson Woolley (1874–1947) and Leta S. Hollingworth (1886–1939) were pioneers in research on the psychology of sex differences. Working in the early 20th century, when women's rights were marginalized, Thompson examined the assumption that women were overemotional compared to men and found that emotion did not influence women's decisions any more than it did men's. Hollingworth found that menstruation did not negatively impact women's cognitive or motor abilities. Such work combatted harmful stereotypes and showed that psychological research could contribute to social change (Scarborough & Furumoto, 1987).



Mamie Phipps Clark and Kenneth Clark studied the negative

impacts of segregated education on African-American children. [Image: Penn State Special Collection, https://goo.gl/WP7Dgc, CC BY-NC-SA 2.0, https://goo.gl/Toc0ZF]

Growth and expansion have been a constant in American psychology. In the latter part of the 20th century, areas such as social, developmental, and personality psychology made major contributions to our understanding of what it means to be human. Today neuroscience is enjoying tremendous interest and growth.

As mentioned at the beginning of the chapter, it is a challenge to cover all the history of psychology in such a short space. Errors of omission and commission are likely in such a selective review. The history of psychology helps to set a stage upon which the story of psychology can be told. This brief summary provides some glimpse into the depth and rich content offered by the history of psychology. It is hoped that you will be able to see these connections and have a greater understanding and appreciation for both the unity and diversity of the field of psychology.

Learning Objectives

- Describe the key characteristics of the scientific approach.
- Discuss a few of the benefits, as well as problems that have been created by science.
- Describe several ways that psychological science has improved the world.
- Describe a number of the ethical guidelines that psychologists follow.
- Describe the different research methods used by psychologists

Psychology as a Science

Even in modern times, many people are skeptical that psychology is really a science. To some degree, this doubt stems from the fact that many psychological phenomena such as depression, intelligence, and prejudice do not seem to be directly observable in the same way that we can observe the changes in ocean tides or the speed of light. Because thoughts and feelings are invisible many early psychological researchers chose to focus on behavior. You might have noticed that some people act in a friendly and outgoing way while others appear to be shy and withdrawn. If you have made these types of observations then you are acting just like early psychologists who used behavior to draw inferences about various types of personality. By using behavioral measures and rating scales it is possible to measure thoughts and feelings. This is similar to how other researchers explore "invisible" phenomena such as the way that educators measure academic performance or economists measure quality of life.

One important pioneering researcher was Francis Galton, a cousin of Charles Darwin who lived in England during the late 1800s. Galton used patches of color to test people's ability to distinguish between them. He also invented the self-report questionnaire, in which people offered their own expressed judgments or opinions on various matters. Galton was able to use self-reports to examine—among other things—people's differing ability to accurately judge distances.

In 1875 Francis Galton did pioneering studies of twins to determine how much the similarities and differences in twins were affected by their life experiences. In the course of this work he coined the phrase "Nature versus Nurture". [Image: XT Inc., https://goo.gl/F1Wvu7, CC BY-NC-SA 2.0, https://goo.gl/Toc0ZF]

Although he lacked a modern understanding of genetics Galton also had the idea that scientists could look at the behaviors of identical and fraternal twins to estimate the degree to which genetic and social factors contribute to personality; a puzzling issue we currently refer to as the "nature-nurture question."

In modern times psychology has become more sophisticated. Researchers now use better measures, more sophisticated study designs and better statistical analyses to explore human nature. Simply take the example of studying the emotion of happiness.

How would you go about studying happiness? One straightforward method is to simply ask people about their happiness and to have them use a numbered scale to indicate their feelings. There are, of course, several problems with this. People might lie about their happiness, might not be able to accurately report on their own happiness, or might not use the numerical scale in the same way. With these limitations in mind modern psychologists employ a wide range of methods to assess happiness. They use, for instance, "peer report measures" in which they ask close friends and family members about the happiness of a target individual. Researchers can then compare these ratings to the self-report ratings and check for discrepancies. Researchers also use memory measures, with the idea that dispositionally positive people have an easier time recalling pleasant events and negative people have an easier time recalling unpleasant events. Modern psychologists even use biological measures such as saliva cortisol samples (cortisol is a stress related hormone) or fMRI images of brain activation (the left pre-frontal cortex is one area of brain activity associated with good moods).

Despite our various methodological advances it is true that psychology is still a very young science. While physics and chemistry are hundreds of years old psychology is barely a hundred and fifty years old and most of our major findings have occurred only in the last 60 years. There are legitimate limits to psychological science but it is a science nonetheless.

What Is Science?

What is this process we call "science," which has so dramatically changed the world? Ancient people were more likely to believe in magical and supernatural explanations for natural phenomena such as solar eclipses or thunderstorms. By contrast, scientifically minded people try to figure out the natural world through testing and observation. Specifically, science is the use of systematic

observation in order to acquire knowledge. For example, children in a science class might combine vinegar and baking soda to observe the bubbly chemical reaction. These empirical methods are wonderful ways to learn about the physical and biological world. Science is not magic—it will not solve all human problems, and might not answer all our questions about behavior. Nevertheless, it appears to be the most powerful method we have for acquiring knowledge about the observable world. The essential elements of science are as follows:

1. *Systematic observation is the core of science*. Scientists observe the world, in a very organized way. We often measure the phenomenon we are observing. We record our observations so that memory biases are less likely to enter in to our conclusions. We are systematic in that we try to observe under controlled conditions, and also systematically vary the conditions of our observations so that we can see variations in the phenomena and understand when they occur and do not occur.

Systematic observation is the core of science. [Image: Cvl Neuro, https://goo.gl/Avbju7, CC BY-SA 3.0, https://goo.gl/uhHola]

2. *Observation leads to hypotheses we can test*. When we develop **hypotheses** and **theories**, we state them in a way that can be tested. For example, you might make the claim that candles made of paraffin wax burn more slowly than do candles of the exact same size and shape made from bee's wax. This claim can be readily tested by timing the burning speed of candles made from these materials.
3. *Science is democratic*. People in ancient times may have been willing to accept the views of their kings or pharaohs as absolute truth. These days, however, people are more likely to want to be able to form their own opinions and debate conclusions. Scientists are skeptical and have open discussions about their observations and theories. These debates often

occur as scientists publish competing findings with the idea that the best data will win the argument.

4. *Science is cumulative*. We can learn the important truths discovered by earlier scientists and build on them. Any physics student today knows more about physics than Sir Isaac Newton did even though Newton was possibly the most brilliant physicist of all time. A crucial aspect of scientific progress is that after we learn of earlier advances, we can build upon them and move farther along the path of knowledge.

Psychological Science is Useful

Psychological science is useful for creating interventions that help people live better lives. A growing body of research is concerned with determining which therapies are the most and least effective for the treatment of psychological disorders.

Cognitive Behavioral Therapy has shown to be effective in treating a variety of conditions, including depression. [Image: SalFalco, https://goo.gl/3knLoJ, CC BY-NC 2.0, https://goo.gl/HEXbAA]

For example, many studies have shown that cognitive behavioral therapy can help many people suffering from depression and anxiety disorders (Butler, Chapman, Forman, & Beck, 2006; Hoffman & Smits, 2008). In contrast, research reveals that some types of therapies actually might be harmful on average (Lilienfeld, 2007).

In organizational psychology, a number of psychological interventions have been found by researchers to produce greater productivity and satisfaction in the workplace (e.g., Guzzo, Jette, & Katzell, 1985). Human factor engineers have greatly increased the safety and utility of the products we use. For example, the human factors psychologist Alphonse Chapanis and other researchers

redesigned the cockpit controls of aircraft to make them less confusing and easier to respond to, and this led to a decrease in pilot errors and crashes.

Forensic sciences have made courtroom decisions more valid. We all know of the famous cases of imprisoned persons who have been exonerated because of DNA evidence. Equally dramatic cases hinge on psychological findings. For instance, psychologist Elizabeth Loftus has conducted research demonstrating the limits and unreliability of eyewitness testimony and memory. Thus, psychological findings are having practical importance in the world outside the laboratory. Psychological science has experienced enough success to demonstrate that it works, but there remains a huge amount yet to be learned.

Ethics of Scientific Psychology

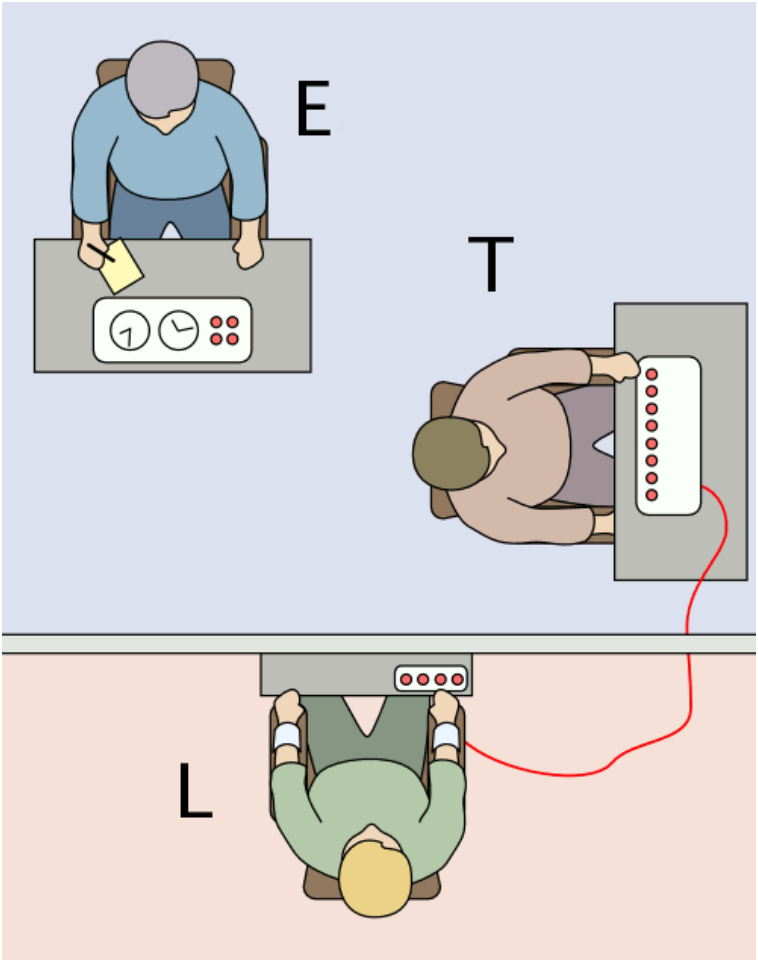


Diagram of the Milgram Experiment in which the "teacher" (T) was asked to deliver a (supposedly) painful electric shock to the "learner"(L). Would this experiment be approved by a review board today? [Image: Fred the Oyster, https://goo.gl/ZIbQz1, CC BY-SA 4.0, https://goo.gl/X3i0tq]

Psychology differs somewhat from the natural sciences such as chemistry in that researchers conduct studies with human research participants. Because of this there is a natural tendency to want to guard research participants against potential psychological harm. For example, it might be interesting to see how people handle ridicule but it might not be advisable to ridicule research participants.

Scientific psychologists follow a specific set of guidelines for research known as a code of ethics. There are extensive ethical guidelines for how human participants should be treated in psychological research (Diener & Crandall, 1978; Sales & Folkman, 2000). Following are a few highlights:

1. *Informed consent*. In general, people should know when they are involved in research, and understand what will happen to them during the study. They should then be given a free choice as to whether to participate.
2. *Confidentiality*. Information that researchers learn about individual participants should not be made public without the consent of the individual.
3. *Privacy*. Researchers should not make observations of people in private places such as their bedrooms without their knowledge and consent. Researchers should not seek confidential information from others, such as school authorities, without consent of the participant or his or her guardian.
4. *Benefits*. Researchers should consider the benefits of their proposed research and weigh these against potential risks to the participants. People who participate in psychological studies should be exposed to risk only if they fully understand these risks and only if the likely benefits clearly outweigh the risks.
5. *Deception*. Some researchers need to deceive participants in order to hide the true nature of the study. This is typically done to prevent participants from modifying their behavior in

unnatural ways. Researchers are required to "debrief" their participants after they have completed the study. Debriefing is an opportunity to educate participants about the true nature of the study.

Why Learn About Scientific 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 behavior. 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).

Scientific Versus Everyday Reasoning

Each day, people offer statements as if they are facts, such as, "It looks like rain today," or, "Dogs are very loyal." These conclusions represent hypotheses about the world: best guesses as to how the world works. Scientists also draw conclusions, claiming things like, "There is an 80% chance of rain today," or, "Dogs tend to protect their human companions." You'll notice that the two examples of scientific claims use less certain language and are more likely to be associated with probabilities. Understanding the similarities and differences between scientific and every day (non-scientific) statements is essential to our ability to accurately evaluate the trustworthiness of various claims.

Scientific and everyday reasoning both employ induction: drawing general conclusions from specific observations. For example, a person's opinion that cramming for a test increases performance may be based on her 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.

The process of induction, alone, does not seem suitable enough to provide trustworthy information—given the contradictory results. What should a student who wants to perform well on exams do? One source of information encourages her to cram, while another suggests that spacing out her studying time is the best strategy. To make the best decision with the information at hand, we need to appreciate the differences between personal opinions and scientific statements, which requires an understanding of science and the nature of scientific reasoning.

There are generally agreed-upon features that distinguish scientific thinking—and the theories and data generated by it—from everyday thinking. A short list of some of the commonly cited features of scientific theories and data is shown in Table 1.

Accuracy	Explanations and theories match real-world observations	E.g. Although people say, "opposites attract," theories that focus on the role of partner similarity do a better job of explaining the observed data
Consistency	A theory has few exceptions and shows agreement with other theories within and across disciplines.	E.g. The theory of evolution explains many findings across biology and psychology predicting, for example, that humans are better able to solve problems presented in concrete rather than abstract terms
Scope	Extent to which a theory extends beyond currently available data, explaining a wide array of phenomena.	E.g. There is a theory that people use mental "short cuts" when making decision rather than weighing every single piece of evidence. This can be seen in consumer purchasing behavior, in romantic relationships, in charitable donations, and in health choices.
Simplicity	When multiple explanations are equally good at explaining the data, the simplest should be selected.	E.g. The simplest explanation for why "good" people sometimes do "bad" things is because they succumb to some outside influence
Fruitfulness	The usefulness of the theory in guiding new research by predicting new, testable relationships.	E.g. The explanation that competition leads to improved performance can be tested by researching different types of competition

Table 1. Features of good scientific theories (Kuhn, 2011)

One additional feature of modern science not included in this list but prevalent in scientists' thinking and theorizing is falsifiability, a feature that has so permeated scientific practice that it warrants additional clarification. In the early 20th century, Karl Popper (1902-1994) suggested that science can be distinguished from pseudoscience (or just everyday reasoning) because scientific claims are capable of being falsified. That is, a claim can be conceivably demonstrated to be untrue. For example, a person might claim that "all people are right-handed." This claim can be tested and–ultimately–thrown out because it can be shown to be false: There are people who are left-handed. An easy rule of thumb is to not get confused by the term "falsifiable" but to understand that–more or less–it means testable.

On the other hand, some claims cannot be tested and falsified. Imagine, for instance, that a magician claims that he can teach people to move objects with their minds. The trick, he explains, is to *truly believe* in one's ability for it to work. When his students fail

to budge chairs with their minds, the magician scolds, "Obviously, you don't truly believe." The magician's claim does not qualify as falsifiable because there is no way to disprove it. It is unscientific.

Popper was particularly irritated about nonscientific claims because he believed they were a threat to the science of psychology. Specifically, he was dissatisfied with Freud's explanations for mental illness. Freud believed that when a person suffers a mental illness it is often due to problems stemming from childhood. For instance, imagine a person who grows up to be an obsessive perfectionist. If she were raised by messy, relaxed parents, Freud might argue that her adult perfectionism is a reaction to her early family experiences—an effort to maintain order and routine instead of chaos. Alternatively, imagine the same person being raised by harsh, orderly parents. In this case, Freud might argue that her adult tidiness is simply her internalizing her parents' way of being. As you can see, according to Freud's rationale, both opposing scenarios are possible; no matter what the disorder, Freud's theory could explain its childhood origin—thus failing to meet the principle of falsifiability.

Popper argued against statements that could not be falsified. He claimed that they blocked scientific progress: There was no way to advance, refine, or refute knowledge based on such claims. Popper's solution was a powerful one: *If science showed all the possibilities that were not true, we would be left only with what is true.* That is, we need to be able to articulate—beforehand—the kinds of evidence that will disprove our hypothesis and cause us to abandon it.

This may seem counterintuitive. For example, if a scientist wanted to establish a comprehensive understanding of why car accidents happen, she would systematically test all potential causes: alcohol consumption, speeding, using a cell phone, fiddling with the radio, wearing sandals, eating, chatting with a passenger, etc. A complete understanding could only be achieved once all possible explanations were explored and either falsified or not. After all the testing was concluded, the evidence would be evaluated against the criteria for falsification, and only the real causes of accidents would remain.

The scientist could dismiss certain claims (e.g., sandals lead to car accidents) and keep only those supported by research (e.g., using a mobile phone while driving increases risk). It might seem absurd that a scientist would need to investigate so many alternative explanations, but it is exactly how we rule out bad claims. Of course, many explanations are complicated and involve multiple causes—as with car accidents, as well as psychological phenomena.

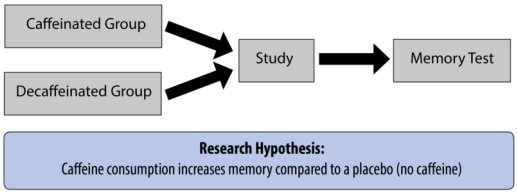
Can It Be Falsified?

Although the idea of falsification remains central to scientific data and theory development, these days it's not used strictly the way Popper originally envisioned it. To begin with, scientists aren't solely interested in demonstrating what *isn't*. Scientists are also interested in providing descriptions and explanations for the way things *are*. We want to describe different causes and the various conditions under which they occur. We want to discover when young children start speaking in complete sentences, for example, or whether people are happier on the weekend, or how exercise impacts depression. These explorations require us to draw conclusions from limited samples of data. In some cases, these data seem to fit with our hypotheses and in others, they do not. This is where interpretation and probability come in.

The Interpretation of Research Results

Imagine a researcher wanting to examine the hypothesis—a specific prediction based on previous research or scientific theory—that caffeine enhances memory. She knows there are several published studies that suggest this might be the case, and she wants to further explore the possibility. She designs an experiment to test this

hypothesis. She randomly assigns some participants a cup of fully caffeinated tea and some a cup of herbal tea. All the participants are instructed to drink up, study a list of words, then complete a memory test. There are three possible outcomes of this proposed study:



1. The caffeine group performs better (support for the hypothesis).
2. The no-caffeine group performs better (evidence against the hypothesis).
3. There is no difference in the performance between the two groups (also evidence against the hypothesis).

Let's look, from a scientific point of view, at how the researcher should interpret each of these three possibilities.

First, if the results of the memory test reveal that the caffeine group performs better, this is a piece of evidence in favor of the hypothesis: It appears, at least in this case, that caffeine is associated with better memory. It does not, however, *prove* that caffeine is associated with better memory. There are still many questions left unanswered. How long does the memory boost last? Does caffeine work the same way with people of all ages? Is there a difference in memory performance between people who drink caffeine regularly and those who never drink it? Could the results be a freak occurrence? Because of these uncertainties, we do not say that a study—especially a single study—*proves* a hypothesis. Instead, we say the results of the study offer evidence in support of the hypothesis. Even if we tested this across 10 thousand or 100 thousand people we still could not use the word "proven" to describe this phenomenon. This is because inductive reasoning is

based on probabilities. Probabilities are always a matter of degree; they may be extremely likely or unlikely. Science is better at shedding light on the likelihood—or probability—of something than at proving it. In this way, data is still highly useful even if it doesn't fit Popper's absolute standards.

The science of meteorology helps illustrate this point. You might look at your local weather forecast and see a high likelihood of rain. This is because the meteorologist has used inductive reasoning to create her forecast. She has taken current observations—lots of dense clouds coming toward your city—and compared them to historical weather patterns associated with rain, making a reasonable prediction of a high probability of rain. The meteorologist has not *proven* it will rain, however, by pointing out the oncoming clouds.

Proof is more associated with deductive reasoning. 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.

The second possible result from the caffeine-memory study is that the group who had *no* caffeine demonstrates better memory. This result is the opposite of what the researcher expects to find (her hypothesis). Here, the researcher must admit the evidence does not support her hypothesis. She must be careful, however, not to extend that interpretation to other claims. For example, finding increased memory in the no-caffeine group would not be evidence that caffeine harms memory. Again, there are too many unknowns. Is this finding a freak occurrence, perhaps based on an unusual

sample? Is there a problem with the design of the study? The researcher doesn't know. She simply knows that she was not able to observe support for her hypothesis.

There is at least one additional consideration: The researcher originally developed her caffeine-benefits-memory hypothesis based on conclusions drawn from previous research. That is, previous studies found results that suggested caffeine boosts memory. The researcher's single study should not outweigh the conclusions of many studies. Perhaps the earlier research employed participants of different ages or who had different baseline levels of caffeine intake. This new study simply becomes a piece of fabric in the overall quilt of studies of the caffeine-memory relationship. It does not, on its own, definitively falsify the hypothesis.

Finally, it's possible that the results show no difference in memory between the two groups. How should the researcher interpret this? How would you? In this case, the researcher once again has to admit that she has not found support for her hypothesis.

Interpreting the results of a study—regardless of outcome—rests on the quality of the observations from which those results are drawn. If you learn, say, that each group in a study included only four participants, or that they were all over 90 years old, you might have concerns. Specifically, you should be concerned that the observations, even if accurate, aren't representative of the general population. This is one of the defining differences between conclusions drawn from personal anecdotes and those drawn from scientific observations. Anecdotal evidence—derived from personal experience and unsystematic observations (e.g., "common sense,")—is limited by the quality and representativeness of observations, and by memory shortcomings. Well-designed research, on the other hand, relies on observations that are systematically recorded, of high quality, and representative of the population it claims to describe.

One of the important steps in scientific inquiry is to test our research questions, otherwise known as hypotheses. However, there are many ways to test hypotheses in psychological research.

Which method you choose will depend on the type of questions you are asking, as well as what resources are available to you. All methods have limitations, which is why the best research uses a variety of methods. Most psychological research can be divided into two types: experimental and correlational research.

Experimental Research

If somebody gave you $20 that absolutely had to be spent today, how would you choose to spend it? Would you spend it on an item you've been eyeing for weeks, or would you donate the money to charity? Which option do you think would bring you the most happiness? If you're like most people, you'd choose to spend the money on yourself (duh, right?). Our intuition is that we'd be happier if we spent the money on ourselves.

At the Corner Perk Cafe customers routinely pay for the drinks of strangers. Is this the way to get the most happiness out of a cup of

coffee? Elizabeth Dunn's research shows that spending money on others may affect our happiness differently than spending money on ourselves. [Image: The Island Packet, https://goo.gl/DMxA5n]

Knowing that our intuition can sometimes be wrong, Professor Elizabeth Dunn (2008) at the University of British Columbia set out to conduct an experiment on spending and happiness. She gave each of the participants in her experiment $20 and then told them they had to spend the money by the end of the day. Some of the participants were told they must spend the money on themselves, and some were told they must spend the money on others (either charity or a gift for someone). At the end of the day she measured participants' levels of happiness using a self-report questionnaire. (But wait, how do you measure something like happiness when you can't really see it? Psychologists measure many abstract concepts, such as happiness and intelligence, by beginning with operational definitions of the concepts.

In an experiment, researchers manipulate, or cause changes, in the independent variable, and observe or measure any impact of those changes in the dependent variable. The independent variable is the one under the experimenter's control, or the variable that is intentionally altered between groups. In the case of Dunn's experiment, the independent variable was whether participants spent the money on themselves or on others. The dependent variable is the variable that is not manipulated at all, or the one where the effect happens. One way to help remember this is that the dependent variable "depends" on what happens to the independent variable. In our example, the participants' happiness (the dependent variable in this experiment) depends on how the participants spend their money (the independent variable). Thus, any observed changes or group differences in happiness can be attributed to whom the money was spent on. What Dunn and her colleagues found was that, after all the spending had been done, the people who had spent the money on others were happier than those who had spent the money

on themselves. In other words, spending on others causes us to be happier than spending on ourselves. Do you find this surprising?

But wait! Doesn't happiness depend on a lot of different factors—for instance, a person's upbringing or life circumstances? What if some people had happy childhoods and that's why they're happier? Or what if some people dropped their toast that morning and it fell jam-side down and ruined their whole day? It is correct to recognize that these factors and many more can easily affect a person's level of happiness. So how can we accurately conclude that spending money on others causes happiness, as in the case of Dunn's experiment?

The most important thing about experiments is random assignment. Participants don't get to pick which condition they are in (e.g., participants didn't choose whether they were supposed to spend the money on themselves versus others). The experimenter assigns them to a particular condition based on the flip of a coin or the roll of a die or any other random method. Why do researchers do this? With Dunn's study, there is the obvious reason: you can imagine which condition most people would choose to be in, if given the choice. But another equally important reason is that random assignment makes it so the groups, on average, are similar on all characteristics except what the experimenter manipulates.

By randomly assigning people to conditions (self-spending versus other-spending), some people with happy childhoods should end up in each condition. Likewise, some people who had dropped their toast that morning (or experienced some other disappointment) should end up in each condition. As a result, the distribution of all these factors will generally be consistent across the two groups, and this means that on average the two groups will be relatively equivalent on all these factors. Random assignment is critical to experimentation because if the only difference between the two groups is the independent variable, we can infer that the independent variable is the cause of any observable difference (e.g., in the amount of happiness they feel at the end of the day).

Correlational Designs

When scientists passively observe and measure phenomena it is called correlational research. Here, we do not intervene and change behavior, as we do in experiments. In correlational research, we identify patterns of relationships, but we usually cannot infer what causes what. Importantly, with correlational research, you can examine only two variables at a time, no more and no less.

So, what if you wanted to test whether spending on others is related to happiness, but you don't have $20 to give to each participant? You could use a correlational design—which is exactly what Professor Dunn did, too. She asked people how much of their income they spent on others or donated to charity, and later she asked them how happy they were. Do you think these two variables were related? Yes, they were! The more money people reported spending on others, the happier they were.

If generosity and happiness are positively correlated, should we conclude that being generous causes happiness? Similarly, if height and pathogen prevalence are negatively correlated, should we conclude that disease causes shortness? From a correlation alone, we can't be certain. For example, in the first case it may be that happiness causes generosity, or that generosity causes happiness. Or, a third variable might cause both happiness *and* generosity, creating the illusion of a direct link between the two. For example, wealth could be the third variable that causes both greater happiness and greater generosity. This is why correlation does not mean causation—an often repeated phrase among psychologists.

Qualitative Designs

Just as correlational research allows us to study topics we can't experimentally manipulate (e.g., whether you have a large or small

income), there are other types of research designs that allow us to investigate these harder-to-study topics. Qualitative designs, including participant observation, case studies, and narrative analysis are examples of such methodologies. Although something as simple as "observation" may seem like it would be a part of all research methods, participant observation is a distinct methodology that involves the researcher embedding him- or herself into a group in order to study its dynamics. For example, Festinger, Riecken, and Shacter (1956) were very interested in the psychology of a particular cult. However, this cult was very secretive and wouldn't grant interviews to outside members. So, in order to study these people, Festinger and his colleagues pretended to be cult members, allowing them access to the behavior and psychology of the cult. Despite this example, it should be noted that the people being observed in a participant observation study usually know that the researcher is there to study them.

Another qualitative method for research is the case study, which involves an intensive examination of specific individuals or specific contexts. Sigmund Freud, the father of psychoanalysis, was famous for using this type of methodology; however, more current examples of case studies usually involve brain injuries. For instance, imagine that researchers want to know how a very specific brain injury affects people's experience of happiness. Obviously, the researchers can't conduct experimental research that involves inflicting this type of injury on people. At the same time, there are too few people who have this type of injury to conduct correlational research. In such an instance, the researcher may examine only one person with this brain injury, but in doing so, the researcher will put the participant through a very extensive round of tests. Hopefully what is learned from this one person can be applied to others; however, even with thorough tests, there is the chance that something unique about this individual (other than the brain injury) will affect his or her happiness. But with such a limited number of possible participants, a case study is really the only type of methodology suitable for researching this brain injury.

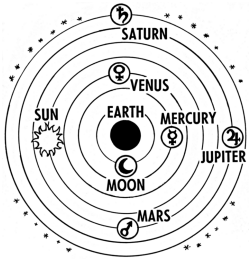
Why Should I Trust Science If It Can't Prove Anything?

Why ought we trust the scientific inductive process, even when it relies on limited samples that don't offer absolute "proof." It's because the methodologies in science are generally trustworthy. Not all claims and explanations are equal; some conclusions are better bets, so to speak. Scientific claims are more likely to be correct and predict real outcomes than "common sense" opinions and personal anecdotes. This is because researchers consider how to best prepare and measure their subjects, systematically collect data from large and–ideally–representative samples, and test their findings against probability.

Is there a relationship between student age and academic performance? How could we research this question? How confident can we be that our observations reflect reality? [Image: Jeremy Wilburn, https://goo.gl/i9MoJb, CC BY-NC-ND 2.0, https://goo.gl/SjTsDg]

Scientific Theories

The knowledge generated from research is organized according to scientific theories. A scientific theory is a comprehensive framework for making sense of evidence regarding a particular phenomenon. When scientists talk about a theory, they mean something different from how the term is used in everyday conversation. In common usage, a theory is an educated guess—as in, "I have a theory about which team will make the playoffs," or, "I have a theory about why my sister is always running late for appointments." Both of these beliefs are liable to be heavily influenced by many untrustworthy factors, such as personal opinions and memory biases. A scientific theory, however, enjoys support from many research studies, collectively providing evidence, including, but not limited to, that which has falsified competing explanations. A key component of good theories is that they describe, explain, and predict in a way that can be empirically tested and potentially falsified.



Early theories placed the Earth at the center of the solar system.

We now know that the Earth revolves around the sun. [Image: Pearson Scott Foresman, https://goo.gl/W3izMR, Public Domain]

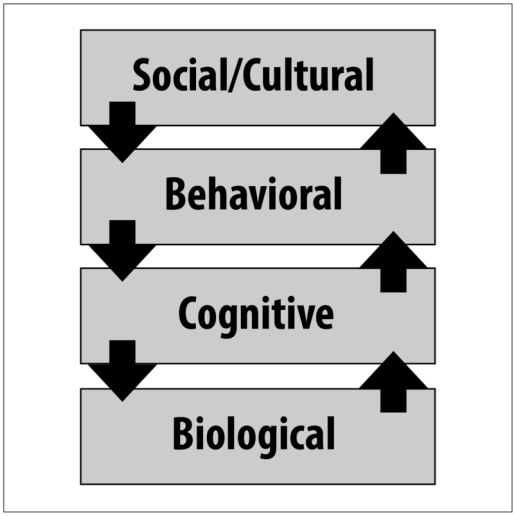
Theories are open to revision if new evidence comes to light that compels reexamination of the accumulated, relevant data. In ancient times, for instance, people thought the Sun traveled around the Earth. This seemed to make sense and fit with many observations. In the 16th century, however, astronomers began systematically charting visible objects in the sky, and, over a 50-year period, with repeated testing, critique, and refinement, they provided evidence for a revised theory: The Earth and other cosmic objects revolve around the Sun. In science, we believe what the best and most data tell us. If better data come along, we must be willing to change our views in accordance with the new evidence.

Is Science Objective?

Thomas Kuhn (2012), a historian of science, argued that science, as an activity conducted by humans, is a social activity. As such, it is—according to Kuhn—subject to the same psychological influences of all human activities. Specifically, Kuhn suggested that there is no such thing as objective theory or data; all of science is informed by values. Scientists cannot help but let personal/cultural values, experiences, and opinions influence the types of questions they ask and how they make sense of what they find in their research. Kuhn's argument highlights a distinction between facts (information about the world), and values (beliefs about the way the world is or ought to be). This distinction is an important one, even if it is not always clear.

The primary point of this illustration is that (contrary to the image of scientists as outside observers to the facts, gathering them neutrally and without bias from the natural world) all science—especially social sciences like psychology—involves values

and interpretation. As a result, science functions best when people with diverse values and backgrounds work collectively to understand complex natural phenomena.



Indeed, science can benefit from multiple perspectives. One approach to achieving this is through levels of analysis. Levels of analysis is the idea that a single phenomenon may be explained at different levels simultaneously. Remember the question concerning cramming for a test versus studying over time? It can be answered at a number of different levels of analysis. At a low level, we might use brain scanning technologies to investigate whether biochemical processes differ between the two study strategies. At a higher level—the level of thinking—we might investigate processes of decision making (what to study) and ability to focus, as they relate to cramming versus spaced practice. At even higher levels, we might be interested in real world behaviors, such as how long people study using each of the strategies. Similarly, we might be interested in how the presence of others influences learning across these two strategies. Levels of analysis suggests that one level is not more correct—or truer—than another; their appropriateness depends on the specifics of the question asked. Ultimately, levels of analysis

would suggest that we cannot understand the world around us, including human psychology, by reducing the phenomenon to only the biochemistry of genes and dynamics of neural networks. But, neither can we understand humanity without considering the functions of the human nervous system.

Science in Context

There are many ways to interpret the world around us. People rely on common sense, personal experience, and faith, in combination and to varying degrees. All of these offer legitimate benefits to navigating one's culture, and each offers a unique perspective, with specific uses and limitations. Science provides another important way of understanding the world and, while it has many crucial advantages, as with all methods of interpretation, it also has limitations. Understanding the limits of science—including its subjectivity and uncertainty—does not render it useless. Because it is systematic, using testable, reliable data, it can allow us to determine causality and can help us generalize our conclusions. By understanding how scientific conclusions are reached, we are better equipped to use science as a tool of knowledge.

Additional Supplemental Resources

Websites

- Psychology: Science in Action

    - A useful APA resource for specific articles and information about applying psychology as a science to the real world.
- Careers in Psychology
    - This APA resource includes numerous links and guidance into fields of prospective career choices in psychology.
- Cummings Center for the History of Psychology
    - This website is comprised of a vast collection of artifacts, media, and documents, including the personal papers of many important psychologists.
- Early Historical Works in Psychology
    - You can find many full classic books in psychology on this site, including Freud.
- Correlation Demonstration
    - With this applet, you can type in a correlation coefficient and the program will generate an appropriate scatter plot. Consider using the examples of correlations given earlier to put labels on the axes. If you add new data points in the scatter plot, the program will calculate a new correlation coefficient.
- Psychological Research on the Net website
    - Want to participate in a study? Click on a link that sounds interesting to you in order to participate in online research.
- Tuskegee Syphilis Study
    - Unfortunately, the ethical guidelines that exist for research today were not always applied in the past. Visit this CDC website to learn more about the Tuskegee Syphilis Study.
- MCCCD IRB
    - Our employees and students, as well as external investigators, may be permitted to conduct research that meets certain standards of integrity and purpose that are consistent with the vision of Maricopa Community

Colleges. You can also complete the free Human Subjects Research training on this website.

Videos

- Battling Bad Science
  - Every day there are news reports of new health advice, but how can you know if they're right? Doctor and epidemiologist Ben Goldacre shows us, at high speed, the ways evidence can be distorted, from the blindingly obvious nutrition claims to the very subtle tricks of the pharmaceutical industry. Through a variety of examples, this video highlights the need to have good critical thinking skills.
- Crash Course Videos Episode #1 – Introduction to Psychology
  - This Introduction to Psychology video introduces students to the definition of psychology and gives a brief history. One question for students is whether or not they notice any similarities between the notable psychologists in the history of psychology. You can then move to add information on female psychologists or psychologists of color or ask students to do some research and teach their classmates about non-white male psychologists.
- Methods 101: Random Sampling
  - An accurate, concise description of random sampling. Closed captioning available.
- How Ice Cream Kills! Correlation vs. Causation
  - This video uses ice cream as an example to discuss the distinction between correlation and causation. It first discusses the correlation between ice cream and negative outcomes (e.g., forest fires, high crime rates) and time of year as a third factor explaining the relationship between

these variables. Then, it discusses the FDA's approval process for drugs. Finally, it discusses the link between ice cream and obesity.

- Statistical Significance, the Null Hypothesis and P-Values Defined & Explained in One Minute
  - This video uses an example of someone claiming they can roll a dice so that it lands on a six more frequently than by chance to introduce the concept of the null hypothesis, p-values, and statistical significance. *Note*: The video does not devote much time to the discussion of how to calculate a p-value besides referencing statistical software. Thus, it provides a good but very high-level overview of these concepts.
- 5 Psychology Experiments You Couldn't Do Today
  - This video discusses several psychology experiments that have ethical issues. It begins by reviewing the principles for ethical research (autonomy/informed consent, beneficence, and justice). Then, it discusses five different experiments that would no longer be considered ethical by today's standards: 1. Watson's experiment conditioning Little Albert to be afraid of rats, 2. Wendell Johnson and Mary Tutor's experiment giving feedback to children with speech disorders, 3. Stanley Milgram's studies on obedience, 4. John Darley and Bib Latane's experiment on the bystander effect, and 5. Philipp Zimbardo's Stanford Prison Experiment. The video discusses the design of the studies as well as the ethical concerns raised by the studies in turn.

- The power of the placebo effect – Emma Bryce
  - The placebo effect is an unexplained phenomenon wherein drugs, treatments, and therapies that aren't supposed to have an effect – and are often fake – miraculously make people feel better. What's going on?

Emma Bryce dives into the mystery of placebos' bizarre benefits.

- Crash Course Video #2 – Psychological Research
  - This video on research methods covers the different categories of psychological research including observational studies and experiments. Closed captioning available.

Access for free at https://openstax.org/books/psychology-2e/pages/1-introduction

2. Biopsychology

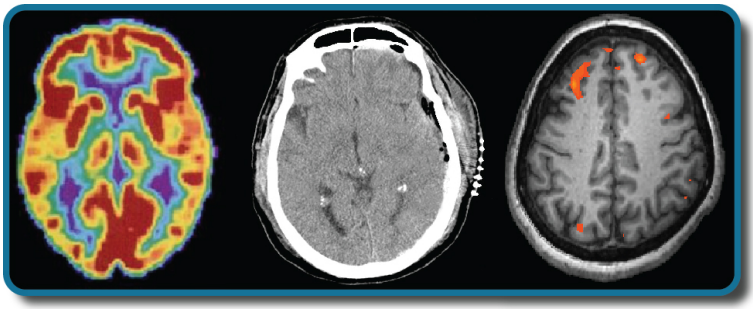


Figure 3.1 Different brain imaging techniques provide scientists with insight into different aspects of how the human brain functions. Left to right, PET scan (positron emission tomography), CT scan (computerized tomography), and fMRI (functional magnetic resonance imaging) are three types of scans. (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.)

Any textbook on psychology would be incomplete without reference to the brain. Every behavior, thought, or experience described in the other modules must be implemented in the brain. A detailed understanding of the human brain can help us make sense of human experience and behavior. For example, one well-established fact about human cognition is that it is limited. We cannot do two complex tasks at once: We cannot read and carry on a conversation at the same time, text and drive, or surf the Internet while listening to a lecture, at least not successfully or safely. We cannot even pat our head and rub our stomach at the same time (with exceptions, see "A Brain Divided"). Why is this? Many people have suggested that such limitations reflect the fact that the behaviors draw on the same resource; if one behavior uses up most of the resource there is

not enough resource left for the other. But what might this limited resource be in the brain?

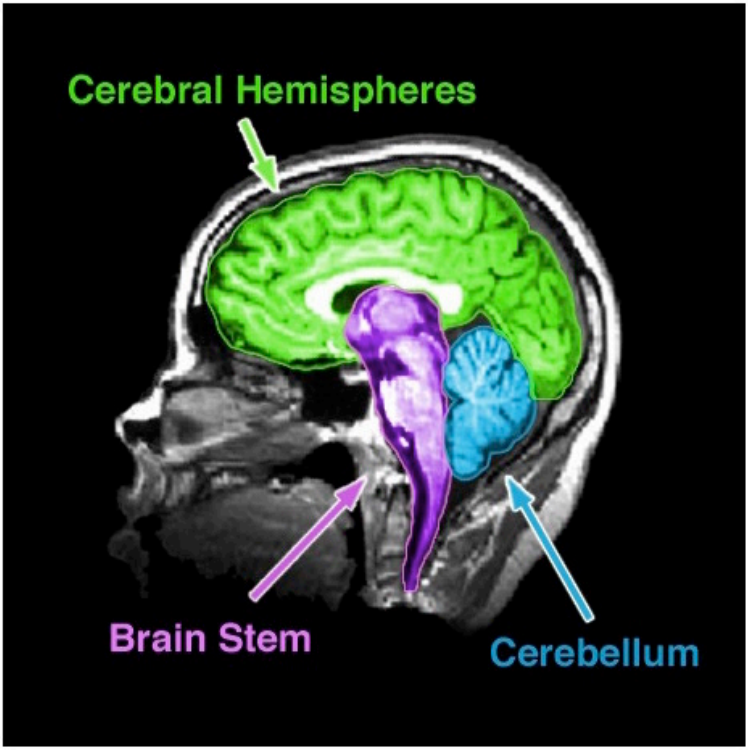


Figure 1. An MRI of the human brain delineating three major structures: the cerebral hemispheres, brain stem, and cerebellum.

The brain uses oxygen and glucose, delivered via the blood. The brain is a large consumer of these metabolites, using 20% of the oxygen and calories we consume despite being only 2% of our total weight. However, as long as we are not oxygen-deprived or malnourished, we have more than enough oxygen and glucose to fuel the brain. Thus, insufficient "brain fuel" cannot explain our limited capacity. Nor is it likely that our limitations reflect too few neurons. The average human brain contains 100 billion neurons. It is also not the case that we use only 10% of our brain, a myth that was likely started to imply we had untapped potential. Modern

neuroimaging (see "Studying the Human Brain") has shown that we use all parts of brain, just at different times, and certainly more than 10% at any one time.

If we have an abundance of brain fuel and neurons, how can we explain our limited cognitive abilities? Why can't we do more at once? The most likely explanation is the way these neurons are wired up. We know, for instance, that many neurons in the visual cortex (the part of the brain responsible for processing visual information) are hooked up in such a way as to inhibit each other (Beck & Kastner, 2009). When one neuron fires, it suppresses the firing of other nearby neurons. If two neurons that are hooked up in an inhibitory way both fire, then neither neuron can fire as vigorously as it would otherwise. This competitive behavior among neurons limits how much visual information the brain can respond to at the same time. Similar kinds of competitive wiring among neurons may underlie many of our limitations. Thus, although talking about limited resources provides an intuitive description of our limited capacity behavior, a detailed understanding of the brain suggests that our limitations more likely reflect the complex way in which neurons talk to each other rather than the depletion of any specific resource.

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 behavior. 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. And, finally, you will learn how the nervous system interacts with the endocrine 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 glial 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.

Imagine trying to string words together into a meaningful sentence without knowing the meaning of each word or its function (i.e., Is it a verb, a noun, or an adjective?). In a similar fashion, to appreciate how groups of cells work together in a meaningful way in the brain as a whole, we must first understand how individual cells in the brain function. Much like words, brain cells, called *neurons*, have an underlying structure that provides the foundation for their functional purpose. Have you ever seen a neuron? Did you know that the basic structure of a neuron is similar whether it is from the brain of a rat or a human? How do the billions of neurons in our brain allow us to do all the fun things we enjoy, such as texting a friend, cheering on our favorite sports team, or laughing?

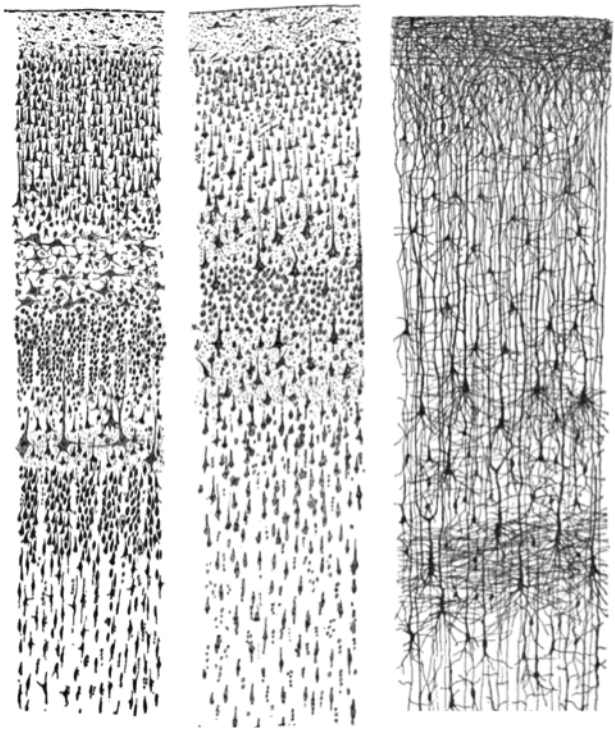


Figure 1. Three drawings by Santiago Ramón y Cajal, taken from "Comparative study of the sensory areas of the human cortex", pages 314, 361, and 363. Left: Nissl-stained visual cortex of a human adult. Middle: Nissl-stained motor cortex of a human adult. Right: Golgi-stained cortex of a 1 1/2 month old infant. [Image: Santiago Ramon y Cajal, https://goo.gl/zOb2l1, CC0 Public Domain, https://goo.gl/m25gce]

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 3.8). 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.

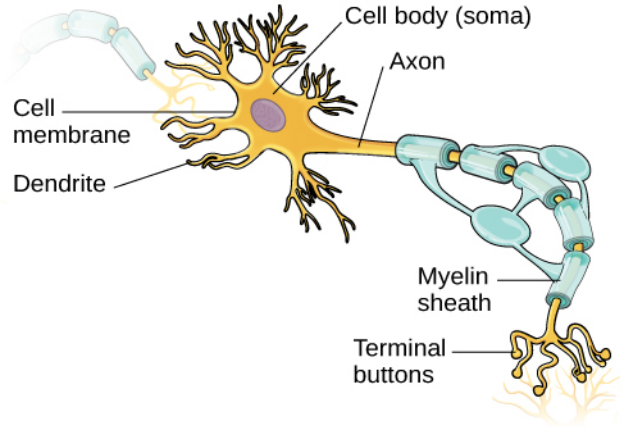


Figure 3.8 This illustration shows a prototypical neuron, which is being myelinated by a glial cell.

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. PKU, a genetic disorder discussed earlier, 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.

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 3.9). 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.

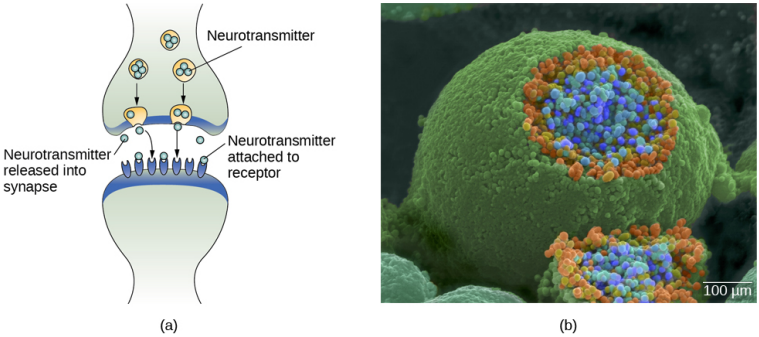


Figure 3.9(a) The synaptic cleft is the space between the terminal button of one neuron and the dendrite of another neuron. (b) In this pseudo-colored image from a scanning electron microscope, a terminal button (green) has been opened to reveal the synaptic vesicles (orange and blue) inside. Each vesicle contains about 10,000 neurotransmitter molecules. (credit b: modification of work by Tina Carvalho, NIH-NIGMS; scale-bar data from Matt Russell)

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 as 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 3.12). 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).

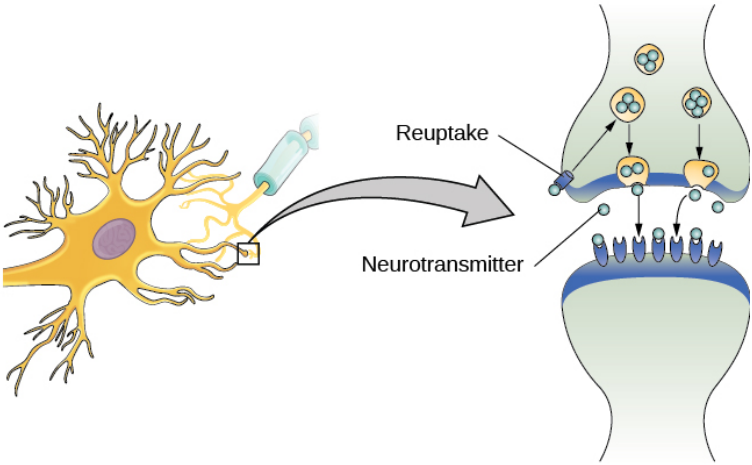


Figure 3.12 Reuptake involves moving a neurotransmitter from the synapse back into the axon terminal from which it was released.

LINK TO LEARNING: Watch this video about neuronal communication to learn more.

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 3.1). Much of what psychologists know about the functions of neurotransmitters come from research on the effects of drugs in psychological disorders. Psychologists who take a biological perspective and focus on the physiological causes of behavior 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.

Major Neurotransmitters and How They Affect Behavior

Neurotransmitter	Involved in	Potential Effect on Behavior
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

Table3.1

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 signaling 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 behavioral 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).

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
- Distinguish between gray and white matter of the cerebral hemispheres.

The mammalian nervous system is a complex biological organ, which enables many animals including humans to function in a coordinated fashion. The original design of this system is preserved across many animals through evolution; thus, adaptive physiological and behavioral functions are similar across many animal species. Comparative study of physiological functioning in the nervous systems of different animals lend insights to their behavior and their mental processing and make it easier for us to understand the human brain and behavior. In addition, studying the development of the nervous system in a growing human provides a wealth of information about the change in its form and behaviors that result from this change. The nervous system is divided into central and peripheral nervous systems, and the two heavily interact with one another. The peripheral nervous system controls volitional (somatic

nervous system) and nonvolitional (autonomic nervous system) behaviors using cranial and spinal nerves. The central nervous system is divided into forebrain, midbrain, and hindbrain, and each division performs a variety of tasks; for example, the cerebral cortex in the forebrain houses sensory, motor, and associative areas that gather sensory information, process information for perception and memory, and produce responses based on incoming and inherent information. To study the nervous system, a number of methods have evolved over time; these methods include examining brain lesions, microscopy, electrophysiology, electroencephalography, and many scanning technologies.

Evolution of the Nervous System

Many scientists and thinkers (Cajal, 1937; Crick & Koch, 1990; Edelman, 2004) believe that the human nervous system is the most complex machine known to man. Its complexity points to one undeniable fact—that it has evolved slowly over time from simpler forms. Evolution of the nervous system is intriguing not because we can marvel at this complicated biological structure, but it is fascinating because it inherits a lineage of a long history of many less complex nervous systems (Figure 1), and it documents a record of adaptive behaviors observed in life forms other than humans. Thus, evolutionary study of the nervous system is important, and it is the first step in understanding its design, its workings, and its functional interface with the environment.

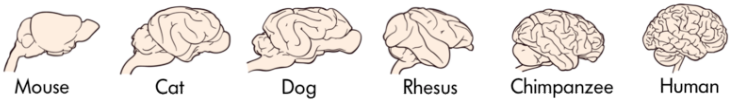


Figure 1 The brains of various animals

The brains of some animals, like apes, monkeys, and rodents, are structurally similar to humans (Figure 1), while others are not (e.g.,

invertebrates, single-celled organisms). Does anatomical similarity of these brains suggest that behaviors that emerge in these species are also similar? Indeed, many animals display behaviors that are similar to humans, e.g., apes use nonverbal communication signals with their hands and arms that resemble nonverbal forms of communication in humans (Gardner & Gardner, 1969; Goodall, 1986; Knapp & Hall, 2009). If we study very simple behaviors, like physiological responses made by individual neurons, then brain-based behaviors of invertebrates (Kandel & Schwartz, 1982) look very similar to humans, suggesting that from time immemorial such basic behaviors have been conserved in the brains of many simple animal forms and in fact are the foundation of more complex behaviors in animals that evolved later (Bullock, 1984).

Even at the micro-anatomical level, we note that individual neurons differ in complexity across animal species. Human neurons exhibit more intricate complexity than other animals; for example, neuronal processes (dendrites) in humans have many more branch points, branches, and spines.

Complexity in the structure of the nervous system, both at the macro- and micro-levels, give rise to complex behaviors. We can observe similar movements of the limbs, as in nonverbal communication, in apes and humans, but the variety and intricacy of nonverbal behaviors using hands in humans surpasses apes. Deaf individuals who use American Sign Language (ASL) express themselves in English nonverbally; they use this language with such fine gradation that many accents of ASL exist (Walker, 1987). Complexity of behavior with increasing complexity of the nervous system, especially the cerebral cortex, can be observed in the genus *Homo* (Figure 2). If we compare sophistication of material culture in Homo habilis (2 million years ago; brain volume ~650 cm3) and Homo sapiens (300,000 years to now; brain volume ~1400 cm3), the evidence shows that *Homo habilis* used crude stone tools compared with modern tools used by *Homo sapiens* to erect cities, develop written languages, embark on space travel, and study her

own self. All of this is due to increasing complexity of the nervous system.

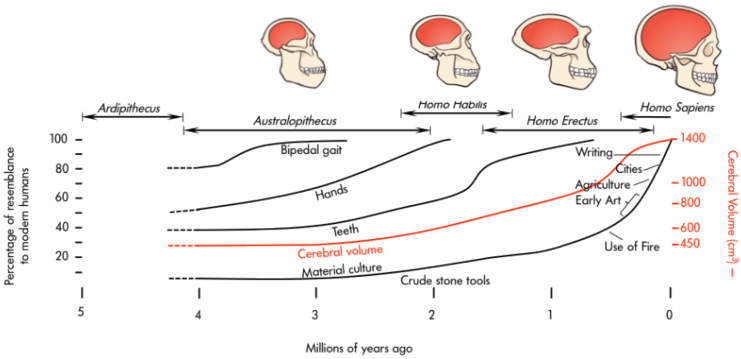


Figure 2 Changes in cerebral volume across evolution

What has led to the complexity of the brain and nervous system through evolution, to its behavioral and cognitive refinement? Darwin (1859, 1871) proposed two forces of natural and sexual selection as work engines behind this change. He prophesied, "psychology will be based on a new foundation, that of the necessary acquirement of each mental power and capacity by gradation" that is, psychology will be based on evolution (Rosenzweig, Breedlove, & Leiman, 2002).

Development of the Nervous System

Where the study of change in the nervous system over eons is immensely captivating, studying the change in a single brain during individual development is no less engaging. In many ways the ontogeny (development) of the nervous system in an individual mimics the evolutionary advancement of this structure observed across many animal species. During development, the nervous tissue emerges from the ectoderm (one of the three layers of the mammalian embryo) through the process of neural induction. This

process causes the formation of the neural tube, which extends in a rostrocaudal (head-to-tail) plane. The tube, which is hollow, seams itself in the rostrocaudal direction. In some disease conditions, the neural tube does not close caudally and results in an abnormality called spina bifida. In this pathological condition, the lumbar and sacral segments of the spinal cord are disrupted.

As gestation progresses, the neural tube balloons up (cephalization) at the rostral end, and forebrain, midbrain, hindbrain, and the spinal cord can be visually delineated (day 40). About 50 days into gestation, six cephalic areas can be anatomically discerned (also see below for a more detailed description of these areas).

The progenitor cells (neuroblasts) that form the lining (neuroepithelium) of the neural tube generate all the neurons and glial cells of the central nervous system. During early stages of this development, neuroblasts rapidly divide and specialize into many varieties of neurons and glial cells, but this proliferation of cells is not uniform along the neural tube—that is why we see the forebrain and hindbrain expand into larger cephalic tissues than the midbrain. The neuroepithelium also generates a group of specialized cells that migrate outside the neural tube to form the neural crest. This structure gives rise to sensory and autonomic neurons in the peripheral nervous system.

The Structure of the Nervous System

The mammalian nervous system is divided into central and peripheral nervous systems.

The Peripheral Nervous System

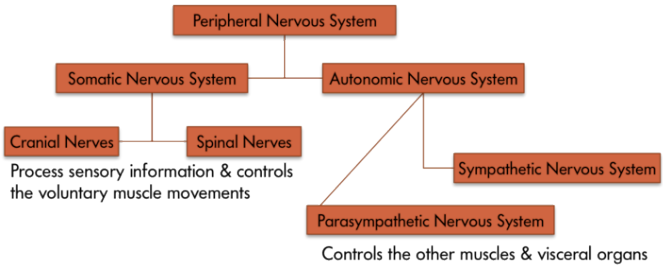


Figure 3 The various components of the peripheral nervous system

The peripheral nervous system is divided into somatic and autonomic nervous systems (Figure 3). Where the somatic nervous system consists of cranial nerves (12 pairs) and spinal nerves (31 pairs) and is under the volitional control of the individual in maneuvering bodily muscles, the autonomic nervous system also running through these nerves lets the individual have little control over muscles and glands. Main divisions of the autonomic nervous system that control visceral structures are the sympathetic and parasympathetic nervous systems.

At an appropriate cue (say a fear-inducing object like a snake), the sympathetic division generally energizes many muscles (e.g., heart) and glands (e.g., adrenals), causing activity and release of hormones that lead the individual to negotiate the fear-causing snake with fight-or-flight responses. Whether the individual decides to *fight* the snake or *run* away from it, either action requires energy; in short, the sympathetic nervous system says "go, go, go." The parasympathetic nervous system, on the other hand, curtails undue energy mobilization into muscles and glands and modulates the response by saying "stop, stop, stop." This push–pull tandem system regulates fight-or-flight responses in all of us.

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, his pupils constrict, he regains control of his bladder, and the liver begins to store glucose in the form of glycogen for future use. These restorative processes are associated with the activation of the parasympathetic nervous system.

The Central Nervous System

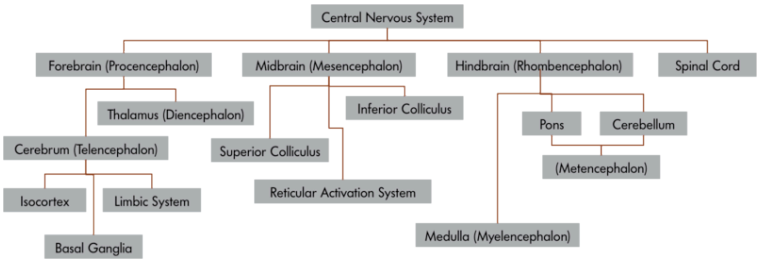


Figure 4 the central nervous system and its components

The central nervous system is divided into a number of important parts (see Figure 4), including the spinal cord, each specialized to perform a set of specific functions. Telencephalon or cerebrum is a *newer* development in the evolution of the mammalian nervous system. In humans, it is about the size of a large napkin and when crumpled into the skull, it forms furrows called sulci (singular form, sulcus). The bulges between sulci are called gyri (singular form, gyrus). The cortex is divided into two hemispheres, and each hemisphere is further divided into four lobes (Figure 5a), which have specific functions. The division of these lobes is based on two delineating sulci: the central sulcus divides the hemisphere into frontal and parietal-occipital lobes and the lateral sulcus marks the temporal lobe, which lies below.

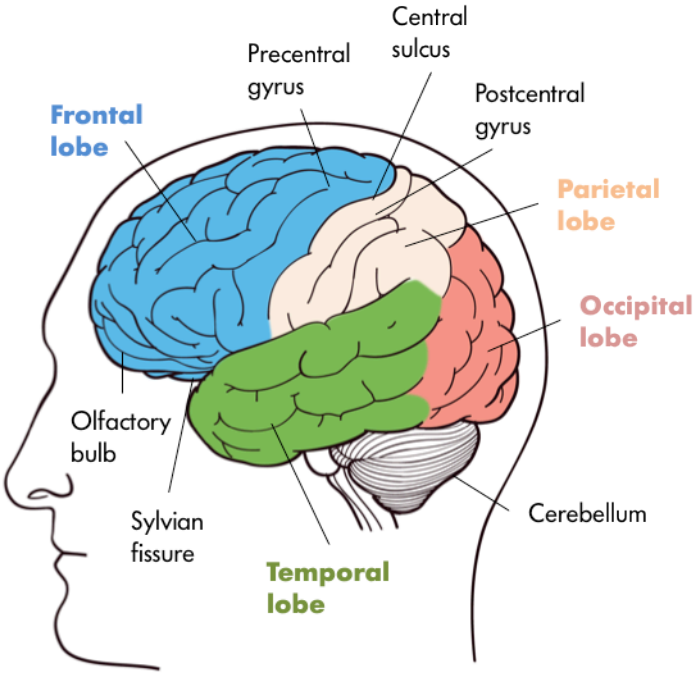


Figure 5a The lobes of the brain

Just in front of the central sulcus lies an area called the primary motor cortex (precentral gyrus), which connects to the muscles of the body, and on volitional command moves them. From mastication to movements in the genitalia, the body map is represented on this strip (Figure 5b).

Some body parts, like fingers, thumbs, and lips, occupy a greater representation on the strip than, say, the trunk. This disproportionate representation of the body on the primary motor cortex is called the magnification factor (Rolls & Cowey, 1970) and is seen in other motor and sensory areas. At the lower end of the central sulcus, close to the lateral sulcus, lies the Broca's area (Figure 6b) in the left frontal lobe, which is involved with language production. Damage to this part of the brain led Pierre

Paul Broca, a French neuroscientist in 1861, to document many different forms of aphasias, in which his patients would lose the ability to speak or would retain partial speech impoverished in syntax and grammar (AAAS, 1880). It is no wonder that others have found subvocal rehearsal and central executive processes of working memory in this frontal lobe (Smith & Jonides, 1997, 1999).

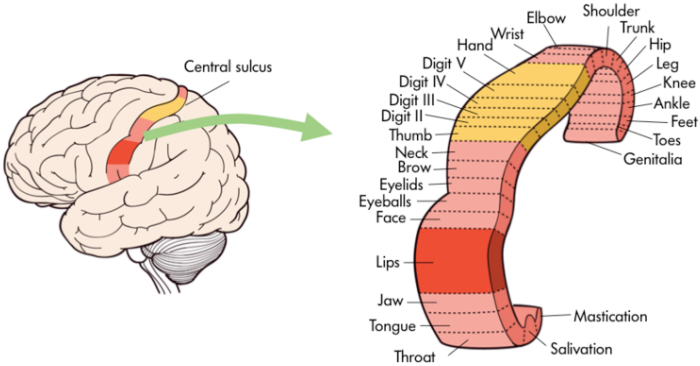


Figure 5b. Specific body parts like the tongue or fingers are mapped onto certain areas of the brain including the primary motor cortex.

Just behind the central gyrus, in the parietal lobe, lies the primary somatosensory cortex (Figure 6a) on the postcentral gyrus, which represents the whole body receiving inputs from the skin and muscles. The primary somatosensory cortex parallels, abuts, and connects heavily to the primary motor cortex and resembles it in terms of areas devoted to bodily representation. All spinal and some cranial nerves (e.g., the facial nerve) send sensory signals from skin (e.g., touch) and muscles to the primary somatosensory cortex. Close to the lower (ventral) end of this strip, curved inside the parietal lobe, is the taste area (secondary somatosensory cortex), which is involved with taste experiences that originate from the tongue, pharynx, epiglottis, and so forth.

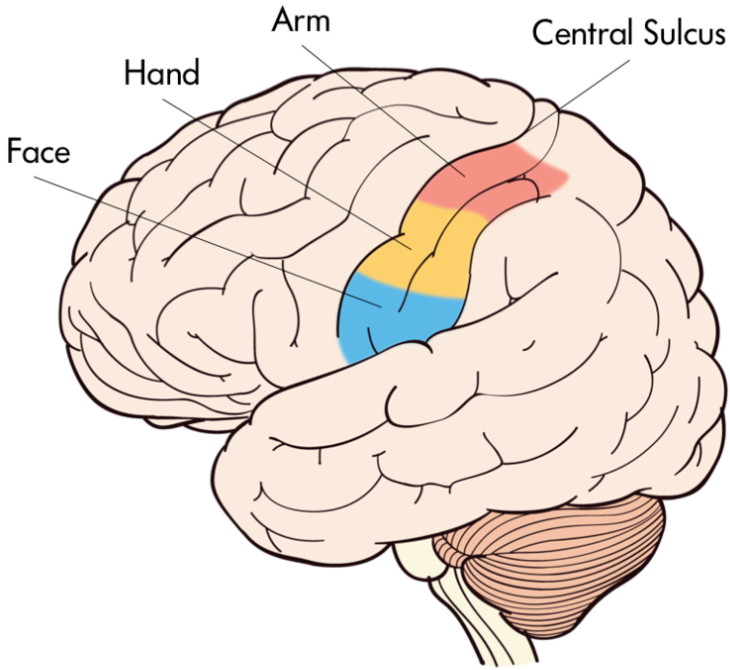


Figure 6a The Primary Somatosensory Cortex

Just below the parietal lobe, and under the caudal end of the lateral fissure, in the temporal lobe, lies the Wernicke's area (Demonet et al., 1992). This area is involved with language comprehension and is connected to the Broca's area through the arcuate fasciculus, nerve fibers that connect these two regions. Damage to the Wernicke's area (Figure 6b) results in many kinds of agnosias; agnosia is defined as an inability to know or understand language and speech-related behaviors. So an individual may show word deafness, which is an inability to recognize spoken language, or word blindness, which is an inability to recognize written or printed language. Close in proximity to the Wernicke's area is the primary auditory cortex, which is involved with audition, and finally the brain region devoted

to smell (olfaction) is tucked away inside the primary olfactory cortex (prepyriform cortex).

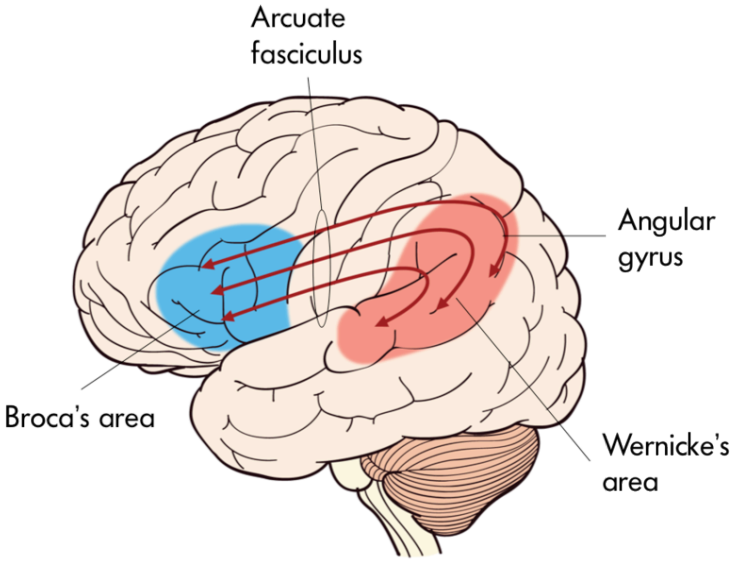


Figure 6b Wernicke's area

At the very back of the cerebral cortex lies the occipital lobe housing the primary visual cortex. Optic nerves travel all the way to the thalamus (lateral geniculate nucleus, LGN) and then to visual cortex, where images that are received on the retina are projected (Hubel, 1995).

In the past 50 to 60 years, visual sense and visual pathways have been studied extensively, and our understanding about them has increased manifold. We now understand that all objects that form images on the retina are transformed (transduction) in neural language handed down to the visual cortex for further processing. In the visual cortex, all attributes (features) of the image, such as the color, texture, and orientation, are decomposed and processed by different visual cortical modules (Van Essen, Anderson & Felleman,

1992) and then recombined to give rise to singular perception of the image in question.

If we cut the cerebral hemispheres in the middle, a new set of structures come into view. Many of these perform different functions vital to our being. For example, the limbic system contains a number of nuclei that process memory (hippocampus and fornix) and attention and emotions (cingulate gyrus); the globus pallidus is involved with motor movements and their coordination; the hypothalamus and thalamus are involved with drives, motivations, and trafficking of sensory and motor throughputs. The hypothalamus plays a key role in regulating endocrine hormones in conjunction with the pituitary gland that extends from the hypothalamus through a stalk (infundibulum).

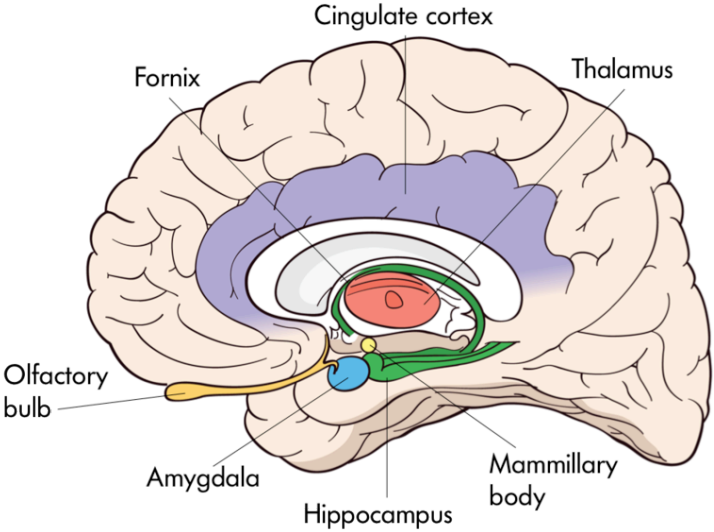


Figure 7 The interior of the brain

As we descend down the thalamus, the midbrain comes into view with superior and inferior colliculi, which process visual and auditory information, as does the substantia nigra, which is involved with notorious Parkinson's disease, and the reticular formation regulating arousal, sleep, and temperature. A little lower, the hindbrain with the pons processes sensory and motor information

employing the cranial nerves, works as a bridge that connects the cerebral cortex with the medulla, and reciprocally transfers information back and forth between the brain and the spinal cord. The medulla oblongata processes breathing, digestion, heart and blood vessel function, swallowing, and sneezing. The cerebellum controls motor movement coordination, balance, equilibrium, and muscle tone.

The midbrain and the hindbrain, which make up the brain stem, culminate in the spinal cord. Whereas inside the cerebral cortex, the gray matter (neuronal cell bodies) lies outside and white matter (myelinated axons) inside; in the spinal cord this arrangement reverses, as the gray matter resides inside and the white matter outside. Paired nerves (ganglia) exit the spinal cord, some closer in direction towards the back (dorsal) and others towards the front (ventral). The dorsal nerves (afferent) receive sensory information from skin and muscles, and ventral nerves (efferent) send signals to muscles and organs to respond.

Gray Versus White Matter

The cerebral hemispheres contain both grey and white matter, so called because they appear grayish and whitish in dissections or in an MRI (magnetic resonance imaging; see, "Studying the Human Brain"). The gray matter is composed of the neuronal cell bodies (see module, "Neurons"). The cell bodies (or soma) contain the genes of the cell and are responsible for metabolism (keeping the cell alive) and synthesizing proteins. In this way, the cell body is the workhorse of the cell. The white matter is composed of the axons of the neurons, and, in particular, axons that are covered with a sheath of myelin (fatty support cells that are whitish in color). Axons conduct the electrical signals from the cell and are, therefore, critical to cell communication. People use the expression "use your gray matter" when they want a person to think harder. The "gray

matter" in this expression is probably a reference to the cerebral hemispheres more generally; the gray cortical sheet (the convoluted surface of the cortex) being the most visible. However, both the gray matter and white matter are critical to proper functioning of the mind. Losses of either result in deficits in language, memory, reasoning, and other mental functions. See Figure 3 for MRI slices showing both the inner white matter that connects the cell bodies in the gray cortical sheet.

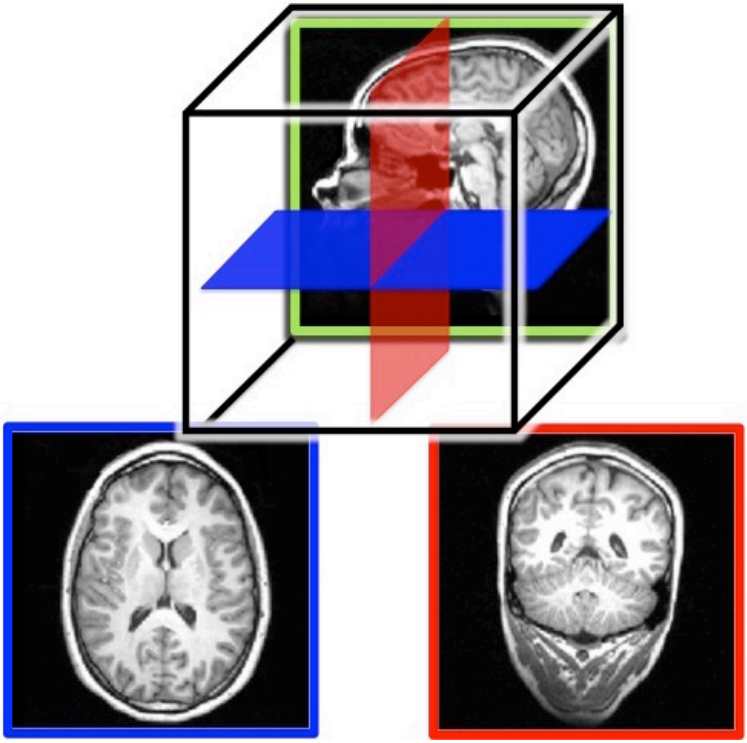


Figure 3. MRI slices of the human brain. Both the outer gray matter and inner white matter are visible in each image. The brain is a three-dimensional (3-D) structure, but an image is two-dimensional (2-D). Here, we show example slices of the three possible 2-D cuts through the brain: a saggital slice (top image), a horizontal slice (bottom left), which is also known as a transverse or axial slice, and a coronal slice (bottom right). The bottom two

images are color-coded to match the illustration of the relative orientations of the three slices in the top image.

Studying the Nervous System

The study of the nervous system involves anatomical and physiological techniques that have improved over the years in efficiency and caliber. Clearly, gross morphology of the nervous system requires an eye-level view of the brain and the spinal cord. However, to resolve minute components, optical and electron microscopic techniques are needed.

Light microscopes and, later, electron microscopes have changed our understanding of the intricate connections that exist among nerve cells. For example, modern staining procedures (immunocytochemistry) make it possible to see selected neurons that are of one type or another or are affected by growth. With better resolution of the electron microscopes, fine structures like the synaptic cleft between the pre- and post-synaptic neurons can be studied in detail. Along with the neuroanatomical techniques, a number of other methodologies aid neuroscientists in studying the function and physiology of the nervous system. These methods will be explored later on in the chapter.

Understanding the nervous system has been a long journey of inquiry, spanning several hundreds of years of meticulous studies carried out by some of the most creative and versatile investigators in the fields of philosophy, evolution, biology, physiology, anatomy, neurology, neuroscience, cognitive sciences, and psychology. Despite our profound understanding of this organ, its mysteries continue to surprise us, and its intricacies make us marvel at this complex structure unmatched in the universe.

Learning Objectives

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

- Explain the functions of the spinal cord
- Identify the hemispheres of the brain
- Name and describe the basic function of the four cerebral lobes: occipital, temporal, parietal, and frontal cortex.
- Describe a split-brain patient and at least two important aspects of brain function that these patients reveal.

The brain is a remarkably complex organ comprised of billions of interconnected neurons and glia. It is a bilateral, or two-sided, structure that can be separated into distinct lobes. Each lobe is associated with certain types of functions, but, ultimately, all of the areas of the brain interact with one another to provide the foundation for our thoughts and behaviors. In this section, we discuss the overall organization of the brain and the functions associated with different brain areas, beginning with what can be seen as an extension of the brain, the spinal cord.

The Spinal Cord

It can be said that the spinal cord is what connects the brain to the outside world. Because of it, the brain can act. The spinal cord is like a relay station, but a very smart one. It not only routes messages

to and from the brain, but it 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 the basic processes of life are controlled, such as breathing and digestion. In the opposite direction, the spinal cord ends just below the ribs—contrary to what we might expect, it does not extend all the way to the base of the spine.

The spinal cord is functionally organized in 30 segments, corresponding with the vertebrae. Each segment is 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. Messages travel to and from the brain through every segment.

Some sensory messages are immediately acted on by the spinal cord, without any input from the brain. Withdrawal from a hot object and the knee jerk are two examples. When a sensory message meets certain parameters, the spinal cord initiates an automatic reflex. The signal passes from the sensory nerve to a simple processing center, which initiates a motor command. Seconds are saved because messages don't have to go the brain, be processed, and get sent back. In matters of survival, the spinal reflexes allow the body to react extraordinarily fast.

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, causing paralysis. Therefore, the lower on the spine damage occurs, the fewer functions an injured individual will lose.

Neuroplasticity

Bob Woodruff, a reporter for ABC, suffered a traumatic brain injury after a bomb exploded next to the vehicle he was in while covering a news story in Iraq. As a consequence of these injuries, Woodruff

experienced many cognitive deficits including difficulties with memory and language. However, over time and with the aid of intensive amounts of cognitive and speech therapy, Woodruff has shown an incredible recovery of function (Fernandez, 2008, October 16).

One of the factors that made this recovery possible was neuroplasticity. Neuroplasticity refers to how the nervous system can change and adapt. Neuroplasticity can occur in a variety of ways including personal experiences, developmental processes, or, as in Woodruff's case, in response to some sort of damage or injury that has occurred. Neuroplasticity can involve the creation of new synapses, pruning of synapses that are no longer used, changes in glial cells, and even the birth of new neurons. Because of neuroplasticity, our brains are constantly changing and adapting, and while our nervous system is most plastic when we are very young, as Woodruff's case suggests, it is still capable of remarkable changes later in life.

The Two Hemispheres

The surface of the brain, known as the cerebral cortex, is very uneven, characterized by a distinctive pattern of folds or bumps, known as gyri (singular: gyrus), and grooves, known as sulci (singular: sulcus), shown in Figure 3.15. 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 hemisphere and the right hemisphere.

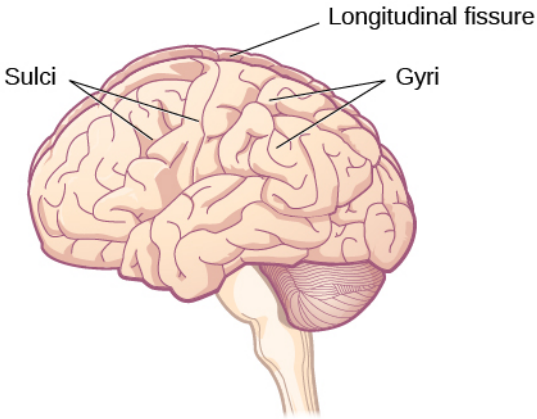


Figure 3.15The surface of the brain is covered with gyri and sulci. A deep sulcus is called a fissure, such as the longitudinal fissure that divides the brain into left and right hemispheres. (credit: modification of work by Bruce Blaus)

There is evidence of specialization of function—referred to as lateralization—in each hemisphere, mainly regarding differences in language functions. The left hemisphere controls the right half of the body, and the right hemisphere controls the left half of the body. Decades of research on lateralization of function by Michael Gazzaniga and his colleagues suggest that a variety of functions ranging from cause-and-effect reasoning to self-recognition may follow patterns that suggest some degree of hemispheric dominance (Gazzaniga, 2005). For example, the left hemisphere has been shown to be superior for forming associations in memory, selective attention, and positive emotions. The right hemisphere, on the other hand, has been shown to be superior in pitch perception, arousal, and negative emotions (Ehret, 2006). However, it should be pointed out that research on which hemisphere is dominant in a variety of different behaviors has produced inconsistent results, and therefore, it is probably better to think of how the two hemispheres interact to produce a given behavior rather than attributing certain behaviors to one hemisphere versus the other (Banich & Heller, 1998).

The two hemispheres are connected by a thick band of neural fibers known as the corpus callosum, consisting of about 200 million axons. The corpus callosum allows the two hemispheres to communicate with each other and allows for information being processed on one side of the brain to be shared with the other side.

Normally, we are not aware of the different roles that our two hemispheres play in day-to-day functions, but there are people who come to know the capabilities and functions of their two hemispheres quite well. In some cases of severe epilepsy, doctors elect to sever the corpus callosum as a means of controlling the spread of seizures (Figure 3.16). While this is an effective treatment option, it results in individuals who have "split brains." After surgery, these split-brain patients show a variety of interesting behaviors. For instance, a split-brain patient is unable to name a picture that is shown in the patient's left visual field because the information is only available in the largely nonverbal right hemisphere. However, they are able to 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).

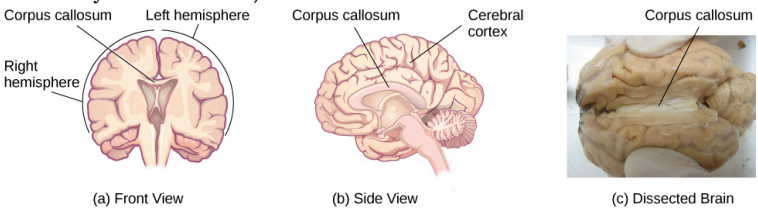


Figure 3.16(a, b) The corpus callosum connects the left and right hemispheres of the brain. (c) A scientist spreads this dissected sheep brain apart to show the corpus callosum between the hemispheres. (credit c: modification of work by Aaron Bornstein)

Much of what we know about the functions of different areas of the brain comes from studying changes in the behavior and ability of individuals who have suffered damage to the brain. For example, researchers study the behavioral changes caused by strokes to learn

about the functions of specific brain areas. A stroke, caused by an interruption of blood flow to a region in the brain, causes a loss of brain function in the affected region. The damage can be in a small area, and, if it is, this gives researchers the opportunity to link any resulting behavioral changes to a specific area. The types of deficits displayed after a stroke will be largely dependent on where in the brain the damage occurred.

Consider Theona, an intelligent, self-sufficient woman, who is 62 years old. Recently, she suffered a stroke in the front portion of her right hemisphere. As a result, she has great difficulty moving her left leg. (As you learned earlier, the right hemisphere controls the left side of the body; also, the brain's main motor centers are located at the front of the head, in the frontal lobe.) Theona has also experienced behavioral changes. For example, while in the produce section of the grocery store, she sometimes eats grapes, strawberries, and apples directly from their bins before paying for them. This behavior—which would have been very embarrassing to her before the stroke—is consistent with damage in another region in the frontal lobe—the prefrontal cortex, which is associated with judgment, reasoning, and impulse control.

Forebrain Structures

The two hemispheres of the cerebral cortex are part of the forebrain (Figure 3.17), which is the largest part of the brain. The forebrain contains the cerebral cortex and a number of other structures that lie beneath the cortex (called subcortical structures): thalamus, hypothalamus, pituitary gland, and the limbic system (a collection of structures). The cerebral cortex, which is the outer surface of the brain, is associated with higher-level processes such as consciousness, thought, emotion, reasoning, language, and memory. Each cerebral hemisphere can be subdivided into four lobes, each associated with different functions.

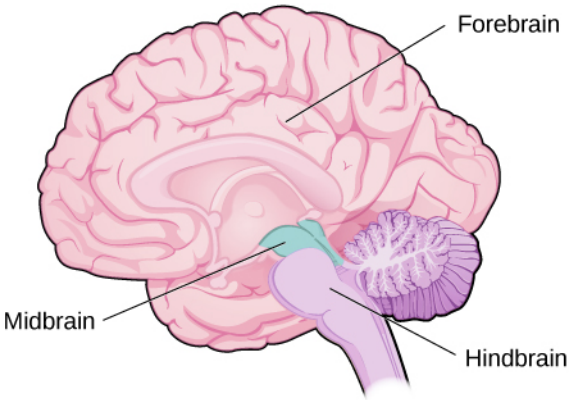


Figure 3.17The brain and its parts can be divided into three main categories: the forebrain, midbrain, and hindbrain.

Lobes of the Brain

The four lobes of the brain are the frontal, parietal, temporal, and occipital lobes (Figure 3.18). The frontal lobe is located in the forward part of the brain, extending back to a fissure known as the central sulcus. The frontal lobe is involved in reasoning, motor control, emotion, and language. It contains the motor cortex, which is involved in planning and coordinating movement; the prefrontal cortex, which is responsible for higher-level cognitive functioning; and Broca's area, which is essential for language production.

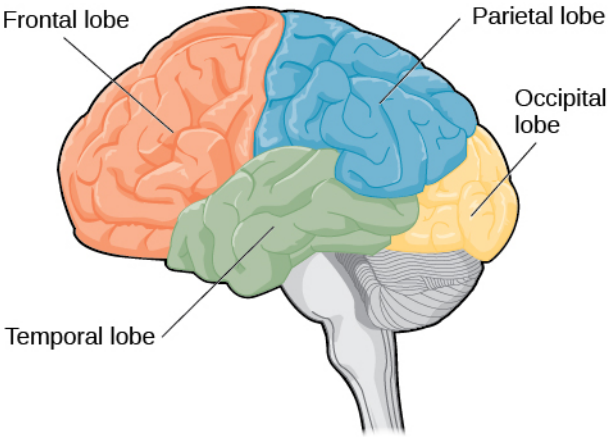


Figure 3.18The lobes of the brain are shown.

People who suffer damage to Broca's area have great difficulty producing language of any form (Figure 3.18). For example, Padma was an electrical engineer who was socially active and a caring, involved parent. About twenty years ago, she was in a car accident and suffered damage to her Broca's area. She completely lost the ability to speak and form any kind of meaningful language. There is nothing wrong with her mouth or her vocal cords, but she is unable to produce words. She can follow directions but can't respond verbally, and she can read but no longer write. She can do routine tasks like running to the market to buy milk, but she could not communicate verbally if a situation called for it.

Probably the most famous case of frontal lobe damage is that of a man by the name of Phineas Gage. On September 13, 1848, Gage (age 25) was working as a railroad foreman in Vermont. He and his crew were using an iron rod to tamp explosives down into a blasting hole to remove rock along the railway's path. Unfortunately, the iron rod created a spark and caused the rod to explode out of the blasting hole, into Gage's face, and through his skull (Figure 3.19). Although lying in a pool of his own blood with brain matter emerging from his head, Gage was conscious and able to get up, walk, and speak.

However, there is some debate on what long-term effects Gage

experienced after the accident. Gage's case occurred in the midst of a 19th-century debate over localization—regarding whether certain areas of the brain are associated with particular functions. On the basis of extremely limited information about Gage, the extent of his injury, and his life before and after the accident, scientists tended to find support for their own views, on whichever side of the debate they fell (Macmillan, 1999). What we can conclude from his accident is that he was able to live a full life after his brain injury and that the brain is incredibly resilient.

(a)

(b)

Figure 3.19(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)

LINK TO LEARNING: Watch this video about the truth about Phineas Gage.

The brain's parietal lobe is located immediately behind the frontal lobe and is involved in processing information from the body's senses. It contains the somatosensory cortex, which is essential for processing sensory information from across the body, such as touch, temperature, and pain. The somatosensory cortex is organized topographically, which means that spatial relationships that exist in the body are generally maintained on the surface of the somatosensory cortex (Figure 3.20). For example, the portion of the cortex that processes sensory information from the hand is adjacent to the portion that processes information from the wrist.

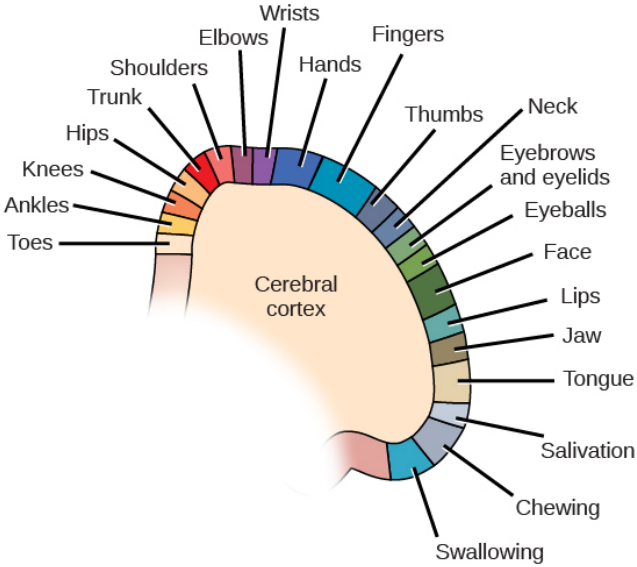


Figure 3.20 Spatial relationships in the body are mirrored in the organization of the somatosensory cortex.

The temporal lobe is located on the side of the head (temporal means "near the temples"), and is associated with hearing, memory, emotion, and some aspects of language. The auditory cortex, the main area responsible for processing auditory information, is located within the temporal lobe. Wernicke's area, important for

speech comprehension, is also located here. Whereas individuals with damage to Broca's area have difficulty producing language, those with damage to Wernicke's area can produce sensible language, but they are unable to understand it (Figure 3.21).

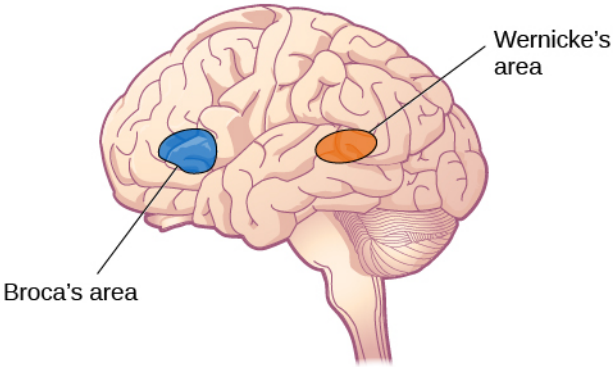


Figure 3.21Damage to either Broca's area or Wernicke's area can result in language deficits. The types of deficits are very different, however, depending on which area is affected.

The occipital lobe is located at the very back of the brain and contains the primary visual cortex, which is responsible for interpreting incoming visual information. The occipital cortex is organized retinotopically, which means there is a close relationship between the position of an object in a person's visual field and the position of that object's representation on the cortex. You will learn much more about how visual information is processed in the occipital lobe when you study sensation and perception.

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 3.22).

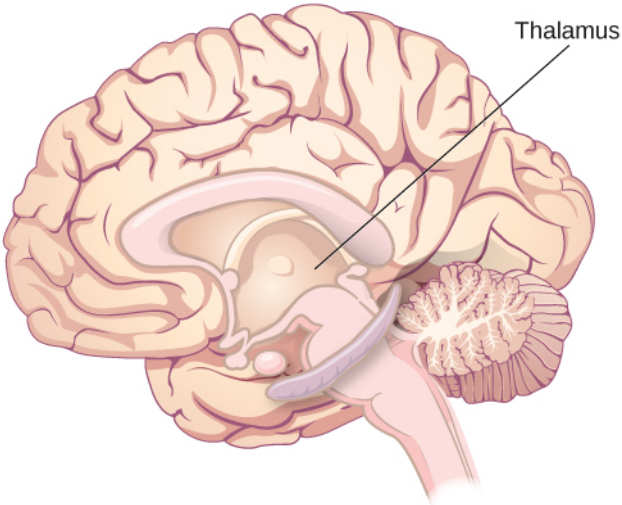


Figure 3.22The thalamus serves as the relay center of the brain where most senses are routed for processing.

The limbic system is involved in processing both emotion and memory. Interestingly, the sense of smell projects directly to the limbic system; therefore, not surprisingly, the sense of smell can evoke emotional responses in ways that other sensory modalities cannot. 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 3.23). 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 behavior.

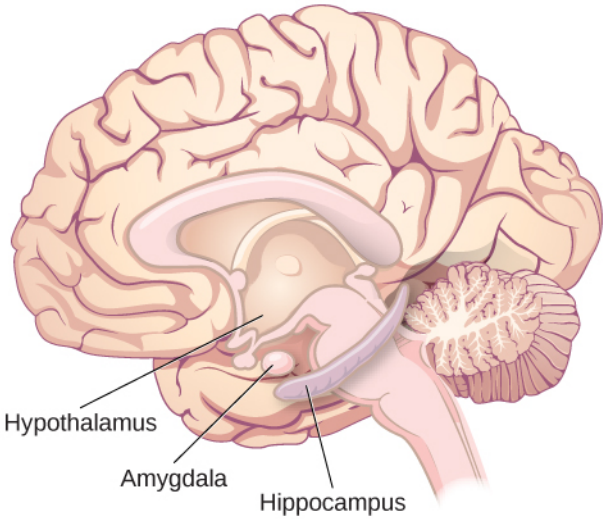


Figure 3.23The limbic system is involved in mediating emotional response and memory.

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.

Midbrain and Hindbrain Structures

The midbrain is comprised of structures located deep within the brain, between the forebrain and the hindbrain. The reticular formation is centered in the midbrain, but it actually extends up into the forebrain and down into the hindbrain. The reticular formation is important in regulating the sleep/wake cycle, arousal, alertness, and motor activity.

The substantia nigra (Latin for "black substance") and the ventral tegmental area (VTA) are also located in the midbrain (Figure 3.24). Both regions contain cell bodies that produce the neurotransmitter dopamine, and both are critical for movement. Degeneration of the substantia nigra and VTA is involved in Parkinson's disease. In addition, these structures are involved in mood, reward, and addiction (Berridge & Robinson, 1998; Gardner, 2011; George, Le Moal, & Koob, 2012).

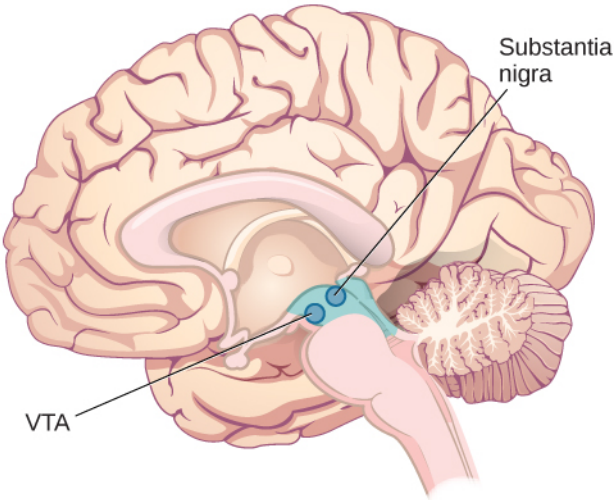


Figure 3.24The substantia nigra and ventral tegmental area (VTA) are located in the midbrain.

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 3.25). 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 serves to connect the hindbrain to the rest of the brain. It also is involved in regulating brain activity during sleep. The medulla, pons, and various structures are known as the brainstem, and aspects of the brainstem span both the midbrain and the hindbrain.

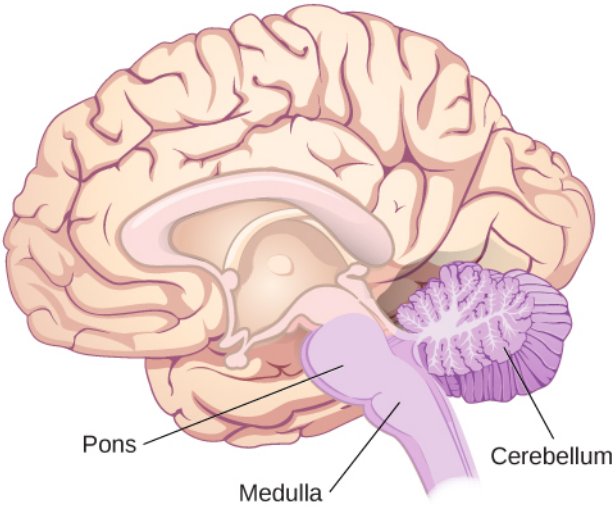


Figure 3.25The pons, medulla, and cerebellum make up the hindbrain.

The cerebellum (Latin for "little brain") receives messages from muscles, tendons, joints, and structures in our ear to control balance, coordination, movement, and 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 be associated with the cerebellum. Recall that H. M. was unable to form new explicit memories, but he could learn new tasks. This is likely due to the fact that H. M.'s cerebellum remained intact.

Learning Objectives

- Name and describe the most common approaches

to studying the human brain.

- Distinguish among neuroimaging methods

Studying the Human Brain

How do we know what the brain does? We have gathered knowledge about the functions of the brain from many different methods. Each method is useful for answering distinct types of questions, but the strongest evidence for a specific role or function of a particular brain area is converging evidence; that is, similar findings reported from multiple studies using different methods.

One of the first organized attempts to study the functions of the brain was phrenology, a popular field of study in the first half of the 19th century. Phrenologists assumed that various features of the brain, such as its uneven surface, are reflected on the skull; therefore, they attempted to correlate bumps and indentations of the skull with specific functions of the brain. For example, they would claim that a very artistic person has ridges on the head that vary in size and location from those of someone who is very good at spatial reasoning. Although the assumption that the skull reflects the underlying brain structure has been proven wrong, phrenology nonetheless significantly impacted current-day neuroscience and its thinking about the functions of the brain. That is, different parts of the brain are devoted to very specific functions that can be identified through scientific inquiry.

Neuroanatomy

Dissection of the brain, in either animals or cadavers, has been a critical tool of neuroscientists since 340 BC when Aristotle first published his dissections. Since then this method has advanced

considerably with the discovery of various staining techniques that can highlight particular cells. Because the brain can be sliced very thinly, examined under the microscope, and particular cells highlighted, this method is especially useful for studying specific groups of neurons or small brain structures; that is, it has a very high spatial resolution. Dissections allow scientists to study changes in the brain that occur due to various diseases or experiences (e.g., exposure to drugs or brain injuries).

Virtual dissection studies with living humans are also conducted. Here, the brain is imaged using computerized axial tomography (CAT) or MRI scanners; they reveal with very high precision the various structures in the brain and can help detect changes in gray or white matter. These changes in the brain can then be correlated with behavior, such as performance on memory tests, and, therefore, implicate specific brain areas in certain cognitive functions.

Some researchers induce lesions or ablate (i.e., remove) parts of the brain in animals. If the animal's behavior changes after the lesion, we can infer that the removed structure is important for that behavior. Lesions of human brains are studied in patient populations only; that is, patients who have lost a brain region due to a stroke or other injury, or who have had surgical removal of a structure to treat a particular disease (e.g., a callosotomy to control epilepsy, as in split-brain patients). From such case studies, we can infer brain function by measuring changes in the behavior of the patients before and after the lesion.

Neuroimaging

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 a 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 3.26). 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 tumor or significant brain atrophy.

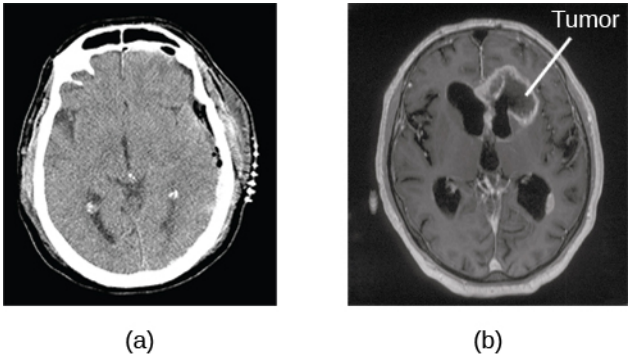


Figure 3.26A CT scan can be used to show brain tumors. (a) The image on the left shows a healthy brain, whereas (b) the image on the right indicates a brain tumor in the left frontal lobe. (credit a: modification of work by "Aceofhearts1968"/Wikimedia Commons; credit b: modification of work by Roland Schmitt et al)

Positron emission tomography (PET) scans create pictures of the living, active brain (Figure 3.27). 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 behavior. 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.

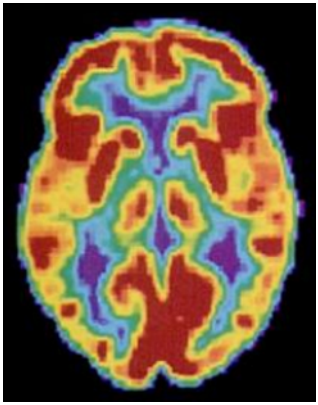


Figure 3.27A PET scan is helpful for showing activity in different parts of the brain. (credit: Health and Human Services Department, National Institutes of Health)

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 3.28). With their high level of detail, MRI and fMRI are often used to compare the brains of healthy individuals to the brains of individuals diagnosed with psychological disorders. This comparison helps determine what structural and functional differences exist between these populations.

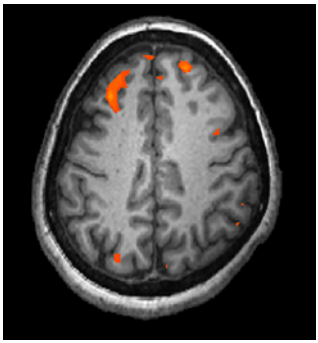
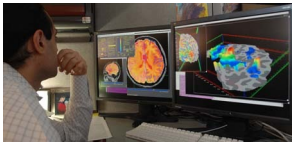


Figure 3.28An fMRI shows activity in the brain over time. This image represents a single frame from an fMRI. (credit: modification of work by Kim J, Matthews NL, Park S.)



A researcher looking at the areas of activation in the brain of a study participant who had an fMRI scan – areas of brain activation are determined by the amount of blood flow to a certain area – the more blood flow, the higher the activation of that area of the brain. [Image: National Institute of Mental Health, CC0 Public Domain, https://goo.gl/m25gce]

LINK TO LEARNING: Visit this virtual lab about MRI and fMRI to learn more.

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 3.29). 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.

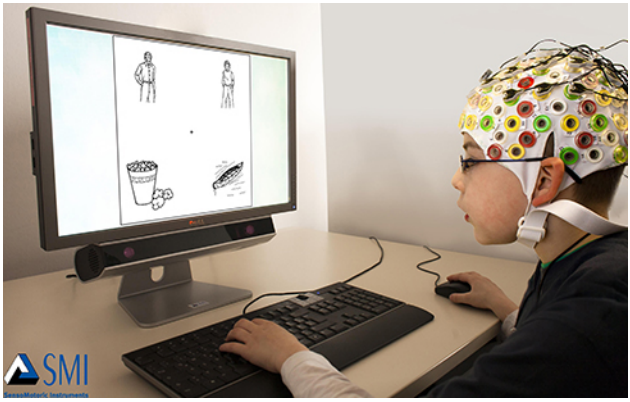


Figure 3.29Using caps with electrodes, modern EEG research can study the precise timing of overall brain activities. (credit: SMI Eye Tracking)

Learning Objectives

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

- Identify the major glands of the endocrine system
- Identify the hormones secreted by each gland
- Describe each hormone's role in regulating bodily functions

This module describes the relationship between hormones and behavior. Many readers are likely already familiar with the general idea that hormones can affect behavior. Students are generally familiar with the idea that sex-hormone concentrations increase in the blood during puberty and decrease as we age, especially after about 50 years of age. Sexual behavior shows a similar pattern. Most people also know about the relationship between aggression and anabolic steroid hormones, and they know that administration of artificial steroid hormones sometimes results in uncontrollable, violent behavior called "roid rage." Many different hormones can influence several types of behavior, but for the purpose of this module, we will restrict our discussion to just a few examples of hormones and behaviors. For example, are behavioral sex differences the result of hormones, the environment, or some combination of factors? Why are men much more likely than women to commit aggressive acts? Are hormones involved in mediating the so-called maternal "instinct"? Behavioral endocrinologists are interested in how the general physiological effects of hormones alter the development and expression of behavior and how behavior may influence the effects of hormones. This module describes, both

phenomenologically and functionally, how hormones affect behavior.

To understand the hormone-behavior relationship, it is important briefly to describe hormones. Hormones are organic chemical messengers produced and released by specialized glands called endocrine glands. Hormones are released from these glands into the blood, where they may travel to act on target structures at some distance from their origin. Hormones are similar in function to neurotransmitters, the chemicals used by the nervous system in coordinating animals' activities. However, hormones can operate over a greater distance and over a much greater temporal range than neurotransmitters (Focus Topic 1). Examples of hormones that influence behavior include steroid hormones such as testosterone (a common type of androgen), estradiol (a common type of estrogen), progesterone (a common type of progestin), and cortisol (a common type of glucocorticoid) (Table 1, A-B). Several types of protein or peptide (small protein) hormones also influence behavior, including oxytocin, vasopressin, prolactin, and leptin.

Focus Topic 1:

Neural Transmission versus Hormonal Communication

Although neural and hormonal communication both rely on chemical signals, several prominent differences exist. Communication in the nervous system is analogous to traveling on a train. You can use the train in your travel plans as long as tracks exist between your proposed origin and destination. Likewise, neural messages can travel only to destinations along existing nerve tracts. Hormonal communication, on the other hand, is like traveling in a car. You can drive to many more destinations than train travel allows because there are many more roads than railroad tracks. Similarly, hormonal messages can travel anywhere in the body via the circulatory system; any cell receiving blood is potentially able to receive a hormonal message.

Neural and hormonal communication differ in other ways as well. To illustrate them, consider the differences between digital and

analog technologies. Neural messages are digital, all-or-none events that have rapid onset and offset: neural signals can take place in milliseconds. Accordingly, the nervous system mediates changes in the body that are relatively rapid. For example, the nervous system regulates immediate food intake and directs body movement. In contrast, hormonal messages are analog, graded events that may take seconds, minutes, or even hours to occur. Hormones can mediate long-term processes, such as growth, development, reproduction, and metabolism.

Hormonal and neural messages are both chemical in nature, and they are released and received by cells in a similar manner; however, there are important differences as well. Neurotransmitters, the chemical messengers used by neurons, travel a distance of only 20–30 nanometers (30 X 10–9 m)–to the membrane of the postsynaptic neuron, where they bind with receptors. Hormones enter the circulatory system and may travel from 1 millimeter to >2 meters before arriving at a target cell, where they bind with specific receptors.

Another distinction between neural and hormonal communication is the degree of voluntary control that can be exerted over their functioning. In general, there is more voluntary control of neural than of hormonal signals. It is virtually impossible to will a change in your thyroid hormone levels, for example, whereas moving your limbs on command is easy.

Although these are significant differences, the division between the nervous system and the endocrine system is becoming more blurred as we learn more about how the nervous system regulates hormonal communication. A better understanding of the interface between the endocrine system and the nervous system, called neuroendocrinology, is likely to yield important advances in the future study of the interaction between hormones and behavior.

Steroid Hormones	
Cortisol	Increases carbohydrate metabolism; mediates stress responses
Estradiol	Uterine and other female tissue development; regulates sexual motivation and performance in females and males
Testosterone	Promotes sperm production and male secondary sexual characteristics; promotes sexual motivation and behavior, typically by being converted to estradiol

Table 1-A: Prominent Hormones That Influence Behavior

Peptides and Protein Hormones	
Oxytocin	Stimulates milk letdown and uterine contractions during birth; Promotes social bonding
Prolactin	Many actions relating to reproduction, water balance, and behavior associated with parental care
Thyroxine	Increases oxidation rates in tissue and affects neural development
Vasopressin	Increases water reabsorption in the kidney and affects learning and memory

Table 1-B: Prominent Hormones That Influence Behavior

Hormones coordinate the physiology and behavior of individuals by regulating, integrating, and controlling bodily functions. Over evolutionary time, hormones have often been co-opted by the nervous system to influence behavior to ensure reproductive success. For example, the same hormones, testosterone and estradiol, that cause gamete (egg or sperm) maturation also promote mating behavior. This dual hormonal function ensures that mating behavior occurs when animals have mature gametes available for fertilization. Another example of endocrine regulation of physiological and behavioral function is provided by pregnancy. Estrogens and progesterone concentrations are elevated during pregnancy, and these hormones are often involved in mediating maternal behavior in the mothers.

Not all cells are influenced by each and every hormone. Rather, any given hormone can directly influence only cells that have specific hormone receptors for that particular hormone. Cells that have these specific receptors are called target cells for the hormone. The interaction of a hormone with its receptor begins a series of cellular events that eventually lead to activation of enzymatic pathways or, alternatively, turns on or turns off gene activation that regulates protein synthesis. The newly synthesized

proteins may activate or deactivate other genes, causing yet another cascade of cellular events. Importantly, sufficient numbers of appropriate hormone receptors must be available for a specific hormone to produce any effects. For example, testosterone is important for male sexual behavior. If men have too little testosterone, then sexual motivation may be low, and it can be restored by testosterone treatment. However, if men have normal or even elevated levels of testosterone yet display low sexual drive, then it might be possible for a lack of receptors to be the cause and treatment with additional hormones will not be effective.

The endocrine system consists of a series of glands that produce chemical substances known as hormones (Figure 3.30). Like neurotransmitters, hormones are chemical messengers that must bind to a receptor in order to send their signal. However, unlike neurotransmitters, which are released in close proximity to cells with their receptors, hormones are secreted into the bloodstream and travel throughout the body, affecting any cells that contain receptors for them. Thus, whereas neurotransmitters' effects are localized, the effects of hormones are widespread. Also, hormones are slower to take effect, and tend to be longer-lasting.

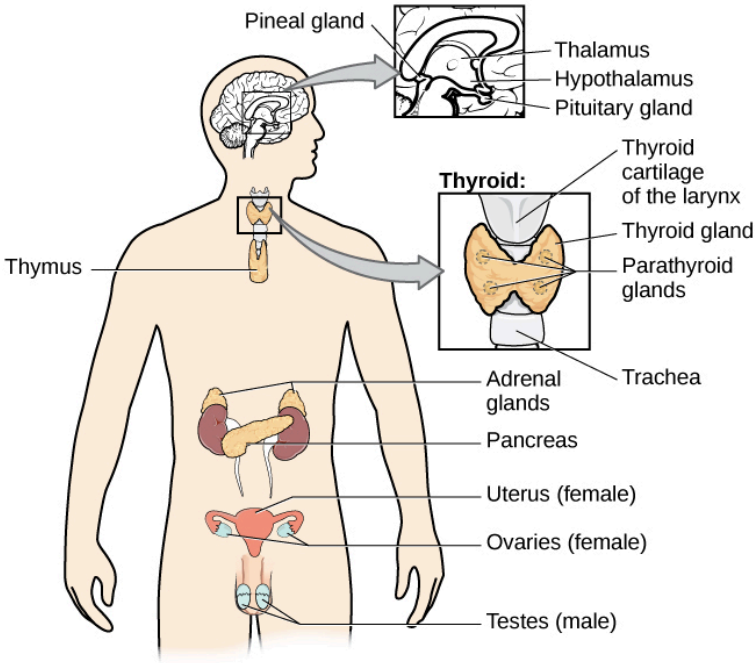


Figure 3.30The major glands of the endocrine system are shown.

Hormones are involved in regulating all sorts of bodily functions, and they are ultimately controlled through interactions between the hypothalamus (in the central nervous system) and the pituitary gland (in the endocrine system). Imbalances in hormones are related to a number of disorders. This section explores some of the major glands that make up the endocrine system and the hormones secreted by these glands (Table 3.2).

Major Glands

The pituitary gland descends from the hypothalamus at the base of the brain and acts in close association with it. The pituitary is often referred to as the "master gland" because its messenger hormones

control all the other glands in the endocrine system, although it mostly carries out instructions from the hypothalamus. In addition to messenger hormones, the pituitary also secretes growth hormone, endorphins for pain relief, and a number of key hormones that regulate fluid levels in the body.

Located in the neck, the thyroid gland releases hormones that regulate growth, metabolism, and appetite. In hyperthyroidism or Grave's disease, the thyroid secretes too much of the hormone thyroxine, causing agitation, bulging eyes, and weight loss. In hypothyroidism, reduced hormone levels cause sufferers to experience tiredness, and they often complain of feeling cold. Fortunately, thyroid disorders are often treatable with medications that help reestablish a balance in the hormones secreted by the thyroid.

The adrenal glands sit atop our kidneys and secrete hormones involved in the stress response, such as epinephrine (adrenaline) and norepinephrine (noradrenaline). The pancreas is an internal organ that secretes hormones that regulate blood sugar levels: insulin and glucagon. These pancreatic hormones are essential for maintaining stable levels of blood sugar throughout the day by lowering blood glucose levels (insulin) or raising them (glucagon). People who suffer from diabetes do not produce enough insulin; therefore, they must take medications that stimulate or replace insulin production, and they must closely control the amount of sugars and carbohydrates they consume.

The gonads secrete sexual hormones, which are important in reproduction, and mediate both sexual motivation and behavior. The female gonads are the ovaries; the male gonads are the testes. Ovaries secrete estrogens and progesterone, and the testes secrete androgens, such as testosterone.

Major Endocrine Glands and Associated Hormone Functions		
Endocrine Gland	**Associated Hormones**	**Function**
Hypothalamus	Releasing and inhibiting hormones, such as oxytocin	Regulate hormone release from pituitary gland
Pituitary	Growth hormone, releasing and inhibiting hormones (such as thyroid stimulating hormone)	Regulate growth, regulate hormone release
Thyroid	Thyroxine, triiodothyronine	Regulate metabolism and appetite
Pineal	Melatonin	Regulate some biological rhythms such as sleep cycles
Adrenal	Epinephrine, norepinephrine	Stress response, increase metabolic activities
Pancreas	Insulin, glucagon	Regulate blood sugar levels
Ovaries	Estrogen, progesterone	Mediate sexual motivation and behavior, reproduction
Testes	Androgens, such as testosterone	Mediate sexual motivation and behavior, reproduction

Table 3.2

Additional Supplemental Resources

Websites

- Areas and Function of the Brain

    - Students will interact with the map and chart to review major areas of the brain and their functions. Toggle down on the top left menu to choose different structures to explore.
- Explore the UCLA Laboratory of Neuro Imaging
    - We've built a diverse team of neurobiologists, mathematicians, and computer scientists, and a worldwide network of collaborators sharing data. Our goal is to increase the pace of discovery in neuroscience by better understanding how the brain works when it's healthy and what goes wrong in disease.
- Brain Museum
    - This web site provides browsers with images and information from one of the world's largest collection of well-preserved, sectioned and stained brains of mammals. Viewers can see and download photographs of brains of over 100 different species of mammals (including humans) representing over 20 Mammalian Orders.

Videos

- Self Reflected
    - Neuroscientist and artist Greg Dunn have created a map of the brain's neural pathways and animated the firing of neurons. After you have learned about brain regions and neurons, this will provide a beautiful capstone to what you have learned. Closed captioning not available.
- 3 Clues to Understanding Your Brain
    - Vilayanur Ramachandran tells us what brain damage can reveal about the connection between cerebral tissue and the mind, using three startling delusions as examples.
- Crossing the Divide: How Neurons Talk to One Another

    - View the process of neurotransmission up close in this short video clip. Closed captioning available.
- In-Depth Fight or Flight Response
    - This in-depth video explains the cellular processes that result in common "fight or flight" physiological responses, including hair-raising, sweating, and increased respiration. Includes play-by-play printout but not a full transcript.
- Severed Corpus Callosum
    - Alan Alda interviews Michael Gazzaniga and a split-brain patient to determine the peculiarities of having a severed corpus callosum. Closed captioning available.
- What is a Neuron?
    - This video includes information on topics such as the structure of a neuron. It is hosted by neuroscientist Alie Caldwell. Check out her other videos in the series as well. Closed captioning available.
- Modern ways of studying the brain |Khan Academy
    - This video gives an overview of some of the most common brain imaging tests including CAT, MRI, fMRI, MEG, EEG, and PET.
- Navy SEALs Mental Training
    - Video segment from "The Brain: Mystery Explained" documentary featured on The History Channel. Navy SEALs Mental Training: – Goal Setting – Mental Rehearsal (aka Visualization) – Self Talk – Arousal Control
- What Percentage of Your Brain do you Use?- TED-Ed
    - Two-thirds of the population believes a myth that has been propagated for over a century: that we use only 10% of our brains. Hardly! Our neuron-dense brains have evolved to use the least amount of energy while carrying the most information possible – a feat that requires the entire brain. Richard E. Cytowic debunks this neurological

myth (and explains why we aren't so good at multitasking).

- Crash Course Video #3 – The Chemical Mind
  - This video on the chemical mind covers the structure and function of the neuron, neurotransmitters and the endocrine system. Closed captioning available.
- Crash Course Video #4 – Meet Your Master: Getting to Know Your Brain
  - This video on getting to know your brain contains information on the structure and function of the cerebral cortex, the limbic system, and lower-level structures. Closed captioning available.
- Anatomy of the Nervous System
  - Video on the anatomy of the nervous system
- How the Human Brain Works
  - To look at the functions of the brain and neurons, watch this video.

Access for free at https://openstax.org/books/psychology-2e/pages/1-introduction

3. States of Consciousness

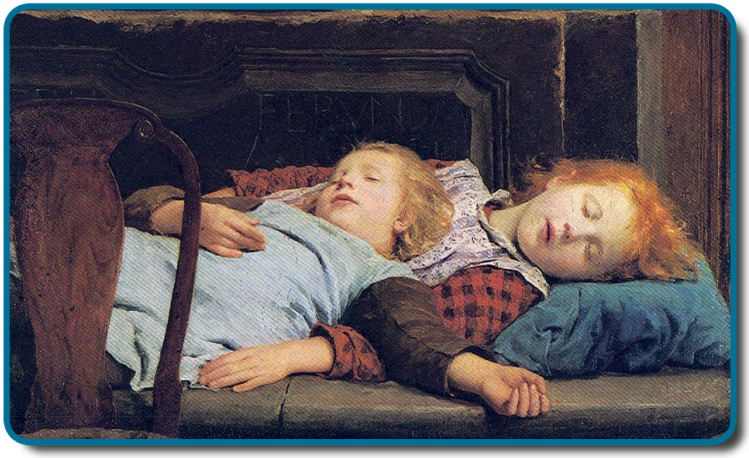


Figure 4.1 Sleep, which we all experience, is a quiet and mysterious pause in our daily lives. Two sleeping children are depicted in this 1895 oil painting titled *Zwei schlafende Mädchen auf der Ofenbank*, which translates as "two sleeping girls on the stove," by Swiss painter Albert Anker.

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.

Learning Objectives

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

- Understand what is meant by consciousness
- 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.

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 behavior. 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 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 behavior, are rooted in our biology.

Biological Rhythms

Biological rhythms are internal rhythms of biological activity. A woman's 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 4.2). Alertness is associated with higher body temperatures, and sleepiness with lower body temperatures.

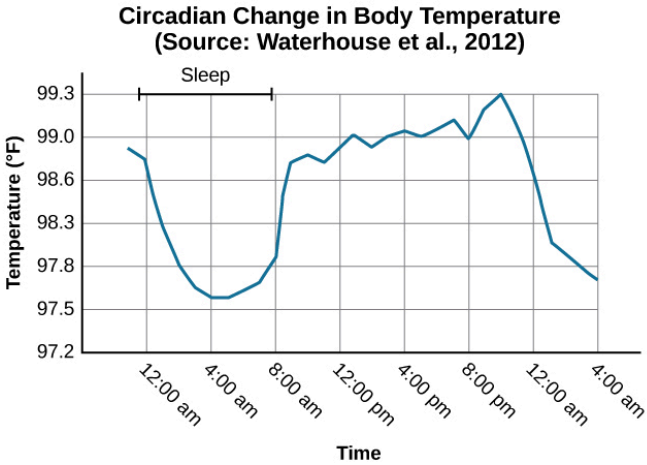


Figure 4.2 This chart illustrates the circadian change in body temperature over 28 hours in a group of eight young men. Body temperature rises throughout the waking day, peaking in the afternoon, and falls during sleep with the lowest point occurring during the very early morning hours.

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 the main center 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 neurons 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 4.3).

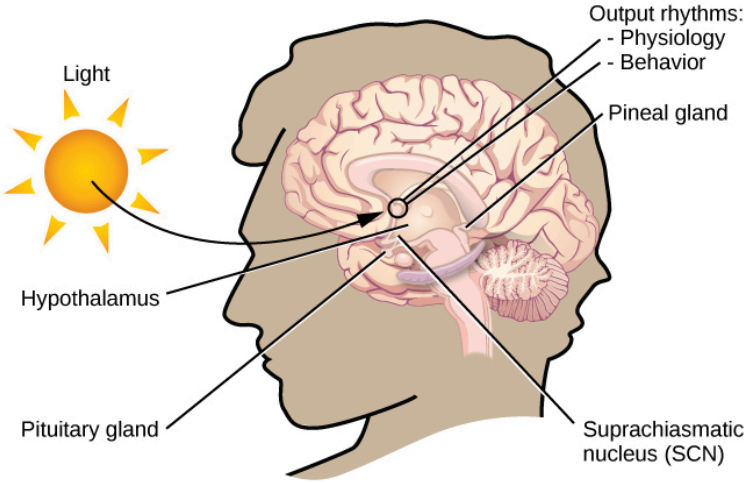


Figure 4.3 The suprachiasmatic nucleus (SCN) serves as the brain's clock mechanism. The clock sets itself with light information received through projections from the retina.

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.

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 families. 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 4.4, 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 4.4 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.

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 its sleep duration hours, to better accommodate individual differences. Table 4.1 shows the new recommendations, which describe sleep durations that are "recommended", "may be appropriate", and "not recommended".

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
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

Table4.1

Sleep debt and sleep deprivation have significant negative psychological and physiological consequences Figure 4.5. 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 (for 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.

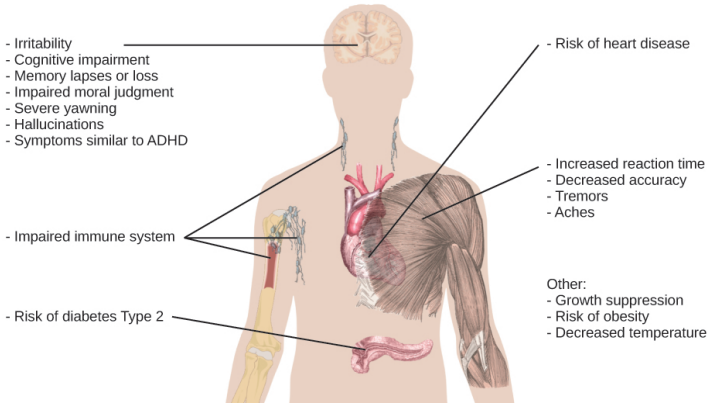


Figure 4.5 This figure illustrates some of the negative consequences of sleep deprivation. While cognitive deficits may be the most obvious, many body systems are negatively impacted by lack of sleep. (credit: modification of work by Mikael Häggström)

LINK TO LEARNING: Read this article about sleep needs to assess your own 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).

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 U.S. citizens falls between 73 and 79 years old (Singh & Siahpush, 2006), 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 4.6). 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).

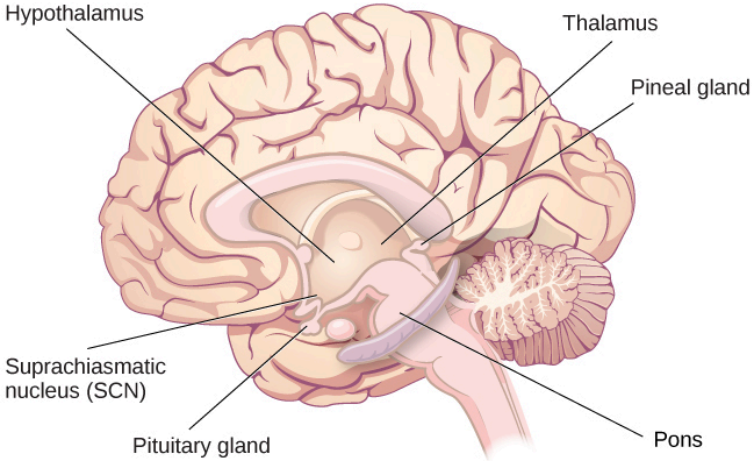


Figure 4.6 The pineal and pituitary glands secrete a number of hormones during sleep.

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 behavior and cognitive processes have evolved over time as a result of natural selection. Variations and adaptations in cognition and behavior 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 a 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.

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).

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 4.7). 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.

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 4.8). 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.

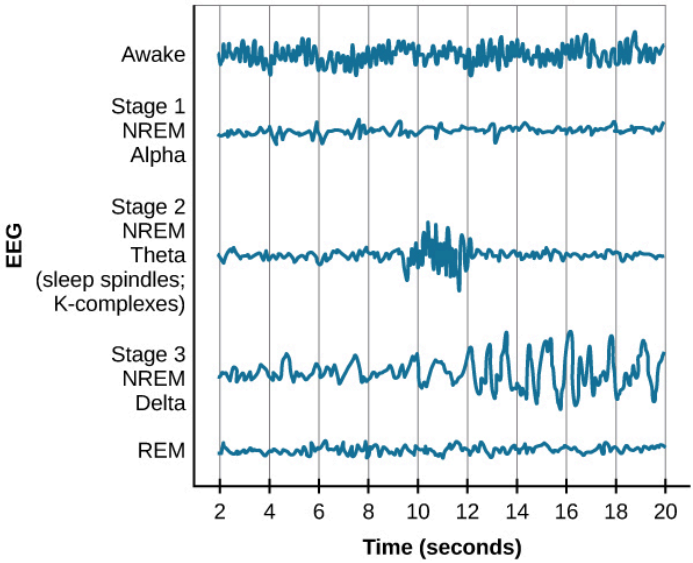


Figure 4.8 Brainwave activity changes dramatically across the different stages of sleep.

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 4.9). 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).

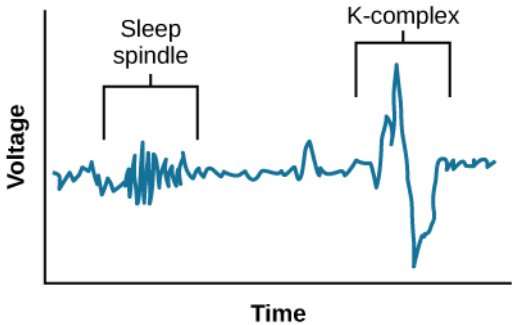
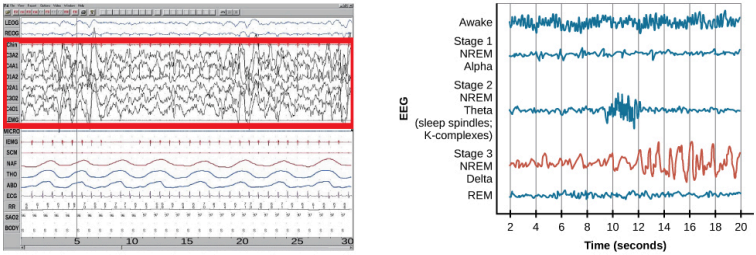


Figure 4.9 Stage 2 sleep is characterized by the appearance of both sleep spindles and K-complexes.

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 4.10). 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).

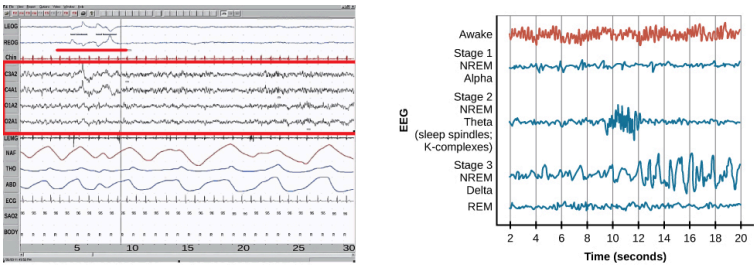


(a) (b)

Figure 4.10 (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 4.11, 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).



(a) (b)

Figure 4.11 (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 non-depressed 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 4.12) shows a person's passage through the stages of sleep.

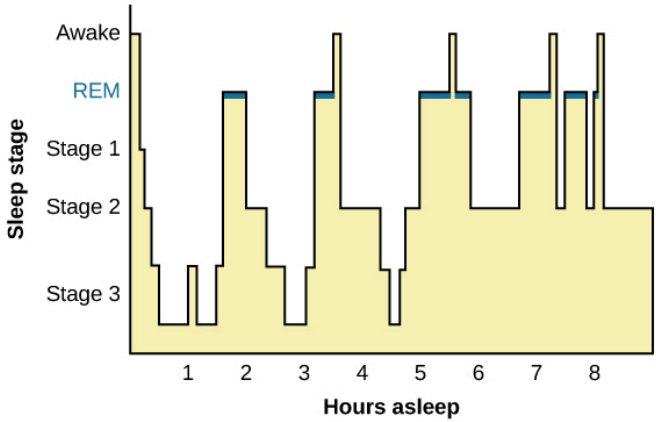


Figure 4.12 A hypnogram is a diagram of the stages of sleep as they occur during a period of sleep. This hypnogram illustrates how an individual moves through the various stages of sleep.

LINK TO LEARNING: View this video about the various stages of sleep to learn more.

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 content, 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 a 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 the 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).

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
- Recognize risk factors associated with sudden infant death syndrome (SIDS) and steps to prevent it
- 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-behavioral

therapy, can help sufferers of insomnia. Cognitive-behavioral therapy is a type of psychotherapy that focuses on cognitive processes and problem behaviors. The treatment of insomnia likely would include stress management techniques and changes in problematic behaviors that could contribute to insomnia (e.g., spending more waking time in bed). Cognitive-behavioral therapy has been demonstrated to be quite effective in treating insomnia (Savard, Simard, Ivers, & Morin, 2005; Williams, Roth, Vatthauer, & McCrae, 2013).

EVERYDAY CONNECTION: Solutions to Support Healthy Sleep

Has something like this ever happened to you? My sophomore college housemate got so stressed out during finals sophomore year he drank almost a whole bottle of Nyquil to try to fall asleep. When he told me, I made him go see the college therapist.

Many college students struggle to get the recommended 7–9 hours of sleep each night. However, for some, it's not because of all-night partying or late-night study sessions. It's simply that they feel so overwhelmed and stressed that they cannot fall asleep or stay asleep. One or two nights of sleep difficulty is not unusual, but if you experience anything more than that, you should seek a doctor's advice.

Here are some tips to maintain healthy sleep:

- Stick to a sleep schedule, even on the weekends.

Try going to bed and waking up at the same time every day to keep your biological clock in sync so your body gets in the habit of sleeping every night.

- Avoid anything stimulating for an hour before bed. That includes exercise and bright light from devices.
- Exercise daily.
- Avoid naps.
- Keep your bedroom temperature between 60 and 67 degrees. People sleep better in cooler temperatures.
- Avoid alcohol, cigarettes, caffeine, and heavy meals before bed. It may feel like alcohol helps you sleep, but it actually disrupts REM sleep and leads to frequent awakenings. Heavy meals may make you sleepy, but they can also lead to frequent awakenings due to gastric distress.
- If you cannot fall asleep, leave your bed and do something else until you feel tired again. Train your body to associate the bed with sleeping rather than other activities like studying, eating, or watching television shows.

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 behaviors 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 Behavior Disorder (RBD)

REM sleep behavior 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 behaviors 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 behaviors. Furthermore, these types of behaviors ultimately disrupt sleep, although affected individuals have no memories that these behaviors 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

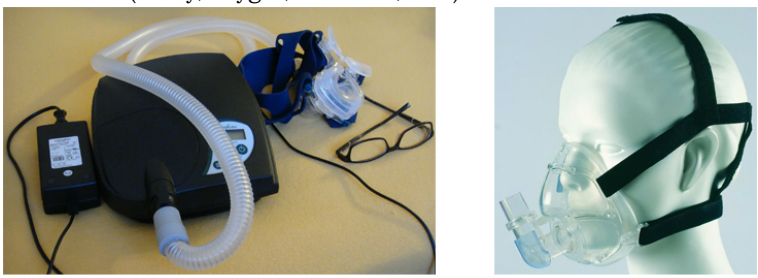
Sleep apnea is defined by episodes during which a sleeper's breathing stops. These episodes can last 10–20 seconds or longer and often are associated with brief periods of arousal. While individuals suffering from sleep apnea may not be aware of these repeated disruptions in sleep, they do experience 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 afterward" (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 the 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 4.13. 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 4.13 (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.

SIDS

In sudden infant death syndrome (SIDS) an infant stops breathing

during sleep and dies. Infants younger than 12 months appear to be at the highest risk for SIDS, and boys have a greater risk than girls. A number of risk factors have been associated with SIDS including premature birth, smoking within the home, and hyperthermia. There may also be differences in both brain structure and function in infants that die from SIDS (Berkowitz, 2012; Mage & Donner, 2006; Thach, 2005).

The substantial amount of research on SIDS has led to a number of recommendations to parents to protect their children (Figure 4.14). For one, research suggests that infants should be placed on their backs when put down to sleep, and their cribs should not contain any items which pose suffocation threats, such as blankets, pillows, or padded crib bumpers (cushions that cover the bars of a crib). Infants should not have caps placed on their heads when put down to sleep in order to prevent overheating, and people in the child's household should abstain from smoking in the home. Recommendations like these have helped to decrease the number of infant deaths from SIDS in recent years (Mitchell, 2009; Task Force on Sudden Infant Death Syndrome, 2011).

Figure 4.14 The Safe to Sleep campaign educates the public about how to minimize risk factors associated with SIDS. This campaign is sponsored in part by the National Institute of Child Health and Human Development.

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 a minute or two 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 signaling 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 on 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.

Learning Objectives

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

- Describe the diagnostic criteria for substance use disorders
- Identify the neurotransmitter systems impacted by various categories of drugs
- Describe how different categories of drugs affect behavior 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 problems associated with such use. This will be followed by brief descriptions of the effects of some of the more well-known drugs commonly used today.

Substance Use Disorders

The fifth edition of the *Diagnostic and Statistical Manual of Mental Disorders*, *Fifth Edition* (DSM-5) is used by clinicians to diagnose individuals suffering from various psychological disorders. Drug use disorders are addictive disorders, and the criteria for specific substance (drug) use disorders are described in DSM-5. A person who has a substance use disorder often uses more of the substance than they originally intended to and continues to use that substance despite experiencing significant adverse consequences. In individuals diagnosed with a substance use disorder, there is a compulsive pattern of drug use that is often associated with both physical and psychological dependence.

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 the 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 4.2. 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.

Drugs and Their Effects

Class of Drug	Examples	Effects on the Body	Effects When Used	Psychological Addicting?
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
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

Drugs and Their Effects				
Class of Drug	**Examples**	**Effects on the Body**	**Effects When Used**	**Psychological Addicting?**
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

Table4.2

Alcohol and Other Depressants

Ethanol, which we commonly refer to as alcohol, is in a class of psychoactive drugs known as depressants (Figure 4.15). A depressant is a drug that tends to suppress central nervous system activity. Other depressants include 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.

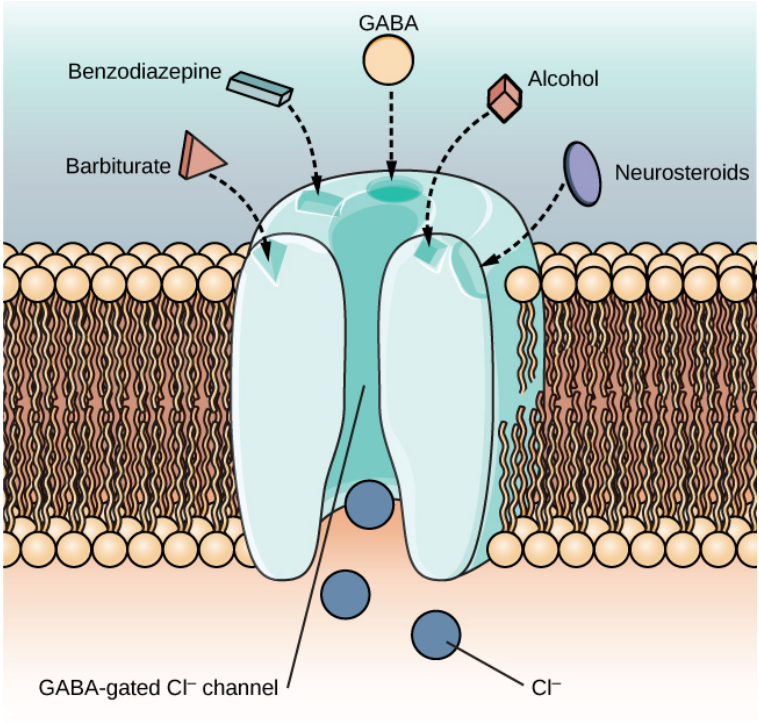


Figure 4.15 The GABA-gated chloride (Cl^-) channel is embedded in the cell membrane of certain neurons. The channel has multiple receptor sites where alcohol, barbiturates, and benzodiazepines bind to exert their effects. The binding of these molecules opens the chloride channel, allowing negatively-charged chloride ions (Cl^-) into the neuron's cell body. Changing its charge in a negative direction pushes the neuron *away* from firing; thus, activating a GABA neuron has a quieting effect on the brain.

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 behavioral 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.

DIG DEEPER: 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 continue 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 a 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 behavior, 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 4.16). 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.

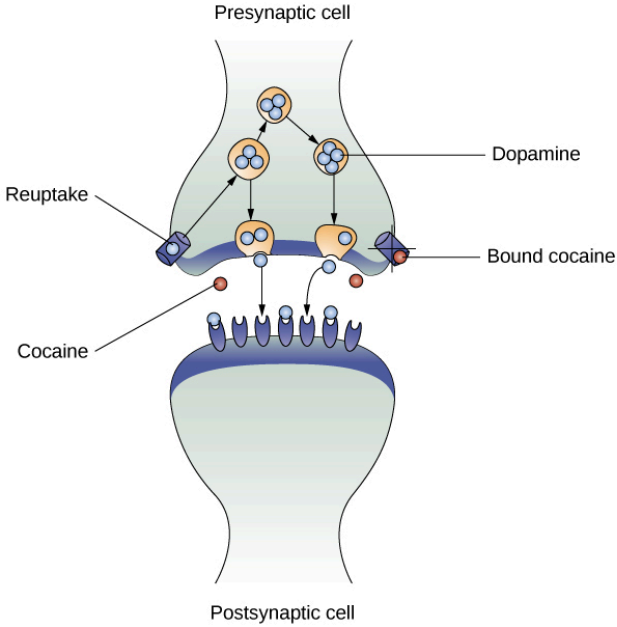


Figure 4.16 As one of their mechanisms of action, cocaine, and amphetamines block the reuptake of dopamine from the synapse into the presynaptic cell.

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). The 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 re-establish 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 liters 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 the 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 neurons. 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 flavorings as a vapor. 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 one of 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 4.17). 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 semi-conscious 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 4.17 (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 the 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 the United States remain untouched by the recent opioid epidemic. It seems like everyone knows a friend, family member, or neighbor 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 4.18). 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.

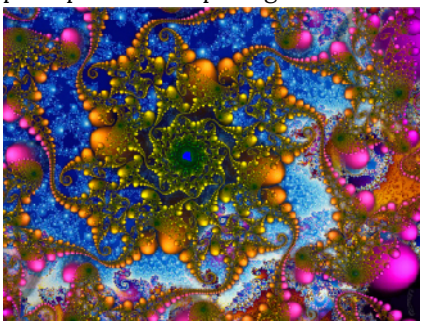


Figure 4.18 Psychedelic images like this are often associated with hallucinogenic compounds. (credit: modification of work by "new 1lluminati"/Flickr)

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 prescription and street drugs, check out the Commonly Abused Drugs Chart and the Commonly Abused Prescription Drugs Chart from the National Institute on Drug Abuse.

DIG DEEPER: Medical Marijuana

The decade from 2010–2019 brought many changes in laws regarding marijuana. While the possession and use of marijuana remain illegal in many states, it is now legal to possess limited quantities of marijuana for recreational use in eleven states: Alaska, California, Colorado, Illinois, Maine, Massachusetts, Michigan, Nevada, Oregon, Vermont, and Washington. Medical marijuana is legal in over half of the United States and in the District of Columbia (Figure 4.19). Medical marijuana is marijuana that is prescribed by a doctor for the treatment of a health condition. For example, people who undergo chemotherapy will often be prescribed marijuana to stimulate their appetites and prevent excessive weight loss resulting from the side effects of chemotherapy treatment. Marijuana may also have some promise in the treatment of a variety of medical conditions (Mather, Rauwendaal, Moxham-Hall, & Wodak, 2013; Robson, 2014; Schicho & Storr, 2014).

Figure 4.19 Medical marijuana shops are becoming more and more common in the United States. (credit: Laurie Avocado)

While medical marijuana laws have been passed on a state-by-state basis, federal laws still classify this as an illicit substance, making conducting research on the potentially beneficial medicinal uses of marijuana problematic. There is quite a bit of controversy within the scientific community as to the extent to which marijuana might have medicinal benefits due to a lack of large-scale, controlled research (Bostwick, 2012). As a result, many scientists have urged the federal government to allow for the relaxation of current marijuana laws and classifications in order to facilitate a more widespread study of the drug's effects (Aggarwal et al., 2009; Bostwick, 2012; Kogan & Mechoulam, 2007).

Until recently, the United States Department of Justice routinely arrested people involved and seized marijuana used in medicinal settings. In the latter part of 2013, however, the United States Department of Justice issued statements indicating that they would not continue to challenge state medical marijuana laws. This shift in policy may be in response to the scientific community's recommendations and/or reflect changing public opinion regarding marijuana.

Learning Objectives

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

- Define hypnosis and meditation
- Understand the similarities and differences between 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 4.20). 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 behaviors. While hypnosis may be useful in enhancing memory or a skill, such enhancements are very modest in nature (Raz, 2011).

Figure 4.20 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 behavior can be shaped by their expectations of how they should act in a given situation. Some view a hypnotized person's behavior 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).

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 4.21), 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 4.21 (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: Watch this video about the results of a brain imaging study in individuals who underwent specific mindfulness meditative techniques to learn more.

Additional Supplemental Resources

Websites

- National Institute on Drug Abuse
  - The mission of the National Institute on Drug Abuse (NIDA) is to advance science on the causes and

consequences of drug use and addiction and to apply that knowledge to improve individual and public health.

Videos

- Ted-Ed: What Would Happen if you didn't Sleep?
  - In this Ted-Ed video, you'll learn more about the importance of sleep and how it impacts our bodies and our minds. A variety of discussion and assessment questions are included with the video (free registration is required to access the questions). Closed captioning available.
- Ted-Ed: Why do we dream?
  - Watch this Ted-Ed video to learn more about the various theories behind why we dream, and how dreams may help us in our everyday lives. A variety of discussion and assessment questions are included with the video (free registration is required to access the questions). Closed captioning available.
- What is consciousness? – Michael S. A. Graziano
  - Explore the theories of human consciousness and the science of how your brain works to create a conscious experience. Michael Graziano explores the question that has vexed scientists and philosophers for centuries.
- Crash Course Video #8 – Consciousness
  - This video on consciousness includes information on topics such as change blindness, states of consciousness, and selective attention. Closed captioning available.
- Crash Course Video #9 – To Sleep, Perchance to Dream
  - This video on sleep includes information on topics such as sleep stages, disorders, and dreams. Closed captioning available.

- Crash Course Video #10 – Altered States
    - This video on altered states includes information on topics such as hypnosis and psychoactive drugs. Closed captioning available.

Access for free at https://openstax.org/books/psychology-2e/pages/1-introduction

4. Sensation and Perception

Figure 5.1 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.

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 neurons 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).

The sensitivity of a given sensory system to the relevant stimuli can be expressed as an absolute threshold. Absolute threshold refers to the minimum amount of stimulus energy that must be present for the stimulus to be detected 50% of the time. Another way to think about this is by asking how dim can a light be or how soft can a sound be and still be detected half of the time. The sensitivity of our sensory receptors can be quite amazing. It has been estimated that on a clear night, the most sensitive sensory cells in the back of the eye can detect a candle flame 30 miles away (Okawa & Sampath, 2007). Under quiet conditions, the hair cells (the receptor cells of the inner ear) can detect the tick of a clock 20 feet away (Galanter, 1962).

It is also possible for us to get messages that are presented below the threshold for conscious awareness—these are called subliminal messages. A stimulus reaches a physiological threshold when it is strong enough to excite sensory receptors and send nerve impulses to the brain: This is an absolute threshold. A message below that threshold is said to be subliminal: We receive it, but we are not consciously aware of it. Over the years there has been a great deal of speculation about the use of subliminal messages in advertising, rock music, and self-help audio programs. Research evidence shows that in laboratory settings, people can process and respond to information outside of awareness. But this does not mean that we obey these messages like zombies; in fact, hidden messages have little effect on behavior outside the laboratory (Kunst-Wilson & Zajonc, 1980; Rensink, 2004; Nelson, 2008; Radel, Sarrazin, Legrain, & Gobancé, 2009; Loersch, Durso, & Petty, 2013).

Absolute thresholds are generally measured under incredibly controlled conditions in situations that are optimal for sensitivity. Sometimes, we are more interested in how much difference in stimuli is required to detect a difference between them. This is known as the just noticeable difference (jnd) or difference threshold. Unlike the absolute threshold, the difference threshold changes depending on the stimulus intensity. As an example, imagine yourself in a very dark movie theater. If an audience

member were to receive a text message that caused the cell phone screen to light up, chances are that many people would notice the change in illumination in the theater. However, if the same thing happened in a brightly lit arena during a basketball game, very few people would notice. The cell phone brightness does not change, but its ability to be detected as a change in illumination varies dramatically between the two contexts. Ernst Weber proposed this theory of change in difference threshold in the 1830s, and it has become known as Weber's law: The difference threshold is a constant fraction of the original stimulus, as the example illustrates.

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 5.2 (Egeth & Yantis, 1997; Fine & Minnery, 2009; Yantis & Egeth, 1999).

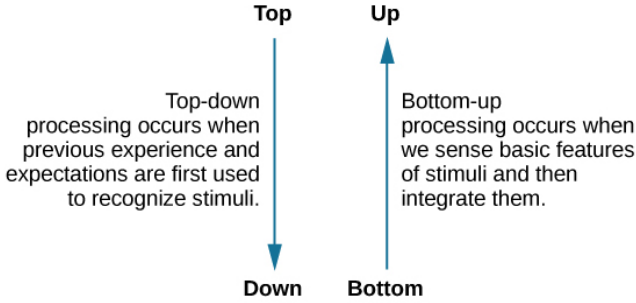


Figure 5.2 Top-down and bottom-up are ways we process our

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 the 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 the 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 odor 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 selective attention test from Simons and Chabris (1999).

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 color. When a red cross passed across the screen, about one-third of subjects did not notice it (Figure 5.3) (Most, Simons, Scholl, & Chabris, 2000).

Figure 5.3 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. The ability to identify a stimulus

when it is embedded in a distracting background is called signal detection theory. This might also explain why a mother is awakened by a quiet murmur from her baby but not by other sounds that occur while she is asleep. Signal detection theory has practical applications, such as increasing air traffic controller accuracy. Controllers need to be able to detect planes among many signals (blips) that appear on the radar screen and follow those planes as they move through the sky. In fact, the original work of the researcher who developed signal detection theory was focused on improving the sensitivity of air traffic controllers to plane blips (Swets, 1964).

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 5.4): The lines appear to be different lengths, but they are actually the same length.

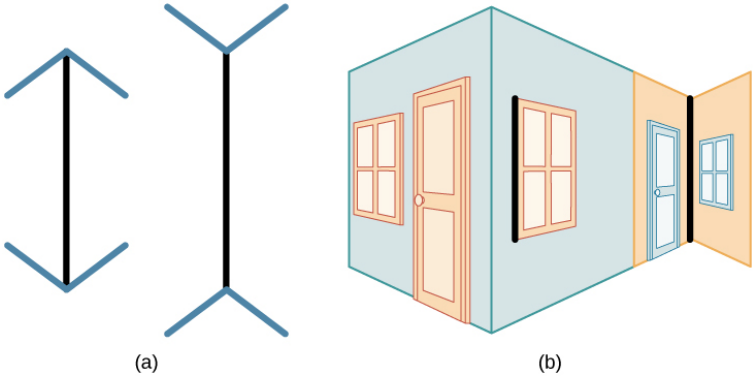


Figure 5.4 In the Müller-Lyer illusion, lines appear to be of different lengths although they are identical. (a) Arrows at the ends of lines may make the line on the right appear longer, although the lines are the same length. (b) When applied to a three-dimensional image, the line on the right again 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 odor 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 flavors (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).

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 light waves are associated with perceptual experience
- Show how physical properties of sound 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 5.5). The amplitude of a wave is the distance from the center 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.

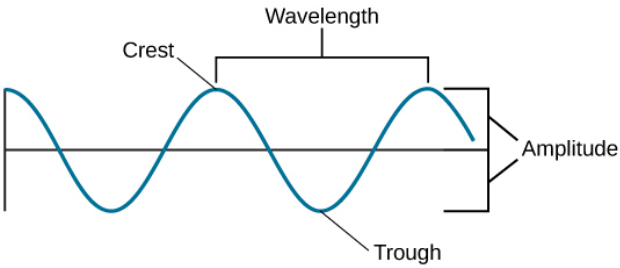


Figure 5.5 The amplitude or height of a wave is measured from the peak to the trough. The wavelength is measured from peak to peak.

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 5.6).

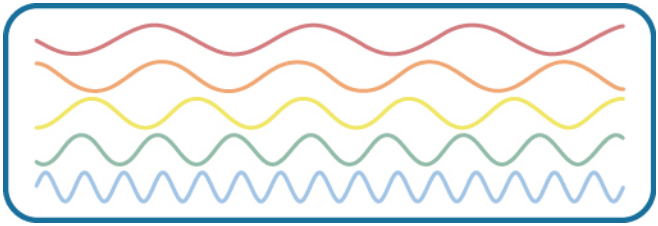


Figure 5.6 This figure illustrates waves of differing wavelengths/frequencies. At the top of the figure, the red wave has a long wavelength/short frequency. Moving from top to bottom, the wavelengths decrease, and frequencies increase.

Light Waves

The visible spectrum is the portion of the larger electromagnetic spectrum that we can see. As Figure 5.7 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).

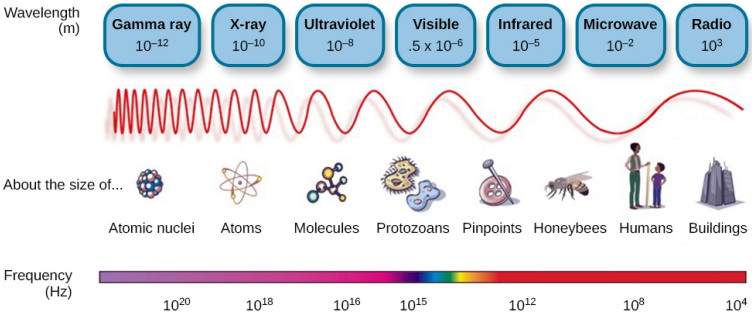


Figure 5.7 Light that is visible to humans makes up only a small portion of the electromagnetic spectrum.

In humans, light wavelength is associated with the perception of color (Figure 5.8). 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 color, with larger amplitudes appearing brighter.

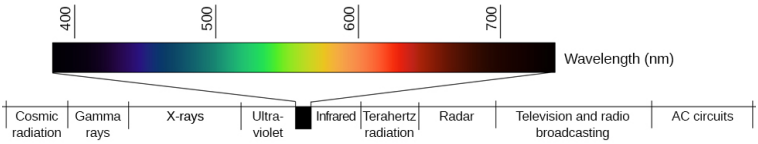


Figure 5.8 Different wavelengths of light are associated with our

perception of different colors. (credit: modification of work by Johannes Ahlmann)

Sound Waves

Like light 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. The audible range of sound frequencies is between 20 and 20000 Hz, with the greatest sensitivity to those frequencies that fall in the middle of this range.

As was the case with the visible spectrum, 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 5.9). 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).

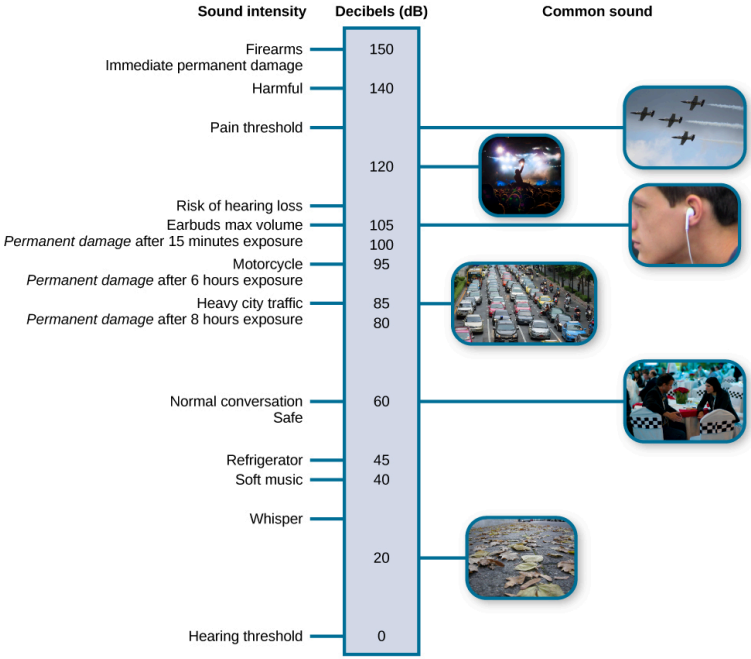


Figure 5.9 This figure illustrates the loudness of common sounds. (credit "planes": modification of work by Max Pfandl; credit "crowd": modification of work by Christian Holmér; credit: "earbuds": modification of work by "Skinny Guy Lover_Flickr"/Flickr; credit "traffic": modification of work by "quinntheislander_Pixabay"/Pixabay; 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 brief video about our perception of frequency and amplitude 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.

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 5.10). 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 color and depth.

Figure 5.10 Our eyes take in sensory information that helps us understand the world around us. (credit "top left": modification of work by "rajkumar1220″/Flickr"; credit "top right": modification of work by Thomas Leuthard; credit "middle left": modification of work by Demietrich Baker; credit "middle right": modification of work by "kaybee07″/Flickr; credit "bottom left": modification of work by "Isengardt"/Flickr; credit "bottom right": modification of work by Willem Heerbaart)

Anatomy of the Visual System

The eye is the major sensory organ involved in vision (Figure 5.11). 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 colored portion of the eye.

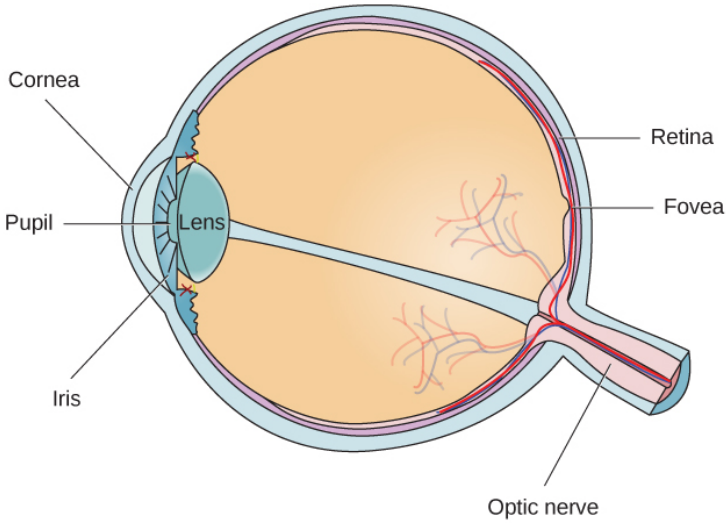


Figure 5.11 The anatomy of the eye is illustrated in this diagram.

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. 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 5.12). 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 color.

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 color 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.

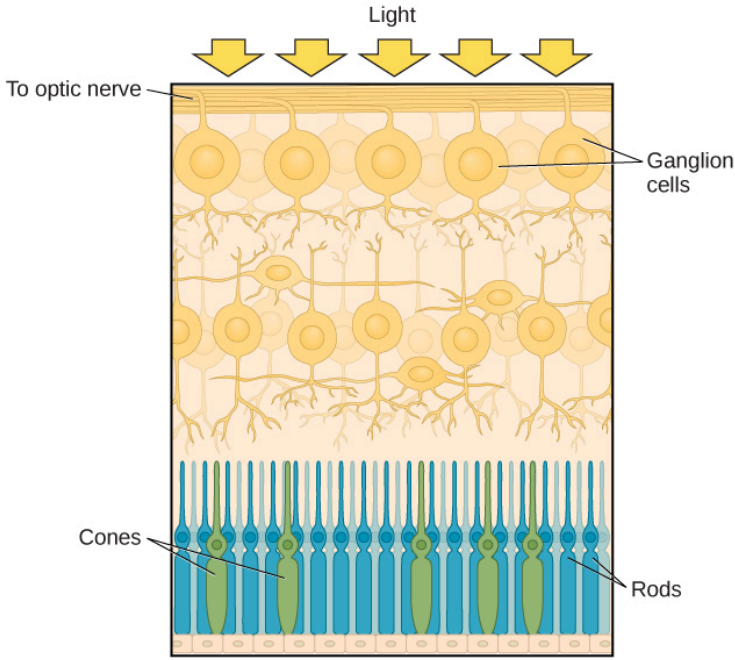


Figure 5.12 The two types of photoreceptors are shown in this image. Cones are colored green and the rods are blue.

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 theater, 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 theater. 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.

The optic nerve from each eye merges just below the brain at a point called the optic chiasm. As Figure 5.13 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.

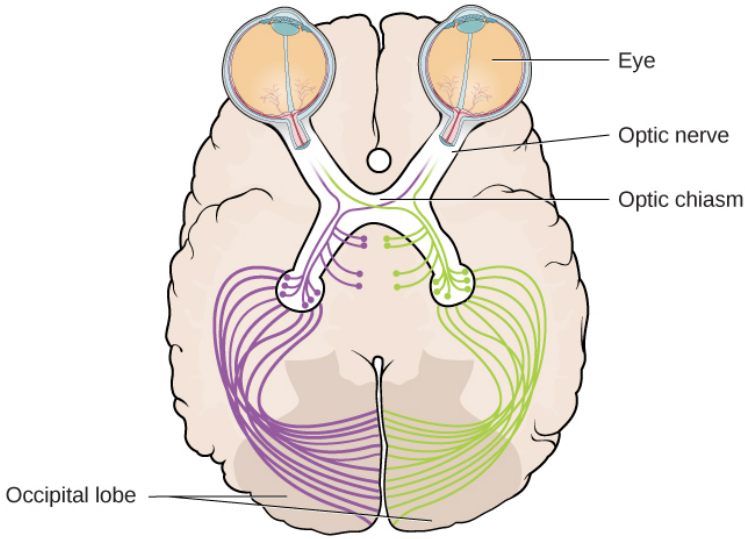


Figure 5.13 This illustration shows the optic chiasm at the front of the brain and the pathways to the occipital lobe at the back of the brain, where visual sensations are processed into meaningful perceptions.

Once inside the brain, visual information is sent via a number of structures to the occipital lobe at the back of the brain for processing. 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" is involved in object recognition and identification, while the "where/how pathway" 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.

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?

Like virtually every other industrialized nation, the United States permits medical experimentation on animals, with few limitations (assuming sufficient scientific justification). The goal of any laws that exist is not to ban such tests but rather to limit unnecessary animal suffering by establishing standards for the humane treatment and housing of animals in laboratories.

As explained by Stephen Latham, the director of the Interdisciplinary Center for Bioethics at Yale (2012), possible legal and regulatory approaches to animal testing vary on a continuum from strong government regulation and monitoring of all experimentation at one end, to a self-regulated approach that depends on the ethics of the researchers at the other end. The United Kingdom has the most significant regulatory scheme, whereas Japan uses the self-regulation approach. The U.S. approach is somewhere in the middle, the result of a gradual blending of the two approaches.

There is no question that medical research is a valuable and important practice. The question is whether the use of animals is a necessary or even best

practice for producing the most reliable results. Alternatives include the use of patient-drug databases, virtual drug trials, computer models and simulations, and noninvasive imaging techniques such as magnetic resonance imaging and computed tomography scans ("Animals in Science/Alternatives," n.d.). Other techniques, such as microdosing, use humans not as test animals but as a means to improve the accuracy and reliability of test results. In vitro methods based on human cell and tissue cultures, stem cells, and genetic testing methods are also increasingly available.

Today, at the local level, any facility that uses animals and receives federal funding must have an Institutional Animal Care and Use Committee (IACUC) that ensures that the NIH guidelines are being followed. The IACUC must include researchers, administrators, a veterinarian, and at least one person with no ties to the institution: that is, a concerned citizen. This committee also performs inspections of laboratories and protocols.

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 color 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 color vision. Each of these cone types is maximally sensitive to a slightly different wavelength of light. According to the trichromatic theory of color vision, shown in Figure 5.14, all colors in the spectrum can be produced by combining red, green, and blue. The three types of cones are each receptive to one of the colors.

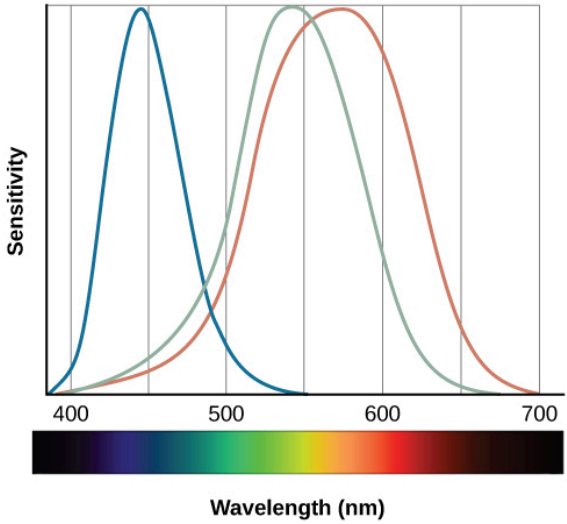


Figure 5.14 This figure illustrates the different sensitivities for the three cone types found in a normal-sighted individual. (credit: modification of work by Vanessa Ezekowitz)

CONNECT THE CONCEPTS

Colorblindness: A Personal Story

Several years ago, I dressed to go to a public function and walked

into the kitchen where my 7-year-old daughter sat. She looked up at me, and in her most stern voice, said, "You can't wear that." I asked, "Why not?" and she informed me the colors of my clothes did not match. She had complained frequently that I was bad at matching my shirts, pants, and ties, but this time, she sounded especially alarmed. As a single father with no one else to ask at home, I drove us to the nearest convenience store and asked the store clerk if my clothes matched. She said my pants were a bright green color, my shirt was a reddish-orange, and my tie was brown. She looked at me quizzically and said, "No way do your clothes match." Over the next few days, I started asking my coworkers and friends if my clothes matched. After several days of being told that my coworkers just thought I had "a really unique style," I made an appointment with an eye doctor and was tested (Figure 5.15). It was then that I found out that I was colorblind. I cannot differentiate between most greens, browns, and reds. Fortunately, other than unknowingly being badly dressed, my colorblindness rarely harms my day-to-day life.

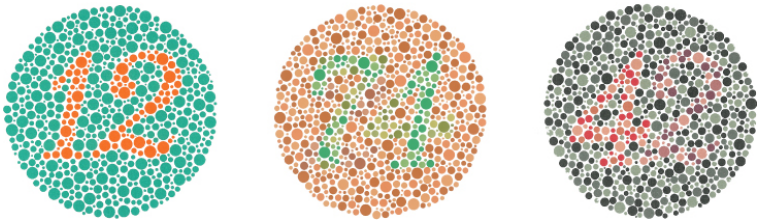


Figure 5.15 The Ishihara test evaluates color perception by assessing whether individuals can discern numbers that appear in a circle of dots of varying colors and sizes.

Some forms of color deficiency are rare. Seeing in grayscale (only shades of black and white) is extremely rare, and people who do so only have rods, which means they have very low visual acuity and cannot see very well. The most common X-linked inherited abnormality is red-green color blindness (Birch, 2012). Approximately 8% of males of European Caucasian descent, 5% of Asian males, 4% of African males, and less than 2% of indigenous American males, Australian males, and Polynesian males have red-

green color deficiency (Birch, 2012). Comparatively, only about 0.4% of females of European Caucasian descent have red-green color deficiency (Birch, 2012).

The trichromatic theory of color vision is not the only theory—another major theory of color vision is known as the opponent-process theory. According to this theory, color 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 colors 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 colors. Another implication is that this leads to the experience of negative afterimages. An afterimage describes the continuation of a visual sensation after the 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 color is involved in the stimulus, the color pairings identified in the opponent-process theory lead to a negative afterimage. You can test this concept using the flag in Figure 5.16.

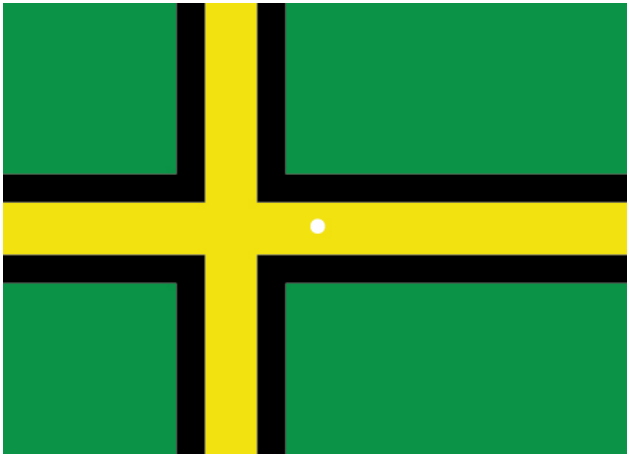


Figure 5.16 Stare at the white dot for 30–60 seconds and then move

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 color vision.

But these two theories—the trichromatic theory of color 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, the 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).

LINK TO LEARNING: Watch this video about color 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.

An example of a monocular cue would be what is known as linear perspective. Linear perspective refers to the fact that we perceive depth when we see two parallel lines that seem to converge in an image (Figure 5.17). Some other monocular depth cues are interposition, the partial overlap of objects, and the relative size and closeness of images to the horizon.

Figure 5.17 We perceive depth in a two-dimensional figure like this one through the use of monocular cues like linear perspective, like the parallel lines converging as the road narrows in the distance. (credit: Marc Dalmulder)

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 theater.

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).

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 semi-circular 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 5.18).

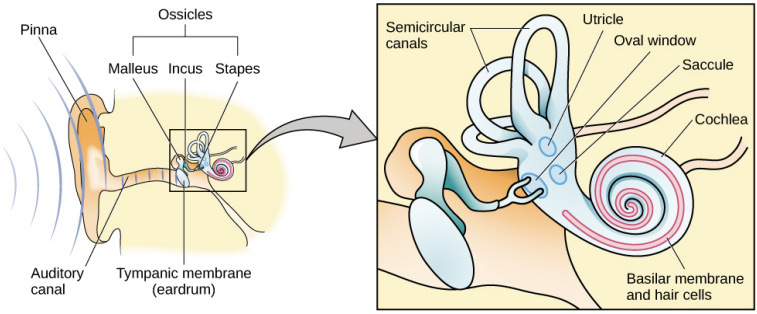


Figure 5.18 The ear is divided into the outer (pinna and tympanic membrane), middle (the three ossicles: malleus, incus, and stapes), and inner (cochlea and basilar membrane) divisions.

Sound waves travel along the auditory canal and strike the tympanic membrane, causing it to vibrate. This vibration results in the movement of the three ossicles. 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).

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 neuron. This would mean that a given hair cell would fire action potentials related to the frequency of the sound wave. 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 the basilar membrane would be labeled as low-pitch receptors (Shamma, 2001).

In reality, both theories explain different aspects of pitch perception. At frequencies up to about 4000 Hz, it is clear that both the rate of action potentials and place contribute to our perception of pitch. However, much higher frequency sounds can only be encoded using place cues (Shamma, 2001).

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 of 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 5.19). Certain brain areas monitor these differences to construct where along a horizontal axis a sound originates (Grothe et al., 2010).

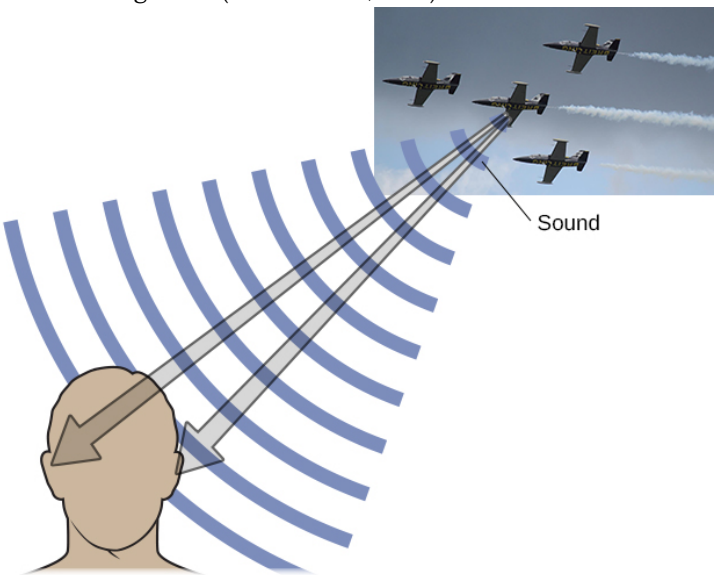


Figure 5.19 Localizing sound involves the use of both monaural and binaural cues. (credit "plane": modification of work by Max Pfandl)

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 suffer from 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 suffer from 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 5.20), tumors, and toxins (such as those found in certain solvents and metals).

(a) (b)

Figure 5.20 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 problems are associated with a failure in the vibration of the eardrum and/or movement of the ossicles. These problems are often dealt with through devices like hearing aids that amplify incoming sound waves to make the 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 cochlear implant surgeries to learn more.

WHAT DO YOU THINK? Deaf Culture

In the United States and other places around the world, deaf people have their own language, schools, and customs. This is called deaf culture. In the United States, deaf individuals often communicate using American Sign Language (ASL); 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.

When a child is diagnosed as deaf, parents have difficult decisions to make. Should the child be enrolled in mainstream schools and taught to verbalize and read lips? Or should the child be sent to a school for deaf children to learn ASL and have significant exposure to deaf culture? Do you think there might be differences in the way that parents approach these decisions depending on whether or not they are also deaf?

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 kinesthetic 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 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 flavor 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 5.21). 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).

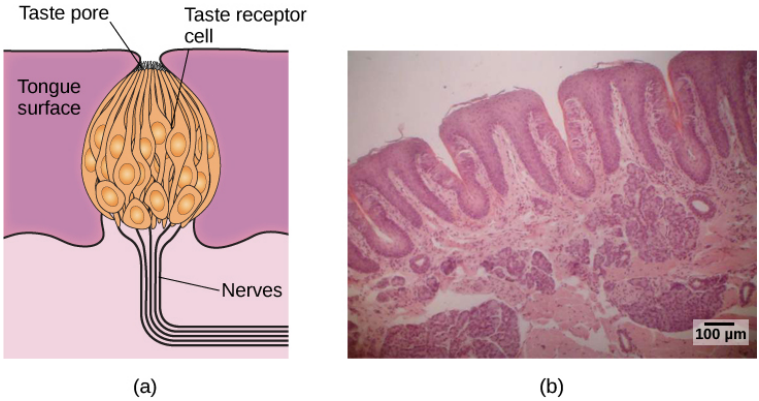


Figure 5.21 (a) Taste buds are composed of a number of individual

taste receptor cells that transmit information to nerves. (b) This micrograph shows a close-up view of the tongue's surface. (credit a: modification of work by Jonas Töle; 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 odor molecules dissolved in the mucus to interact with chemical receptors located on these extensions (Figure 5.22). Once an odor 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).

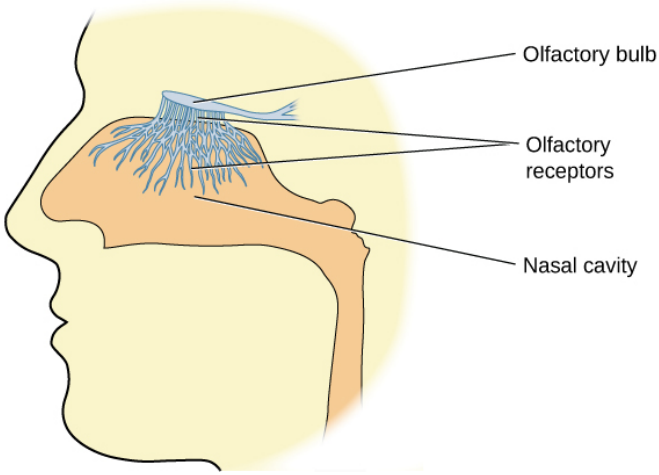


Figure 5.22 Olfactory receptors are the hair-like parts that extend from the olfactory bulb into the mucous membrane of the nasal cavity.

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 tumors (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 behavior 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 5.23). 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).

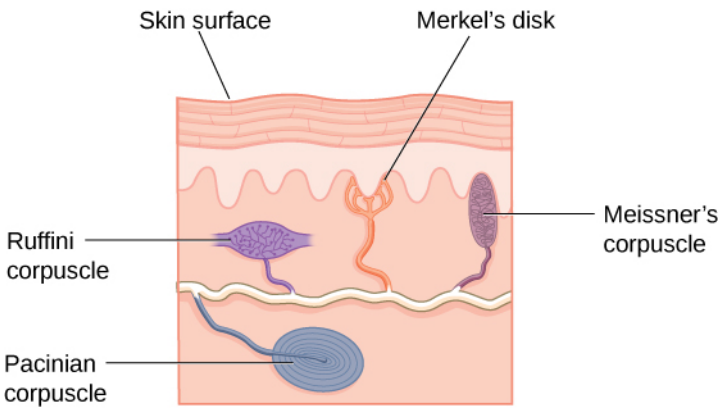


Figure 5.23 There are many types of sensory receptors located in the skin, each attuned to specific touch-related stimuli.

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 the 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 neurons 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 Kinesthesia

The vestibular sense contributes to our ability to maintain balance

and body posture. As Figure 5.24 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 the 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).

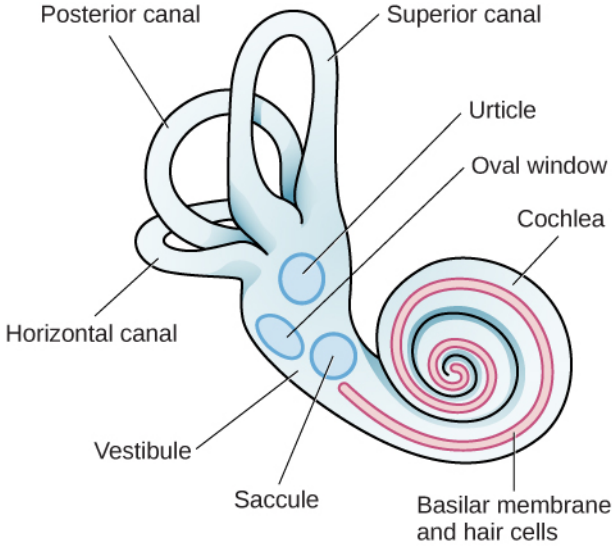


Figure 5.24 The major sensory organs of the vestibular system are located next to the cochlea in the inner ear. These include the utricle, saccule, and the three semicircular canals (posterior, superior, and horizontal).

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 kinesthesia (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 kinesthetic 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 kinesthetic systems.

Learning Objectives

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

- Explain the figure-ground relationship
- Define Gestalt principles of grouping
- 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).

One Gestalt principle is the figure-ground relationship. According to this principle, we tend to segment our visual world into figure and ground. Figure is the object or person that is the focus of the visual field, while the ground is the background. As Figure 5.25 shows, our perception can vary tremendously, depending on what is perceived as figure and what is perceived as ground. Presumably, our ability to interpret sensory information depends on what we label as figure and what we label as ground in any particular case, although this assumption has been called into question (Peterson & Gibson, 1994; Vecera & O'Reilly, 1998).

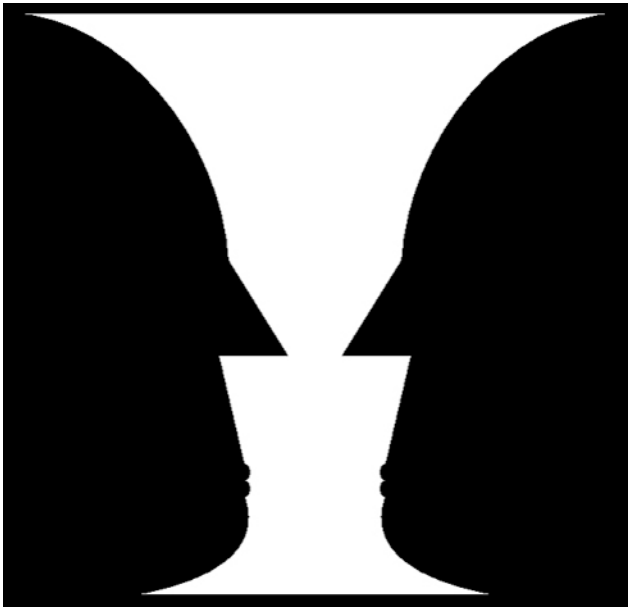


Figure 5.25 The concept of figure-ground relationship explains why this image can be perceived either as a vase or as a pair of faces.

Another Gestalt principle for organizing sensory stimuli into meaningful perception is proximity. This principle asserts that

things that are close to one another tend to be grouped together, as Figure 5.26 illustrates.

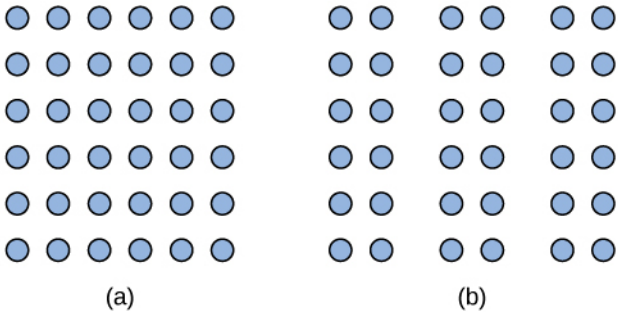


Figure 5.26 The Gestalt principle of proximity suggests that you see (a) one block of dots on the left side and (b) three columns on the right side.

How we read something provides another illustration of the proximity concept. For example, we read this sentence like this, notl iket hiso rt hat. We group the letters of a given word together because there are no spaces between the letters, and we perceive words because there are spaces between each word. Here are some more examples: Cany oum akes enseo ft hiss entence? What doth es e wor dsmea n?

We might also use the principle of similarity to group things in our visual fields. According to this principle, things that are alike tend to be grouped together (Figure 5.27). For example, when watching a football game, we tend to group individuals based on the colors of their uniforms. When watching an offensive drive, we can get a sense of the two teams simply by grouping along this dimension.

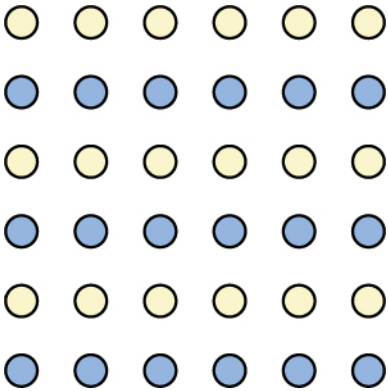


Figure 5.27 When looking at this array of dots, we likely perceive alternating rows of colors. We are grouping these dots according to the principle of similarity.

Two additional Gestalt principles are the law of continuity (or good continuation) and closure. The law of continuity suggests that we are more likely to perceive continuous, smooth flowing lines rather than jagged, broken lines (Figure 5.28). The principle of closure states that we organize our perceptions into complete objects rather than as a series of parts (Figure 5.29).

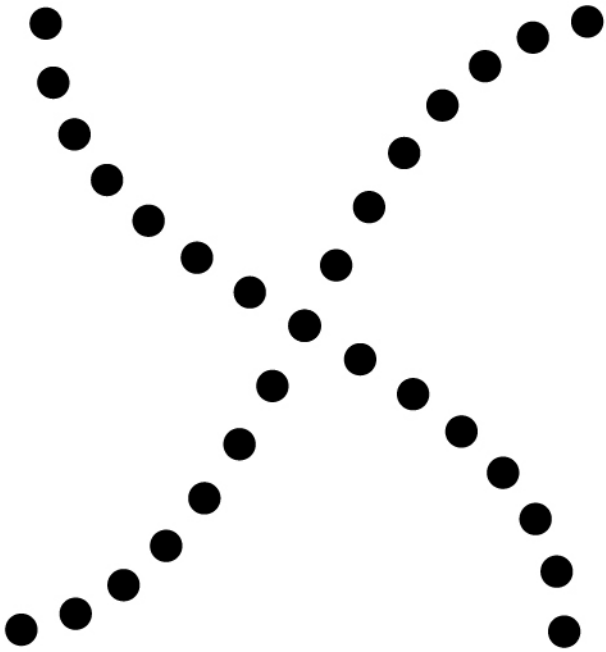


Figure 5.28 Good continuation would suggest that we are more likely to perceive this as two overlapping lines, rather than four lines meeting in the center.

Figure 5.29 Closure suggests that we will perceive a complete circle and rectangle rather than a series of segments.

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).

Case Study in Sensation and Perception

In 2011, the *New York Times* published a feature story on Krista and Tatiana Hogan, Canadian twin girls. 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 center. 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 behavior, 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.

Additional Supplemental Resources

Websites

- Spiral Afterimage Effect
  - Users can explore various aspects of motion detection.
- Illusions and Paradoxes
  - Is seeing believing? This page illustrates through several illusions that our visual perception cannot always be trusted.

- International Association for the Study of Pain
  - The International Association for the Study of Pain brings together scientists, clinicians, health-care providers, and policymakers to stimulate and support the study of pain and translate that knowledge into improved pain relief worldwide.

Videos

- Awareness Test
  - Watch this video very closely it is a great example of change blindness and selective attention. Closed captioning available.
- Ambiguous Vase
  - Description of a famous ambiguous figure. Closed captioning available.
- The "Door" Study
  - Video footage of classic change blindness research. Closed

captioning available.

- Young Woman Illusions
  - Animated demonstration of a famous ambiguous figure.
- Ted-Ed: What is color?
  - How does color work? In this Ted-Ed video, you'll learn about the properties of color, and how frequency plays a role in our perception of color. A variety of discussion and assessment questions are included with the video (free registration is required to access the questions). Closed captioning available.
- Ted-Ed: How optical illusions trick your brain
  - Watch this Ted-Ed video to learn more about the ways in which our eyes and brain are tricked by optical illusions. What does this tell us about the inner-workings of our brains? A variety of discussion and assessment questions are included with the video (free registration is required to access the questions). Closed captioning available.
- How the Ear Works
  - How does the ear work? In this short video clip, you'll learn about the inner workings of the human ear. Closed captioning available.
- The mysterious science of pain – Joshua W. Pate
  - Explore the biological and psychological factors that influence how we experience pain and how our nervous system reactions to harmful stimuli. Joshua W. Pate investigates the experience of pain.
- Crash Course Video #5 – Sensation and Perception
  - This video on the sensation and perception covers topics including absolute threshold, Weber's Law, signal detection theory, and vision. Closed captioning available.
- Crash Course Video #6 – Homunculus
  - This video on the homunculus covers the senses of

hearing, taste, smell, and touch. Closed captioning available.

- Crash Course Video #7 – Perceiving is Believing
  - This video on perceiving includes information on form perception, depth perception, and monocular cues. Closed captioning available.

Access for free at https://openstax.org/books/psychology-2e/pages/1-introduction

5. Learning

Figure 6.1 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 6.1). 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, Ben and his son, Julian, paddle out into the ocean on surfboards. A wave approaches. Julian crouches on his board, then jumps up and rides the wave for a few seconds before losing his balance. He emerges from the water in time to watch his father 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.

Learning Objectives

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

- Explain how learned behaviors 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 mother's breast. Dogs shake water off their wet fur. Salmon swim upstream to spawn, and spiders spin intricate webs. What do these seemingly unrelated behaviors have in common? They all are *unlearned* behaviors. Both instincts and reflexes are innate (unlearned) behaviors 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 centers of the central nervous system (e.g., the spinal cord and the medulla). In contrast, instincts are innate behaviors that are triggered by a broader range of events, such as maturation and the change of seasons. They are more complex patterns of behavior,

involve the movement of the organism as a whole (e.g., sexual activity and migration), and involve higher brain centers.

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 behaviors involve change and experience: learning is a relatively permanent change in behavior or knowledge that results from experience. In contrast to the innate behaviors discussed above, learning involves acquiring knowledge and skills through experience. Looking back at our surfing scenario, Julian will have to spend much more time training with his surfboard before he learns how to ride the waves like his father.

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—behaviors. 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 behavior and its consequence (reinforcement or punishment). A pleasant consequence encourages more of that behavior in the future, whereas a punishment deters the behavior. Imagine you are teaching your dog, Hodor, to sit. You tell Hodor to sit and give him a treat when he does. After repeated experiences, Hodor begins to associate the act of sitting with receiving a treat. He learns that the consequence of sitting is that he gets a doggie biscuit (Figure 6.2). Conversely, if the dog is punished when exhibiting a behavior, it becomes conditioned to avoid that behavior (e.g., receiving a small shock when crossing the boundary of an invisible electric fence).

Figure 6.2 In operant conditioning, a response is associated with a consequence. This dog has learned that certain behaviors 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 Ben and his son Julian from the introduction. How might observation help Julian learn to surf, as opposed to learning by trial and error alone? By watching his father, he 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 behaviorism, 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 behaviorism, whose more extreme adherents once insisted that behaviors are triggered by the environment with no intervening thought.

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 6.3). 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.

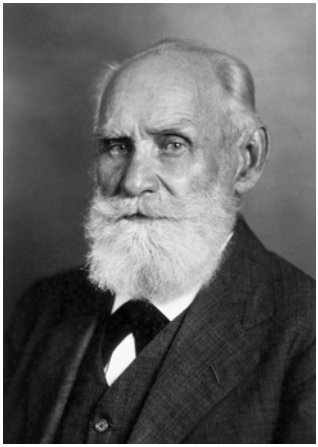


Figure 6.3 Ivan Pavlov's research on the digestive system of dogs unexpectedly led to his discovery of the learning process now known as classical conditioning.

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 (UCS): 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 (UCS) → 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 6.4). 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.

$$\text{Tone (NS)} + \text{Meat Powder (UCS)} \rightarrow \text{Salivation (UCR)}$$

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 behavior 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.

$$\text{Tone (CS)} \rightarrow \text{Salivation (CR)}$$

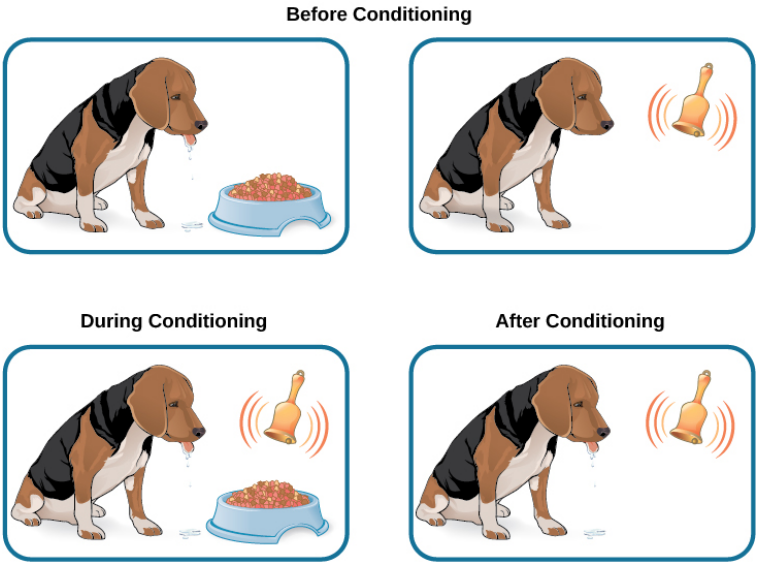


Figure 6.4 Before conditioning, an unconditioned stimulus (food) produces an unconditioned response (salivation), and a neutral stimulus (bell) does not produce a response. During conditioning, the unconditioned stimulus (food) is presented repeatedly just after the presentation of the neutral stimulus (bell). After conditioning, the neutral stimulus alone produces a conditioned response (salivation), thus becoming a conditioned stimulus.

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 Moisha, who was diagnosed with cancer. When she

received her first chemotherapy treatment, she vomited shortly after the chemicals were injected. In fact, every trip to the doctor for chemotherapy treatment shortly after the drugs were injected, she vomited. Moisha's treatment was a success and her cancer went into remission. Now, when she visits her oncologist's office every 6 months for a check-up, she becomes nauseous. In this case, the chemotherapy drugs are the unconditioned stimulus (UCS), vomiting is the unconditioned response (UCR), the doctor's office is the conditioned stimulus (CS) after being paired with the UCS, and nausea is the conditioned response (CR). Let's assume that the chemotherapy drugs that Moisha takes are given through a syringe injection. After entering the doctor's office, Moisha sees a syringe and then gets her medication. In addition to the doctor's office, Moisha 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 Moisha received a syringe injection of chemotherapy drugs in the doctor's office, Moisha likely will never get sick in response to the bell.

Consider another example of classical conditioning. Let's say you have a cat named Tiger, who is quite spoiled. You keep her 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, Tiger hears the distinctive sound of the electric can opener ("zzhzhz") and then gets her food. Tiger quickly learns that when she hears "zzhzhz" she is about to get fed. What do you think Tiger does when she hears the electric can opener? She will likely get excited and run to where you are preparing her food. This is an example of classical conditioning. In this case, what are the UCS, CS, UCR, and CR?

What if the cabinet holding Tiger's food becomes squeaky? In that case, Tiger hears "squeak" (the cabinet), "zzhzhz" (the electric can opener), and then she gets her food. Tiger will learn to get excited when she hears 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 6.5). 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 Tiger, Tiger will likely never get excited when hearing the bell alone.

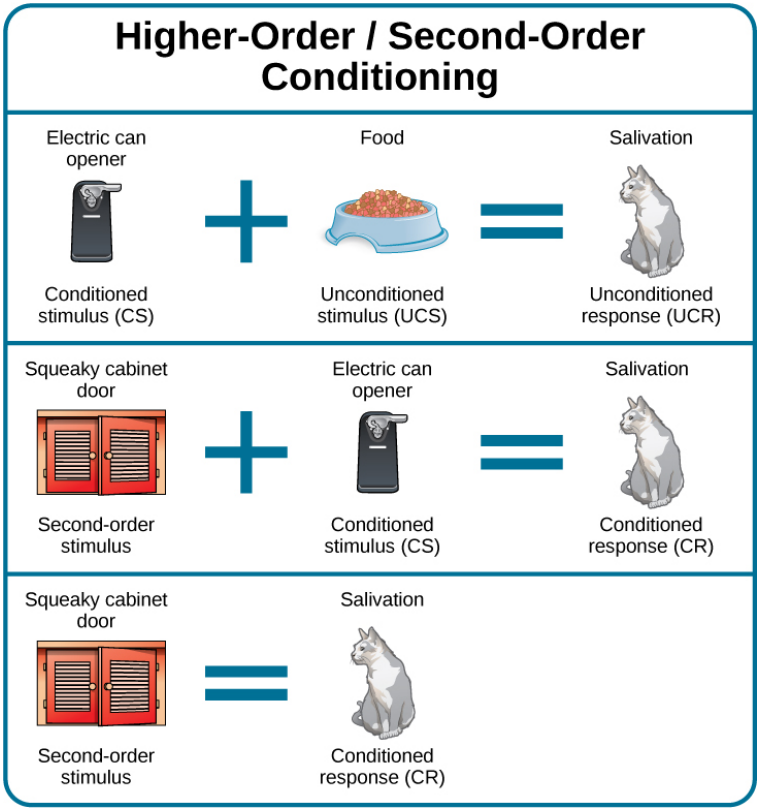


Figure 6.5 In higher-order conditioning, an established conditioned stimulus is paired with a new neutral stimulus (the second-order stimulus), so that eventually the new stimulus also elicits the conditioned response, without the initial conditioned stimulus being presented.

LINK TO LEARNING: Watch this video clip from the television show, *The Office*, for a humorous look at conditioning in which Jim conditions Dwight to expect a breath mint every time Jim's computer makes a specific sound.

Exercises

An interactive or media element has been excluded from this version of the text. You can view it online here:
https://open.maricopa.edu/psy101/?p=29

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 the 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 flavor with illness or lights and sounds with illness. Results showed that all rats exposed to flavor-illness pairings learned to avoid the flavor, 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.

Robert Rescorla demonstrated how powerfully an organism can learn to predict the UCS from the CS. Take, for example, the following two situations. Ari's dad always has dinner on the table every day at 6:00. Soraya's mom 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 Ari, 6:00 reliably and consistently predicts dinner, so Ari will likely start feeling hungry every day right before 6:00, even if he's had a late snack. Soraya, 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)

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 Tiger's case, imagine what would happen if you stopped using the electric can opener for her food and began to use it only for human food. Now, Tiger 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 another 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 Tiger's behavior 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 Tiger's food again, Tiger would remember the association between the can opener and her food—she would get excited and run to the kitchen when she heard the sound. The behavior of Pavlov's dogs and Tiger illustrates a concept Pavlov called spontaneous recovery: the return of a previously extinguished conditioned response following a rest period (Figure 6.7).

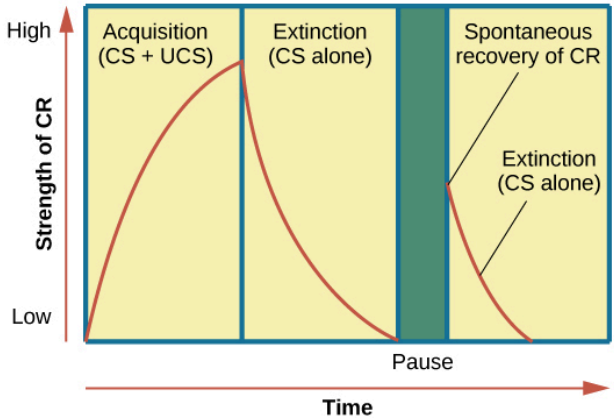


Figure 6.7 This is the curve of acquisition, extinction, and spontaneous recovery. The rising curve shows the conditioned response quickly getting stronger through the repeated pairing of the conditioned stimulus and the unconditioned stimulus (acquisition). Then the curve decreases, which shows how 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 to 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, Tiger, the cat, discriminated between the sound of the can opener and the sound of the electric mixer. When the electric mixer is going, Tiger is not about to be fed, so she does not come running to the kitchen looking for food. In our other example, Moisha, the cancer patient, discriminated between oncologists and other types of doctors. She learned not to feel ill when visiting doctors for other types of appointments, such as her annual physical.

On the other hand, when an organism demonstrates the conditioned response to stimuli that are similar to the conditioned stimulus, it is called stimulus generalization, the opposite of stimulus discrimination. The more similar a stimulus is to the conditioned 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, Tiger may come running after hearing its sound. But if you do not feed her following the electric mixer sound, and you continue to feed her consistently after the electric can opener sound, she will quickly learn to discriminate between the two sounds (provided they are sufficiently dissimilar that she can tell them apart). In our other example,

Moisha continued to feel ill whenever visiting other oncologists or other doctors in the same building as her oncologist.

Behaviorism

John B. Watson, shown in Figure 6.8, is considered the founder of behaviorism. Behaviorism 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 behavior to be hidden in the unconscious, Watson championed the idea that all behavior 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 behavior that can be measured.

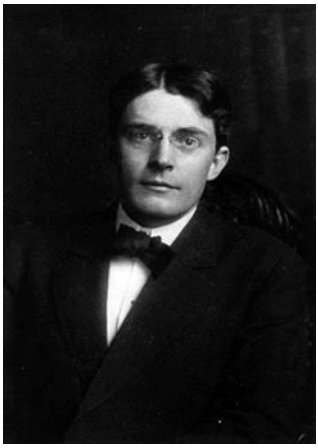


Figure 6.8 John B. Watson used the principles of classical conditioning in the study of human emotion.

Watson's ideas were influenced by Pavlov's work. According to

Watson, human behavior, just like animal behavior, 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 UCS, 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 6.9). 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 6.9 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. As you watch the video, look closely at Little Albert's reactions and the manner in which Watson and Rayner present the stimuli before and after conditioning. Based on what you see, would you come to the same conclusions as the researchers?

EVERYDAY CONNECTION: Advertising and

Associative Learning

Advertising executives are pros at applying the principles of associative learning. Think about the car commercials you have seen on television. Many of them feature an attractive model. By associating the model with the car being advertised, you come to see the car as being desirable (Cialdini, 2008). You may be asking yourself, does this advertising technique actually work? According to Cialdini (2008), men who viewed a car commercial that included an attractive model later rated the car as being faster, more appealing, and better designed than did men who viewed an advertisement for the same car minus the model.

Have you ever noticed how quickly advertisers cancel contracts with a famous athlete following a scandal? As far as the advertiser is concerned, that athlete is no longer associated with positive feelings; therefore, the athlete cannot be used as an unconditioned stimulus to condition the public to associate positive feelings (the unconditioned response) with their product (the conditioned stimulus).

Now that you are aware of how associative learning works, see if you can find examples of these types of advertisements on television, in magazines, or on the Internet.

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

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 behavior and its consequence (Table 6.1). A pleasant consequence makes that behavior 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 her trainer blows a whistle. The consequence is that she gets a fish.

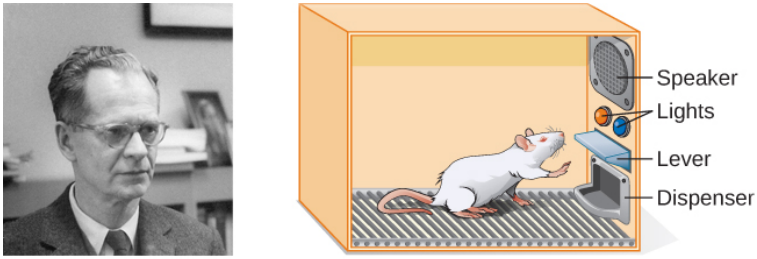
Classical and Operant Conditioning Compared		
	Classical Conditioning	**Operant Conditioning**
Conditioning approach	An unconditioned stimulus (such as food) is paired with a neutral stimulus (such as a bell). The neutral stimulus eventually becomes the conditioned stimulus, which brings about the conditioned response (salivation).	The target behavior is followed by reinforcement or punishment to either strengthen or weaken it, so that the learner is more likely to exhibit the desired behavior in the future.
Stimulus timing	The stimulus occurs immediately before the response.	The stimulus (either reinforcement or punishment) occurs soon after the response.

Table 6.1

Psychologist B. F. Skinner saw that classical conditioning is limited to existing behaviors that are reflexively elicited, and it doesn't account for new behaviors such as riding a bike. He proposed a theory about how such behaviors come about. Skinner believed that behavior is motivated by the consequences we receive for the behavior: 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, behaviors that are followed by consequences that are satisfying to the organism are more likely to be repeated, and behaviors 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 the 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 6.10). 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 behaviors. A recorder counts the number of responses made by the animal.



(a) (b)

Figure 6.10 (a) B. F. Skinner developed operant conditioning for the systematic study of how behaviors 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)

LINK TO LEARNING: Watch this brief video to see Skinner's interview and a demonstration of operant conditioning of pigeons to learn more.

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 behavior, and *punishment* means you are decreasing a behavior. Reinforcement can be positive or negative, and punishment can also be positive or negative. All reinforcers (positive or negative) *increase* the likelihood of a behavioral response. All punishers (positive or negative) *decrease* the likelihood of a behavioral response. Now let's combine these four terms: positive reinforcement, negative reinforcement, positive punishment, and negative punishment (Table 6.2).

Positive and Negative Reinforcement and Punishment		
	Reinforcement	**Punishment**
Positive	Something is *added* to *increase* the likelihood of a behavior.	Something is *added* to *decrease* the likelihood of a behavior.
Negative	Something is *removed* to *increase* the likelihood of a behavior.	Something is *removed* to *decrease* the likelihood of a behavior.

Table 6.2

Reinforcement

The most effective way to teach a person or animal a new behavior is with positive reinforcement. In positive reinforcement, a desirable stimulus is added to increase a behavior.

For example, you tell your five-year-old son, Jerome, that if he cleans his room, he will get a toy. Jerome quickly cleans his room because he wants 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 paychecks 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' behavior 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 behavior. 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 behavior, 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 behavior, 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 behavior. In contrast, punishment always decreases a behavior. In positive punishment, you add an undesirable stimulus to decrease a behavior. 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 behavior (texting in class). In negative punishment, you remove a pleasant stimulus to decrease behavior. For example, when a child misbehaves, a parent can take away a favorite toy. In this case, a stimulus (the toy) is removed in order to decrease the behavior.

Punishment, especially when it is immediate, is one way to decrease undesirable behavior. For example, imagine your four-year-old son, Brandon, hit his younger brother. You have Brandon write 100 times "I will not hit my brother" (positive punishment). Chances are he won't repeat this behavior. 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. Brandon may become fearful of the street, but he also may become fearful of the person who delivered the punishment—you, his 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 behavior 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 behavior when they become angry and frustrated. For example, because you spank

Brenda when you are angry with her for her misbehavior, she might start hitting her 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 favor reinforcement over punishment—they recommend that you catch your child doing something good and reward her for it.

Shaping

In his operant conditioning experiments, Skinner often used an approach called shaping. Instead of rewarding only the target behavior, in shaping, we reward successive approximations of a target behavior. Why is shaping needed? Remember that in order for reinforcement to work, the organism must first display the behavior. Shaping is needed because it is extremely unlikely that an organism will display anything but the simplest of behaviors spontaneously. In shaping, behaviors 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 behavior.
2. Then reinforce the response that more closely resembles the desired behavior. You will no longer reinforce the previously reinforced response.
3. Next, begin to reinforce the response that even more closely resembles the desired behavior.
4. Continue to reinforce closer and closer approximations of the desired behavior.
5. Finally, only reinforce the desired behavior.

Shaping is often used in teaching a complex behavior or chain of behaviors. Skinner used shaping to teach pigeons not only such relatively simple behaviors as pecking a disk in a Skinner box, but

also many unusual and entertaining behaviors, 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 behavior.

It's easy to see how shaping is effective in teaching behaviors to animals, but how does shaping work with humans? Let's consider parents whose goal is to have their child learn to clean his room. They use shaping to help him master steps toward the goal. Instead of performing the entire task, they set up these steps and reinforce each step. First, he cleans up one toy. Second, he cleans up five toys. Third, he chooses whether to pick up ten toys or put his books and clothes away. Fourth, he cleans up everything except two toys. Finally, he cleans his 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 Chris, 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 behavior 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 behavior 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 behavior in a variety of settings such as schools, prisons, and mental hospitals. For example, a study by Cangi and Daly (2013) found that the use of a token economy increased appropriate social behaviors and reduced inappropriate behaviors in a group of autistic school children. Autistic children tend to exhibit disruptive behaviors such as pinching and hitting. When the children in the study exhibited appropriate behavior (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: Behavior Modification in Children

Parents and teachers often use behavior modification to change a child's behavior. Behavior modification uses the principles of operant conditioning to accomplish behavior change so that undesirable behaviors are switched for more socially acceptable ones. Some teachers and parents create a sticker chart, in which several behaviors are listed (Figure 6.11). Sticker charts are a form of token economies, as described in the text. Each time children perform the behavior, they get a sticker, and after a certain number of stickers, they get a prize or reinforcer. The goal is to increase acceptable behaviors and decrease misbehavior. Remember, it is best to reinforce desired behaviors, rather than to use punishment. In the classroom, the teacher can reinforce a wide range of behaviors, from students raising their hands to walking quietly in the hall, to turning in their homework. At home, parents might create a behavior chart that rewards children for things such as putting away toys, brushing their teeth, and helping with dinner. In order for behavior modification to be effective, the reinforcement needs to be connected with the behavior; the reinforcement must matter to the child and be done consistently.

Figure 6.11 Sticker charts are a form of positive reinforcement and a tool for behavior modification. Once this child earns a certain number of stickers for demonstrating a desired behavior, she will be rewarded with a trip to the ice cream parlor. (credit: Abigail Batchelder)

Time-out is another popular technique used in behavior modification with children. It operates on the principle of negative punishment. When a child demonstrates an undesirable behavior, she is removed from the desirable activity at hand (Figure 6.12). For example, say that Sophia and her brother Mario are playing with building blocks. Sophia throws some blocks at her brother, so you give her a warning that she will go to time-out if she does it again. A few minutes later, she throws more blocks at Mario. You remove Sophia from the room for a few minutes. When she comes back, she doesn't throw blocks.

There are several important points that you should know if you plan to implement time-out as a behavior 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 a time-out (because caregiver attention may reinforce misbehavior), and give the child a hug or a kind word when time-out is over.

(a) (b)

Figure 6.12 Time-out is a popular form of negative punishment used by caregivers. When a child misbehaves, he or she is removed from a desirable activity in an effort to decrease the unwanted behavior. 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)

Reinforcement Schedules

Remember, the best way to teach a person or animal a behavior 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 behavior, it is called continuous reinforcement. This reinforcement schedule is the quickest way to teach someone a behavior, and it is especially effective in training a new behavior. Let's look back at the dog that was learning to sit earlier in the chapter. Now, each time he sits, you give him a treat. Timing is important here: you will be most successful if you present the reinforcer immediately after he sits so that he can make an association between the target behavior (sitting) and the consequence (getting a treat).

LINK TO LEARNING: Watch this video clip of veterinarian Dr. Sophia Yin shaping a dog's behavior using the steps outlined above to learn more.

Once a behavior 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 behavior. There are several different types of partial reinforcement schedules (Table 6.3). 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.

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

Table 6.3

Now let's combine these four terms. A fixed interval reinforcement schedule is when behavior is rewarded after a set amount of time. For example, June undergoes major surgery in a hospital. During recovery, she is expected to experience pain and will require prescription medications for pain relief. June is given an IV drip with a patient-controlled painkiller. Her doctor sets a limit: one dose per hour. June pushes a button when the pain becomes difficult, and she receives a dose of medication. Since the reward (pain relief) only occurs on a fixed interval, there is no point in exhibiting the behavior 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 Manuel is the manager at a fast-food restaurant. Every once in a while someone from the quality control division comes to Manuel's restaurant. If the restaurant is clean and the service is fast, everyone on that shift earns a $20 bonus. Manuel never knows when the quality control person will show up, so he always tries to keep the restaurant clean and ensures that his employees provide prompt and courteous service. His productivity regarding prompt service and keeping a clean restaurant are steady because he wants his crew to earn the bonus.

With a fixed ratio reinforcement schedule, there are a set number of responses that must occur before the behavior is rewarded. Carla sells glasses at an eyeglass store, and she earns a commission every time she sells a pair of glasses. She always tries to sell people more pairs of glasses, including prescription sunglasses or a backup pair, so she can increase her commission. She does not care if the person really needs the prescription sunglasses, Carla just wants her bonus. The quality of what Carla sells does not matter because her 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 Sarah—generally a smart, thrifty woman—visits Las Vegas for the first time. She is not a gambler, but out of curiosity, she puts a quarter into the slot machine, and then another, and another. Nothing happens. Two dollars in quarters later, her curiosity is fading, and she is just about to quit. But then, the machine lights up, bells go off, and Sarah gets 50 quarters back. That's more like it! Sarah gets back to inserting quarters with renewed interest, and a few minutes later she has

used up all her gains and is $10 in the hole. Now might be a sensible time to quit. And yet, she keeps putting money into the slot machine because she never knows when the next reinforcement is coming. She keeps thinking that with the next quarter she 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 behavior 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 her doctor has approved, no medication is administered. She 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 6.13).

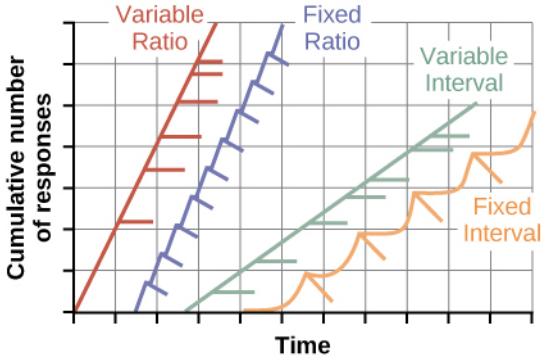


Figure 6.13The four reinforcement schedules yield different response patterns. The variable ratio schedule is unpredictable and yields high and steady response rates, with little if any pause after reinforcement (e.g., a gambler). A fixed ratio schedule is predictable

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).

CONNECT THE CONCEPTS: 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 behavior 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 behavior quite persistent—just imagine the frequency of a child's tantrums if a parent gives in even once to the behavior. The occasional reward makes it almost impossible to stop the behavior.

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 6.14). Specifically, modern research shows the connection between gambling and the activation of the reward centers 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 centers 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 6.14Some 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 behavior, 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.

Cognition and Latent Learning

Strict behaviorists like Watson and Skinner focused exclusively on studying behavior 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 behaviorist, 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.

In the experiments, Tolman placed hungry rats in a maze with no reward for finding their way through it. He also studied a comparison group that was rewarded with food at the end of the maze. As the unreinforced rats explored the maze, they developed a cognitive map: a mental picture of the layout of the maze (Figure 6.15). After 10 sessions in the maze without reinforcement, food was placed in a goal box at the end of the maze. As soon as the rats

became aware of the food, 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 behavior until there is a reason to demonstrate it.

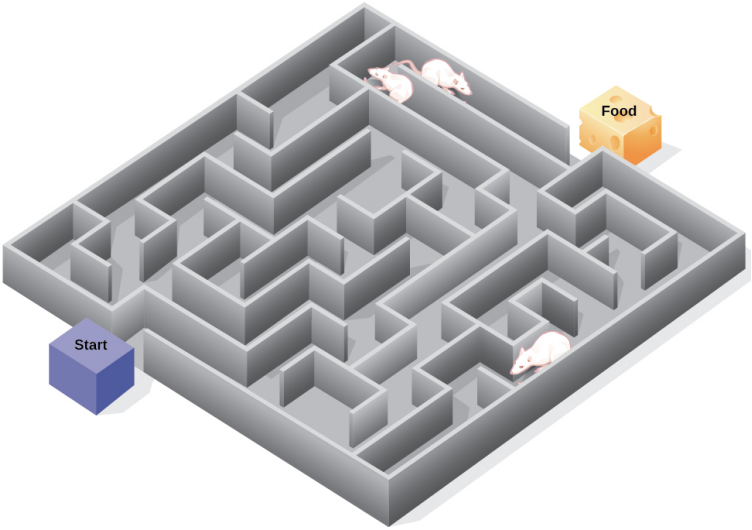


Figure 6.15 Psychologist Edward Tolman found that rats use cognitive maps to navigate through a maze. Have you ever worked your way through various levels on a video game? You learned when to turn left or right, move up or down. In that case, you were relying on a cognitive map, just like the rats in 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 Ravi's dad drives him to school every day. In this way, Ravi learns the route from his house to his school, but he's never driven there himself, so he has not had a chance to demonstrate that he's learned the way. One morning Ravi's dad has to leave early for a meeting, so he can't drive Ravi to school. Instead, Ravi follows the same route on his bike that his dad would have taken in the

car. This demonstrates latent learning. Ravi had learned the route to school but had no need to demonstrate this knowledge earlier.

EVERYDAY CONNECTION: This Place Is Like a Maze

Have you ever gotten lost in a building and couldn't find your way back out? While that can be frustrating, you're not alone. At one time or another, we've all gotten lost in places like a museum, hospital, or university library. Whenever we go someplace new, we build a mental representation—or cognitive map—of the location, as Tolman's rats built a cognitive map of their maze. However, some buildings are confusing because they include many areas that look alike or have short lines of sight. Because of this, it's often difficult to predict what's around a corner or decide whether to turn left or right to get out of a building. Psychologist Laura Carlson (2010) suggests that what we place in our cognitive map can impact our success in navigating through the environment. She suggests that paying attention to specific features upon entering a building, such as a picture on the wall, a fountain, a statue, or an escalator, adds information to our cognitive map that can be used later to help us find our way out of the building.

Learning Objectives

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

- Define observational learning
- Discuss the steps in the modeling 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 modeling, 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 behavior are called models. Research suggests that this imitative learning involves a specific type of neuron, called a mirror neuron (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 6.16). 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 modeling their behavior, they learned that this was a more efficient method of getting juice (Yamamoto, Humle, and Tanaka, 2013).

Figure 6.16 This spider monkey learned to drink water from a plastic bottle by seeing the behavior modeled by a human. (credit: U.S. Air Force, Senior Airman Kasey Close)

Imitation is much more obvious in humans, but is imitation really the sincerest form of flattery? Consider Claire's experience with observational learning. Claire's nine-year-old son, Jay, was getting into trouble at school and was defiant at home. Claire feared that Jay would end up like her brothers, two of whom were in prison. One day, after yet another bad day at school and another negative note from the teacher, Claire, at her wit's end, beat her son with a belt to get him to behave. Later that night, as she put her children to bed, Claire witnessed her four-year-old daughter, Anna, take a belt to her teddy bear and whip it. Claire was horrified, realizing that Anna was imitating her mother. It was then that Claire knew she wanted to discipline her children in a different manner.

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 behaviorists. Bandura and other researchers proposed a brand of behaviorism called social learning theory, which took cognitive processes into account. According to Bandura, pure behaviorism 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 Julian and his father? When learning to surf, Julian might watch how his father pops up successfully on his surfboard and then attempt to do the same thing. On the other hand, Julian might learn not to touch a hot stove after watching his father 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 behavior in person, as when Ben stood up on his surfboard so that Julian could see how he did it. A verbal instructional model does not perform the behavior but instead explains or describes the behavior, as when a soccer coach tells his 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 behaviors in books, movies, television shows, video games, or Internet sources (Figure 6.17).

(a)

(b)

Figure 6.17 (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 modeling, this child can learn a behavior 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 Modeling Process

Of course, we don't learn a behavior simply by observing a model. Bandura described specific steps in the process of modeling 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 behavior that you observed and committed to memory; this is reproduction. Finally, you must have motivation. You need to want to copy the behavior, and whether or not you are motivated depends on what happened to the model. If you saw that the model was reinforced for her behavior, you will be more motivated to copy her. This is known as vicarious reinforcement. On the other hand, if you observed the model being

punished, you would be less motivated to copy her. This is called vicarious punishment. For example, imagine that four-year-old Allison watched her older sister Kaitlyn playing in their mother's makeup, and then saw Kaitlyn get a time out when their mother came in. After their mother left the room, Allison was tempted to play in the make-up, but she did not want to get a time-out from her mother. What do you think she did? Once you actually demonstrate the new behavior, the reinforcement you receive plays a part in whether or not you will repeat the behavior.

Bandura researched modeling behavior, particularly children's modeling of adults' aggressive and violent behaviors (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 behavior was influenced by whether the teacher was punished for her behavior. 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 behavior. When the teacher was punished for her bad behavior, the children decreased their tendency to act as she had. When the teacher was praised or ignored (and not punished for her behavior), the children imitated what she did, and even what she said. They punched, kicked, and yelled at the doll.

LINK TO LEARNING: Watch this video clip about the famous Bobo doll experiment to see a portion of the experiment and an interview with Albert Bandura.

What are the implications of this study? Think back to our discussion of violent media in Chapter 2 when we discussed research in psychology. Do the results of Bandura's study change your beliefs about correlational and causational aspects of media violence and behavior? 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 behavior. 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 favorite 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. As you saw from the example of Claire at the beginning of this section, her daughter viewed Claire's aggressive behavior and copied it. Research suggests that this may help to explain why abused children often grow up to be abusers themselves (Murrell, Christoff, & Henning, 2007). In fact, about 30% of abused children become abusive parents (U.S. Department of Health & Human Services, 2013). We tend to do what we know. Abused children, 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.

Some studies suggest that violent television shows, movies, and video games may also have antisocial effects (Figure 6.18) although further research needs to be done to understand the correlational and causational aspects of media violence and behavior. Some studies have found a link between viewing violence and aggression seen in children (Anderson & Gentile, 2008; Kirsch, 2010; Miller, Grabell, Thomas, Bermann, & Graham-Bermann, 2012). These findings may not be surprising, given that a child graduating from

high school has been exposed to around 200,000 violent acts including murder, robbery, torture, bombings, beatings, and rape through various forms of media (Huston et al., 1992). Not only might viewing media violence affect aggressive behavior by teaching people to act that way in real life situations, but it has also been suggested that repeated exposure to violent acts also desensitizes people to it. Psychologists are working to understand this dynamic.

Figure 6.18 Can video games make us violent? Psychological researchers study this topic. (credit: "woodleywonderworks"/Flickr)

LINK TO LEARNING: View this video about the connection between violent video games and violent behavior to learn more.

WHAT DO YOU THINK? Violent Media and Aggression

Does watching violent media or playing violent video

games cause aggression? Albert Bandura's early studies suggested television violence increased aggression in children, and more recent studies support these findings. For example, research by Craig Anderson and colleagues (Anderson, Bushman, Donnerstein, Hummer, & Warbuten, 2015; Anderson et al., 2010; Bushman et al., 2016) found extensive evidence to suggest a causal link between hours of exposure to violent media and aggressive thoughts and behaviors. However, studies by Christopher Ferguson and others suggest that while there may be a link between violent media exposure and aggression, research to date has not accounted for other risk factors for aggression including mental health and family life (Ferguson, 2011; Gentile, 2016). What do think?

Additional Supplemental Resources

Websites

- Intervention Methods for Young Children with Autism
  - This online version of *The Clinical Practice Guideline for Autism/Pervasive Developmental Disorders* provides information on behavioral and educational approaches for helping children with autism, many of which draw upon operant conditioning principles. This site allows students to explore a modern and relevant use of behavioral

psychology.

Videos

- The Difference Between Classical and Operant Conditioning
  - A video describing how two associative learning processes differ. Five multiple-choice questions are accessible under the "Think" button. A variety of discussion and assessment questions are included with the video (free registration is required to access the questions). Closed captioning available.
- Watson's Theory of Behaviourism
  - John B. Watson famously claimed that if he were to be given a dozen healthy infants, he could shape them into anything; doctors, lawyers, artists, beggars, or thieves, regardless of their background or genetic predispositions. First, he completed experiments with 8-month old Albert. He later applied his theory when raising his own children. In essence, he applied the scientific method to human psychology which he called behaviorism.
- Crash Course Video #11 – How to Train a Brain
  - This video on how to train a brain includes information on topics such as classical and operant conditioning. Closed captioning available.
- Crash Course Video #12 – The Bobo Beatdown
  - This video on the Bobo beatdown includes information on topics such as latent learning, observational learning, and biological bases of learning. Closed captioning available.

Access for free at https://openstax.org/books/psychology-2e/pages/1-introduction

6. Thinking and Intelligence

Figure 7.1 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.

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 nerve 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 7.2). Emotion and memory are powerful influences on both our thoughts and behaviors.

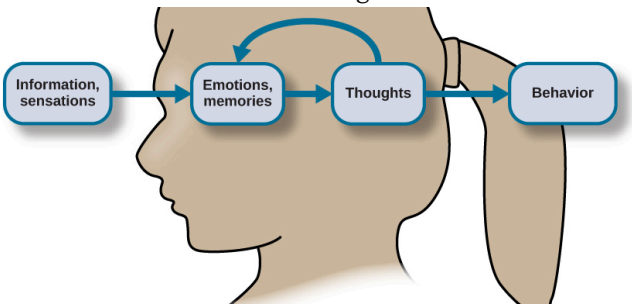


Figure 7.2 Sensations and information are received by our brains, filtered through emotions and memories, and processed to become thoughts.

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 (you will learn more about semantic memory in a later chapter) 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 United States history, for example, you learn about more than just individual events that have happened

in America's 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 American 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 Essex Junction, Vermont, 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 shoveled 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 7.3).

(a) (b)

Figure 7.3 (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 himself 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 him. 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, he just works 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

behaviors that can feel like a routine. Think about what you do when you walk into an elevator (Figure 7.4). 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 the United States, in Tibet, you greet someone by sticking your tongue out at them, and in Belize, you bump fists (Cairns Regional Council, n.d.)

Figure 7.4 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 behavior 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 7.5).

Figure 7.5 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 behavior 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 make 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.

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, odors, 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.

Language Development

Given the remarkable complexity of a language, one might expect that mastering a language would be an especially arduous task; indeed, for those of us trying to learn a second language as adults, this might seem to be true. However, young children master language very quickly with relative ease. B. F. Skinner (1957) proposed that language is learned through reinforcement.

Noam Chomsky (1965) criticized this behaviorist approach, asserting instead that the mechanisms underlying language acquisition are biologically determined. The use of language develops in the absence of formal instruction and appears to follow a very similar pattern in children from vastly different cultures and backgrounds. It would seem, therefore, that we are born with a biological predisposition to acquire a language (Chomsky, 1965; Fernández & Cairns, 2011). Moreover, it appears that there is a critical 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).

Children begin to learn about language from a very early age (Table 7.1). In fact, it appears that this is occurring even before we are born. Newborns show a 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).

Stages of Language and Communication Development

Stage	Age	Developmental Language and Communication
1	0–3 months	Reflexive communication
2	3–8 months	Reflexive communication; interest in others
3	8–13 months	Intentional communication; sociability
4	12–18 months	First words
5	18–24 months	Simple sentences of two words
6	2–3 years	Sentences of three or more words
7	3–5 years	Complex sentences; has conversations

Table7.1

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 critical 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 critical period impeded Genie's ability to fully acquire and use language.

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).

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. 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" 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, she begins 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).

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.

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 is 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 7.2). 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.

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

Table7.2

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 the 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 backward is a useful heuristic in which you begin solving the problem by focusing on the end result. Consider this example: You live in Washington, D.C., and have been invited to a wedding at 4 PM on Saturday in Philadelphia. Knowing that Interstate 95 tends to back 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 2.5 hours to get to Philadelphia without

traffic, what time should you leave your house? You use the working backward 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 a 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.

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 7.7) 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 7.7 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 7.8) that challenges your spatial reasoning skills. Connect all nine dots with four connecting straight lines without lifting your pencil from the paper:

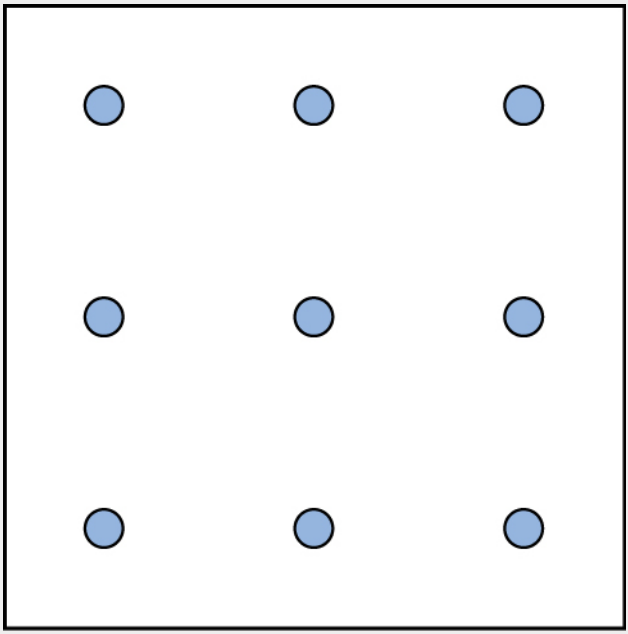


Figure 7.8 Did you figure it out? (The answer is at the end of this section.) Once you understand how to crack this puzzle, you won't forget.

Take a look at the "Puzzling Scales" logic puzzle below (Figure 7.9). Sam Loyd, a well-known puzzle master, created and refined countless puzzles throughout his lifetime (Cyclopedia of Puzzles, n.d.).

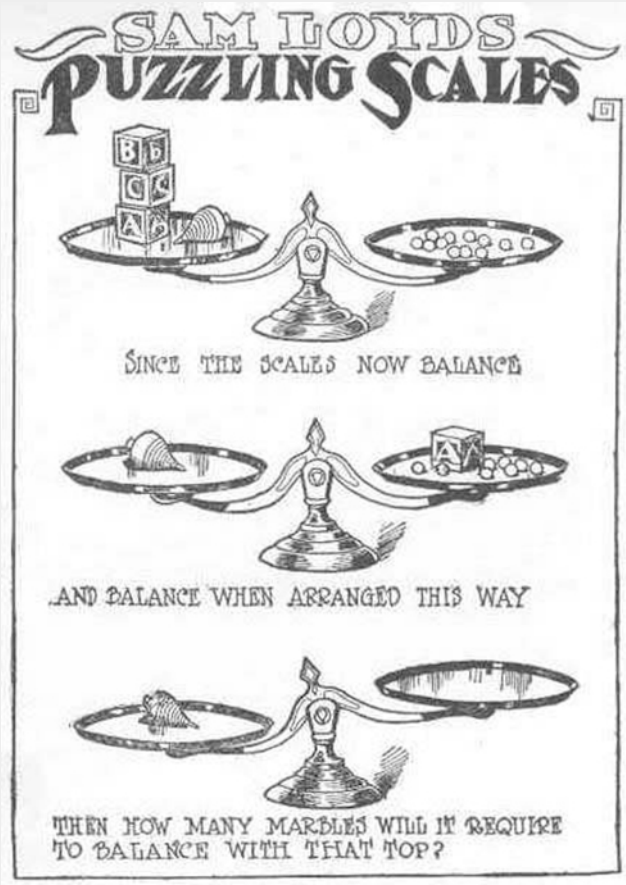


Figure 7.9 What steps did you take to solve this puzzle? You can read the solution at the end of this section.

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 she just needs 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 7.10). 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.

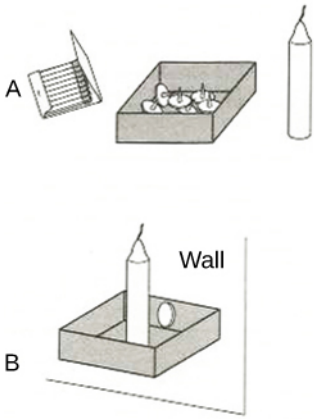


Figure 7.10 In Duncker's classic study, participants were provided the three objects in the top panel and asked to solve the problem. The solution is shown in the bottom portion.

> LINK TO LEARNING: Check out this Apollo 13 scene about NASA engineers overcoming functional fixedness to learn more.

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 behavior exhibited by the professor while ignoring the countless pleasant interactions he is 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. Representative bias 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 7.3.

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

Table7.3

Were you able to determine how many marbles are needed to balance the scales in Figure 7.9? You need nine. Were you able to solve the problems in Figure 7.7 and Figure 7.8? Here are the answers (Figure 7.11).

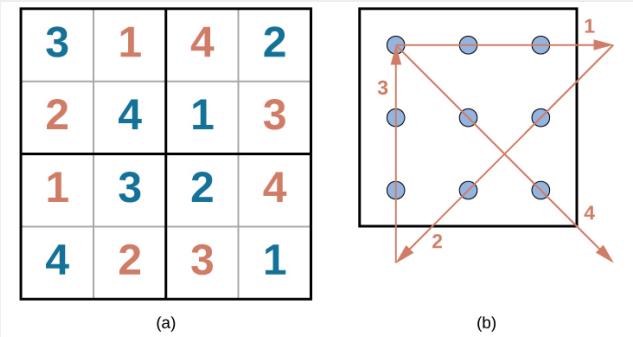


Figure 7.11

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

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).

Other 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 behaviors 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 7.12).

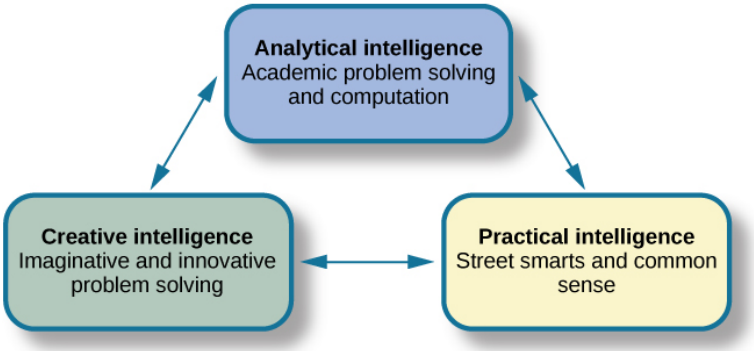


Figure 7.12 Sternberg's theory identifies three types of intelligence: practical, creative, and analytical.

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 the 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 a 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 7.4 describes each type of intelligence.

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
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

Table7.4

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 difficult 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 that compares 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; Gilford, 1967)

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.

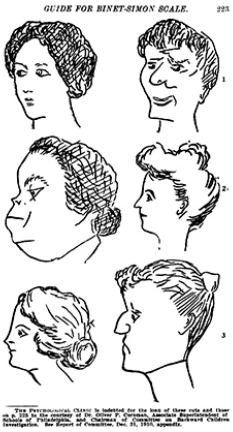
Measuring Intelligence

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.

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 7.13). 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.

(a)



(b)

Figure 7.13 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 7.13).

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 center of the bell curve, representing the average height for American women (Figure 7.14). 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.

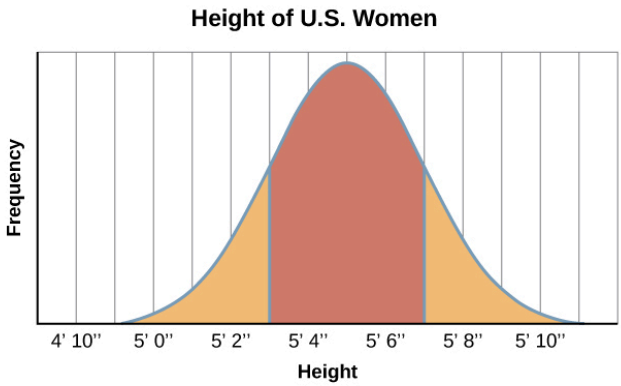


Figure 7.14 Are you of below-average, average, or above-average height?

The same principles apply to intelligence test 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 7.15). 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.

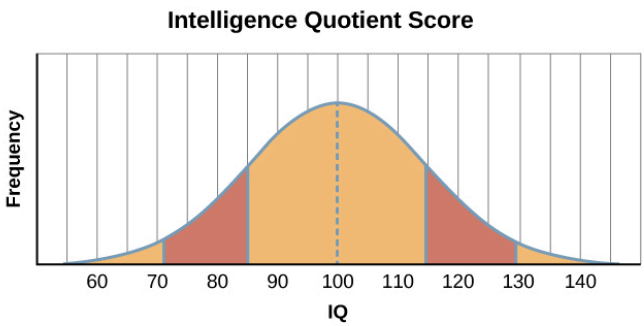


Figure 7.15 The majority of people have an IQ score between 85 and 115.

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). Formerly known as mental retardation, the accepted term now is intellectual disability, and it has four subtypes: mild, moderate, severe, and profound (Table 7.5). *The Diagnostic and Statistical Manual of Psychological Disorders* lists criteria for each subgroup (APA, 2013).

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

Table 7.5

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.

DIG DEEPER: What's in a Name?

In the past, individuals with IQ scores below 70 and significant adaptive and social functioning delays were diagnosed with mental retardation. When this diagnosis was first named, the title held no social stigma. In time, however, the degrading word "retard" sprang from this diagnostic term. "Retard" was frequently used as a taunt, especially among young people, until the words "mentally retarded" and "retard" became an insult. As such, the DSM-5 now labels this diagnosis as "intellectual disability." Many states once had a Department of Mental Retardation to serve those diagnosed with such cognitive delays, but most have changed their name to the Department of Developmental Disabilities or something similar in language.

Erin Johnson's younger brother Matthew has Down syndrome. She wrote this piece about what her brother taught her about the meaning of intelligence:

> His whole life, learning has been hard. Entirely possible – just different. He has always excelled with technology – typing his thoughts was more effective than writing them or speaking them. Nothing says "leave me alone" quite like a text that reads, "Do Not Call Me Right Now." He is fully capable of reading books up to about a third-grade level, but he didn't love it and used to always ask others to read to him. That all

changed when his nephew came along, because he willingly reads to him, and it is the most heart-swelling, smile-inducing experience I have ever had the pleasure of witnessing.

When it comes down to it, Matt can learn. He does learn. It just takes longer, and he has to work harder for it, which if we're being honest, is not a lot of fun. He is extremely gifted in learning things he takes an interest in, and those things often seem a bit "strange" to others. But no matter. It just proves my point – he *can* learn. That does not mean he will learn at the same pace, or even to the same level. It also, unfortunately, does not mean he will be allotted the same opportunities to learn as many others.

Here's the scoop. We are all wired with innate abilities to retain and apply our learning and natural curiosities and passions that fuel our desire to learn. But our abilities and curiosities may not be the same.

The world doesn't work this way though, especially not for my brother and his counterparts. Have him read aloud a book about skunks, and you may not get a whole lot from him. But have him tell you about skunks straight out of his memory, and hold onto your hats. He can hack the school's iPad system, but he can't tell you how he did it. He can write out every direction for a drive to our grandparents' home in Florida, but he can't drive.

Society is quick to deem him disabled and use demeaning language like the r-word to describe him, but in reality, we haven't necessarily given him opportunities to showcase the learning he can do. In my case, I can escape the need to memorize how to change the oil in my car without anyone assuming I can't do it, or calling me names when they find out I can't. But Matthew can't get through a day at his job without someone assuming he needs help. He is bright. Brighter than most anyone would assume. Maybe we need to redefine what is smart.

My brother doesn't fit in the narrow schema of intelligence that is accepted in our society. But intelligence is far more than being able to solve 525 x 62 or properly introduce yourself to another. Why can't we assume the intelligence of someone who can recite all of a character's lines in a movie or remember my birthday a year after I told him/her a single time? Why is it we allow a person's diagnosis or appearance to make us not just wonder if, but entirely doubt that they are capable? Maybe we need to cut away the sides of the box we have created for people so everyone can fit.

My brother can learn. It may not be what you know. It may be knowledge you would deem unimportant. It may not follow a traditional learning trajectory. But the fact remains – he can learn. Everyone can learn. And even though it is

harder for him and harder for others still, he is not a "retard." Nobody is.

When you use the r-word, you are insinuating that an individual, whether someone with a disability or not, is unintelligent, foolish, and purposeless. This in turn tells a person with a disability that they too are unintelligent, foolish, and purposeless. Because the word was historically used to describe individuals with disabilities and twisted from its original meaning to fit a cruel new context, it is forevermore associated with people like my brother. No matter how a person looks or learns or behaves, the r-word is never a fitting term. It's time we waved it goodbye.

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 behavioral 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 her 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 him from participating in some way in a trial. People also use IQ

testing results to seek disability benefits from the Social Security Administration.

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 the difference between a learning disability and a developmental disorder

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 7.15). 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.

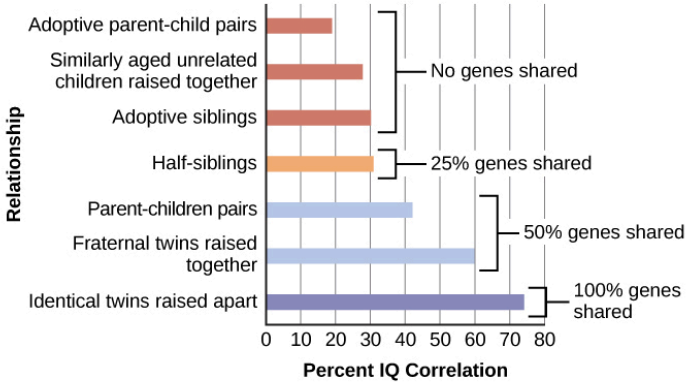


Figure 7.16 The correlations of IQs of unrelated versus related persons reared apart or together suggest a genetic component to intelligence.

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 behaviors 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 his or her 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 her in an

extremely stimulating environment. What will happen to the couple's new daughter? It is likely that the stimulating environment will improve her intellectual outcomes over the course of her 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 him: 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 the 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.

In a related story, parents of African American students filed a case against the State of California in 1979, because they believed that the testing method used to identify students with learning disabilities was culturally unfair as the tests were normed and standardized using white children (*Larry P. v. Riles*). The testing method used by the state disproportionately identified African American children as mentally retarded. This resulted in many students being incorrectly classified as "mentally retarded."

What are Learning Disabilities?

Learning disabilities are cognitive disorders that affect different areas of cognition, particularly language or reading. It should be pointed out that learning disabilities are not the same thing as intellectual disabilities. Learning disabilities are considered specific neurological impairments rather than global intellectual or developmental disabilities. A person with a language disability has difficulty understanding or using spoken language, whereas someone with a reading disability, such as dyslexia, has difficulty processing what he or she is reading.

Often, learning disabilities are not recognized until a child reaches school age. One confounding aspect of learning disabilities is that they most often affect children with average to above-average intelligence. In other words, the disability is specific to a particular area and not a measure of overall intellectual ability. At the same time, learning disabilities tend to exhibit comorbidity with other disorders, like attention-deficit hyperactivity disorder (ADHD). Anywhere between 30–70% of individuals with diagnosed cases of ADHD also have some sort of learning disability (Riccio, Gonzales, & Hynd, 1994). Let's take a look at three examples of common learning disabilities: dysgraphia, dyslexia, and dyscalculia.

Dysgraphia

Children with dysgraphia have a learning disability that results in a struggle to write legibly. The physical task of writing with a pen and paper is extremely challenging for the person. These children often have extreme difficulty putting their thoughts down on paper (Smits-Engelsman & Van Galen, 1997). This difficulty is inconsistent with a person's IQ. That is, based on the child's IQ and/or abilities in other areas, a child with dysgraphia should be able to write, but

can't. Children with dysgraphia may also have problems with spatial abilities.

Students with dysgraphia need academic accommodations to help them succeed in school. These accommodations can provide students with alternative assessment opportunities to demonstrate what they know (Barton, 2003). For example, a student with dysgraphia might be permitted to take an oral exam rather than a traditional paper-and-pencil test. Treatment is usually provided by an occupational therapist, although there is some question as to how effective such treatment is (Zwicker, 2005).

Dyslexia

Dyslexia is the most common learning disability in children. An individual with dyslexia exhibits an inability to correctly process letters. The neurological mechanism for sound processing does not work properly in someone with dyslexia. As a result, dyslexic children may not understand sound-letter correspondence. A child with dyslexia may mix up letters within words and sentences—letter reversals, such as those shown in Figure 7.17, are a hallmark of this learning disability—or skip whole words while reading. A dyslexic child may have difficulty spelling words correctly while writing. Because of the disordered way that the brain processes letters and sounds, learning to read is a frustrating experience. Some dyslexic individuals cope by memorizing the shapes of most words, but they never actually learn to read (Berninger, 2008).

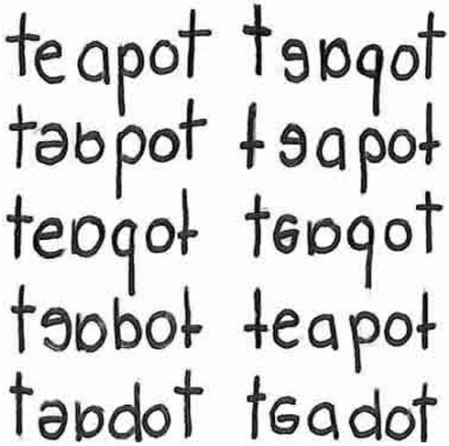


Figure 7.17 These written words show variations of the word "teapot" as written by individuals with dyslexia.

Dyscalculia

Dyscalculia is difficulty in learning or comprehending arithmetic. This learning disability is often first evident when children exhibit difficulty discerning how many objects are in a small group without counting them. Other symptoms may include struggling to memorize math facts, organize numbers, or fully differentiate between numerals, math symbols, and written numbers (such as "3" and "three").

Additional Supplemental Resources

Websites

- Quick Draw

    - Use Google's QuickDraw web app on your phone to quickly draw 5 things for Google's artificially intelligent neural net. When you are done, the app will show you what it thought each of the drawings was. How does this relate to the psychological idea of concepts, prototypes, and schemas? Check out here. Works best in Chrome if used in a web browser
- Speech and Language Developmental Milestones
    - This article lists information about a variety of different topics relating to speech development, including how speech develops and what research is currently being done regarding speech development.
- Human Intelligence
    - The Human intelligence site includes biographical profiles of people who have influenced the development of intelligence theory and testing, in-depth articles exploring current controversies related to human intelligence, and resources for teachers.
- The Jam Experiment
    - In 2000, psychologists Sheena Iyengar and Mark Lepper from Columbia and Stanford University published a study about the paradox of choice. This is the original journal article.
- Mensa
    - *Mensa*, the high IQ society, provides a forum for intellectual exchange among its members. There are members in more than 100 countries around the world. Anyone with an IQ in the top 2% of the population can join.
- The Turing Test
    - This test developed in the 1950s is used to refer to some kinds of behavioral tests for the presence of mind, or thought, or intelligence in putatively minded entities such

as machines.

- Center for Parent Resources on Intellectual Disability
    - Your central "Hub" of information and products created for the network of Parent Centers serving families of children with disabilities.

Videos

- Why our IQ levels are higher than our grandparents'
    - How have average IQ levels changed over time? Hear James Flynn discuss the "Flynn Effect" in this Ted Talk. Closed captioning available.
- How to Make Choosing Easier
    - We all want customized experiences and products – but when faced with 700 options, consumers freeze up. With fascinating new research, Sheena Iyengar demonstrates how businesses (and others) can improve the experience of choosing. This is the same researcher that is featured in your midterm exam.
- IQ Score Distribution
    - What does an IQ Score distribution look like? Where do most people fall on an IQ Score distribution? Find out more in this video. Closed captioning available.
- How I Hacked Online Dating – Ted Talk
    - How do we solve problems? How can data help us to do this? Follow Amy Webb's story of how she used algorithms to help her find her way to true love. Closed captioning available.
- Ted-Ed: Do animals have language?
    - In this Ted-Ed video, explore some of the ways in which animals communicate, and determine whether or not this

communication qualifies as language. A variety of discussion and assessment questions are included with the video (free registration is required to access the questions). Closed captioning available.

- Ted-Ed: The benefits of a bilingual brain
  - Watch this Ted-Ed video to learn more about the benefits of speaking multiple languages, including how bilingualism helps the brain to process information, strengthens the brain, and keeps the speaker more engaged in their world. A variety of discussion and assessment questions are included with the video (free registration is required to access the questions). Closed captioning available.
- Crash Course Video #15 – Cognition: How Your Mind Can Amaze and Betray You
  - This video is on how your mind can amaze and betray you includes information on topics such as concepts, prototypes, problem-solving and mistakes in thinking. Closed captioning available.
- Crash Course Video #16 – Language
  - This video on language includes information on topics such as the development of language, language theories, and brain areas involved in language, as well as language disorders. Closed captioning available.
- Crash Course Video #23 – Controversy of Intelligence
  - This video on the controversy of intelligence includes information on topics such as theories of intelligence, emotional intelligence, and measuring intelligence. Closed captioning available.
- Crash Course Video #24 – Brains vs Bias
  - This video on the brains vs. bias includes information on topics such as intelligence testing, testing bias, and stereotype threat. Closed captioning available.

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7. Memory

Figure 8.1 Photographs can trigger our memories and bring past experiences back to life. (credit: modification of work by Cory Zanker)

We may be top-notch learners, but if we don't have a way to store what we've learned, what good is the knowledge we've gained?

Take a few minutes to imagine what your day might be like if you could not remember anything you had learned. You would have to figure out how to get dressed. What clothing should you wear, and how do buttons and zippers work? You would need someone to teach you how to brush your teeth and tie your shoes. Who would you ask for help with these tasks, since you wouldn't recognize the faces of these people in your house? Wait . . . is this even your house? Uh oh, your stomach begins to rumble and you feel hungry. You'd like something to eat, but you don't know where the food is kept or even how to prepare it. Oh dear, this is getting confusing. Maybe it would be best just go back to bed. A bed . . . what is a bed?

We have an amazing capacity for memory, but how, exactly, do we process and store information? Are there different kinds of memory, and if so, what characterizes the different types? How, exactly, do

we retrieve our memories? And why do we forget? This chapter will explore these questions as we learn about memory.

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 8.2).

Figure 8.2 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.

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 8.3).

Figure 8.3 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

backward 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 backward 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 United States, children often learn the alphabet through song, and they learn the number of days in each month through rhyme: "Thirty days hath September, / April, June, and November; / All the rest have thirty-one, / Save February, with twenty-eight days clear, / And twenty-nine each leap year." These lessons are 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 a 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 8.4), called Atkinson and Shiffrin's model, is based on the belief that we process memories in the same way that a computer processes information.

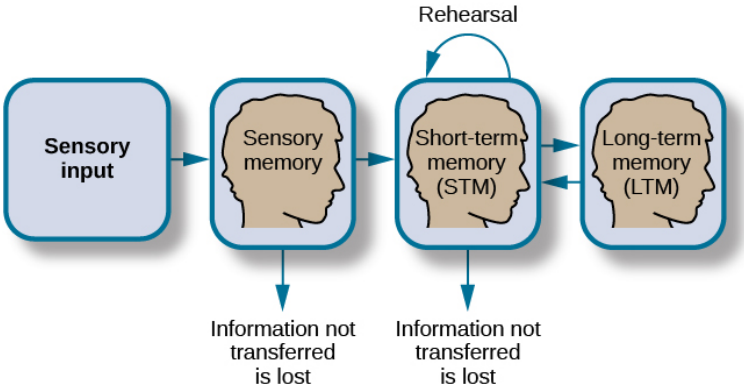


Figure 8.4 According to the Atkinson-Shiffrin model of memory, information passes through three distinct stages in order for it to

be stored in long-term memory.

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.

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? As long as the professor was dressed appropriately, it does not really matter what she was 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, the 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 8.5) 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 8.5 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. However, more contemporary research has found working memory capacity is 4 plus or minus 1 (Cowan, 2010). 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. 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 8.6). 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.

LINK TO LEARNING: View this video that explains short-term and long-term memory to learn more about how memories are stored and retrieved.

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 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 African American president of the United States" 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 behaviors 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.

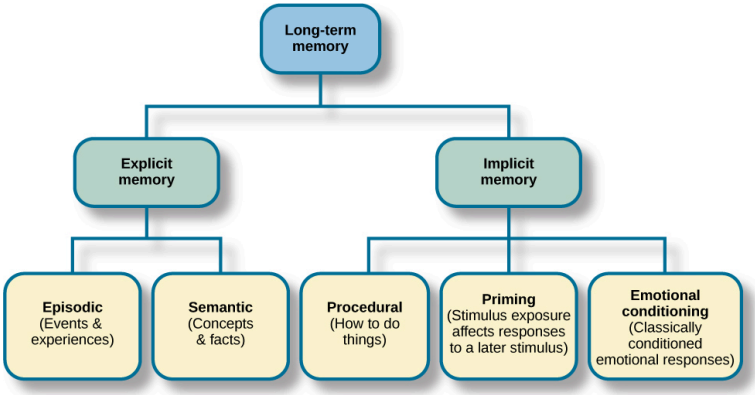


Figure 8.6 There are two components of long-term memory: explicit and implicit. Explicit memory includes episodic and semantic memory. Implicit memory includes procedural memory and things learned through conditioning.

Implicit procedural memory is often studied using observable behaviors (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).

LINK TO LEARNING: Watch this video about superior autobiographical memory from the television news 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. Whitney took Spanish in high school, but after high school, she did not have the opportunity to speak Spanish. Whitney is now 31, and her company has offered her an opportunity to work in their Mexico City office. In order to prepare herself, she enrolls in a Spanish course at the local community center. She's surprised at how quickly she's able to pick up the language after not speaking it for 13 years; this is an example of relearning.

Learning Objectives

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

- Explain the brain functions involved in memory
- Recognize the roles of the hippocampus, amygdala, and cerebellum

Are memories stored in just one part of the brain, or are they stored in many different parts of the brain? Karl Lashley began exploring this problem, about 100 years ago, by making lesions in the brains of animals such as rats and monkeys. He was searching for evidence of the engram: the group of neurons that serve as the "physical representation of memory" (Josselyn, 2010). First, Lashley (1950) trained rats to find their way through a maze. Then, he used the tools available at the time—in this case, a soldering iron—to create lesions in the rats' brains, specifically in the cerebral cortex. He did this because he was trying to erase the engram, or the original memory trace that the rats had of the maze.

Lashley did not find evidence of the engram, and the rats were still able to find their way through the maze, regardless of the size

or location of the lesion. Based on his creation of lesions and the animals' reaction, 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's early work did not confirm the existence of the engram, modern psychologists are making progress locating it. For example, Eric Kandel has spent decades studying the synapse and its role in controlling the flow of information through neural circuits needed to store memories (Mayford, Siegelbaum, & Kandel, 2012).

Many scientists believe that the entire brain is involved with memory. However, since Lashley's research, other scientists have been able to look more closely at the brain and memory. They have argued that memory is located in specific parts of the brain, and specific neurons can be recognized for their involvement in forming memories. The main parts of the brain involved with memory are the amygdala, the hippocampus, the cerebellum, and the prefrontal cortex (Figure 8.8).

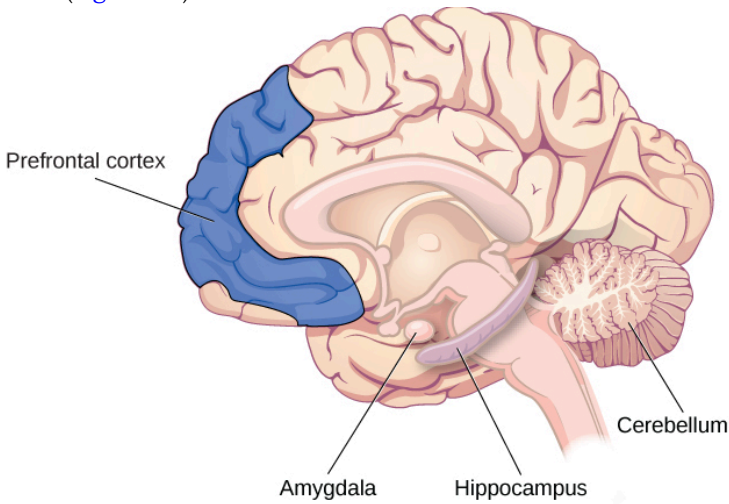


Figure 8.8The amygdala is involved in fear and fear memories. The hippocampus is associated with declarative and episodic memory as well as recognition memory. The cerebellum plays a role in

processing procedural memories, such as how to play the piano. The prefrontal cortex appears to be involved in remembering semantic tasks.

The Amygdala

First, let's look at the role of the amygdala in memory formation. The main job of the amygdala is to regulate emotions, such as fear and aggression (Figure 8.8). The amygdala plays a part in how memories are stored because storage is influenced by stress hormones. For example, one researcher experimented with rats and the fear response (Josselyn, 2010). Using Pavlovian conditioning, a neutral tone was paired with a foot shock to the rats. This produced a fear memory in the rats. After being conditioned, each time they heard the tone, they would freeze (a defense response in rats), indicating a memory for the impending shock. Then the researchers induced cell death in neurons in the lateral amygdala, which is the specific area of the brain responsible for fear memories. They found the fear memory faded (became extinct). Because of its role in processing emotional information, the amygdala is also involved in memory consolidation: the process of transferring new learning into long-term memory. The amygdala seems to facilitate encoding memories at a deeper level when the event is emotionally arousing.

The Hippocampus

Another group of researchers also experimented with rats to learn how the hippocampus functions in memory processing (Figure 8.8). They created lesions in the hippocampi of the rats and found that the rats demonstrated memory impairment on various tasks, such as object recognition and maze running. They concluded that the hippocampus is involved in memory, specifically normal recognition memory as well as spatial memory (when the memory tasks are like recall tests) (Clark, Zola, & Squire, 2000). Another job of the

hippocampus is to project information to cortical regions that give memories meaning and connect them with other memories. It also plays a part in memory consolidation: the process of transferring new learning into long-term memory.

Injury to this area leaves us unable to process new declarative memories. One famous patient, known for years only as H. M., had both his left and right temporal lobes (hippocampi) removed in an attempt to help control the seizures he had been suffering from for years (Corkin, Amaral, González, Johnson, & Hyman, 1997). As a result, his declarative memory was significantly affected, and he could not form new semantic knowledge. He lost the ability to form new memories, yet he could still remember information and events that had occurred prior to the surgery.

The Cerebellum and Prefrontal Cortex

Although the hippocampus seems to be more of a processing area for explicit memories, you could still lose it and be able to create implicit memories (procedural memory, motor learning, and classical conditioning), thanks to your cerebellum (Figure 8.8). For example, one classical conditioning experiment is to accustom subjects to blink when they are given a puff of air to the eyes. When researchers damaged the cerebellums of rabbits, they discovered that the rabbits 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. 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 retrieval of information was associated with the right frontal region (Craik et al., 1999).

Neurotransmitters

There also appear to be specific neurotransmitters involved with the process of memory, such as epinephrine, dopamine, serotonin, glutamate, and acetylcholine (Myhrer, 2003). There continues to be discussion and debate among researchers as to which neurotransmitter plays which specific role (Blockland, 1996). Although we don't yet know which role each neurotransmitter plays in memory, we do know that communication among neurons via neurotransmitters is critical for developing new memories. Repeated activity by neurons leads to increased neurotransmitters in the synapses and more efficient and more synaptic connections. This is how memory consolidation occurs.

It is also believed that strong emotions trigger the formation of strong memories, and weaker emotional experiences form weaker memories; this is called arousal theory (Christianson, 1992). For example, strong emotional experiences can trigger the release of neurotransmitters, as well as hormones, which strengthen memory; therefore, our memory for an emotional event is usually better than our memory for a non-emotional event. When humans and animals are stressed, the brain secretes more of the neurotransmitter glutamate, which helps them remember the stressful event (McGaugh, 2003). This is clearly evidenced by what is known as the flashbulb memory phenomenon.

A flashbulb memory is an exceptionally clear recollection of an important event (Figure 8.9). Where were you when you first heard

about the pandemic? Can you remember where you were and what you were doing? This is an example of a flashbulb memory: a record of an atypical and unusual event that has very strong emotional associations.

Learning Objectives

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

- Compare and contrast the two types of amnesia
- Discuss the unreliability of eyewitness testimony
- Discuss encoding failure
- Discuss the various memory errors
- Compare and contrast the two types of interference

You may pride yourself on your amazing ability to remember the birthdates and ages of all of your friends and family members, or you may be able to recall vivid details of your 5th birthday party at Chuck E. Cheese's. However, all of us have at times felt frustrated, and even embarrassed, when our memories have failed us. There are several reasons why this happens.

Amnesia

Amnesia is the loss of long-term memory that occurs as a result of disease, physical trauma, or psychological trauma. Endel Tulving (2002) and his colleagues at the University of Toronto studied K.

C. for years. K. C. suffered a traumatic head injury in a motorcycle accident and then had severe amnesia. 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)

Anterograde Amnesia

There are two common types of amnesia: anterograde amnesia and retrograde amnesia (Figure 8.10). Anterograde amnesia is commonly caused by brain trauma, such as a blow to the head. With anterograde amnesia, you cannot remember new information, although you can remember information and events that happened prior to your injury. The hippocampus is usually affected (McLeod, 2011). This suggests that damage to the brain has resulted in the inability to transfer information from short-term to long-term memory; that is, the inability to consolidate memories.

Many people with this form of amnesia are unable to form new episodic or semantic memories but are still able to form new procedural memories (Bayley & Squire, 2002). This was true of H. M., which was discussed earlier. 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).

Figure 8.10This 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.

Retrograde Amnesia

Retrograde amnesia is the loss of memory for events that occurred prior to the trauma. People with retrograde amnesia cannot remember some or even all of their past. They have difficulty remembering 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? The trouble is you don't recognize any of them. You were in a car accident, suffered a head injury, and now have retrograde amnesia. You don't remember anything about your life prior to waking up in the hospital. This may sound like the stuff of Hollywood movies, and 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.

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).

Suggestibility

When someone witnesses a crime, that person's memory of the details of the crime is very important in catching the suspect. Because memory is so fragile, witnesses can be easily (and often accidentally) misled due to the problem of suggestibility. Suggestibility describes the effects of misinformation from external sources that leads to the creation of false memories. In the fall of 2002, there was a sniper in the DC area. These shootings went on in a variety of places for over three weeks. During this time, as you can imagine, people were terrified to leave their homes, go shopping, or even walk through their neighborhoods. Police officers and the FBI worked frantically to solve the crimes, and a tip hotline was set up. Law enforcement received over 140,000 tips, which resulted in approximately 35,000 possible suspects (Newseum, n.d.).

Most of the tips were dead ends until a white van was spotted at the site of one of the shootings. The police chief went on national television with a picture of the white van. After the news conference, several other eyewitnesses called to say that they too had seen a white van fleeing from the scene of the shooting. At the time, there were more than 70,000 white vans in the area. Police officers, as well as the general public, focused almost exclusively on

white vans because they believed the eyewitnesses. Other tips were ignored. When the suspects were finally caught, they were driving a blue sedan.

As illustrated by this example, we are vulnerable to the power of suggestion, simply based on something we see on the news. Or we can claim to remember something that in fact is only a suggestion someone made. It is the suggestion that is the cause of the false memory.

Eyewitness Misidentification

Even though memory and the process of reconstruction can be fragile, 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 8.11).

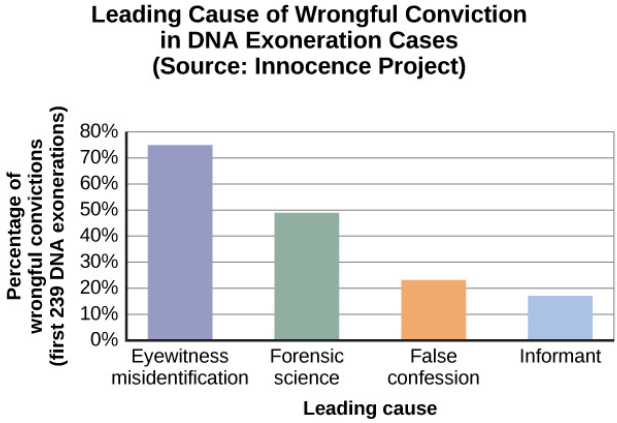


Figure 8.11In studying cases where DNA evidence has exonerated people from crimes, the Innocence Project discovered that eyewitness misidentification is the leading cause of wrongful convictions (Yeshiva University, 2009).

How does this happen? In 1984, Jennifer Thompson, then a 22-year-

old college student in North Carolina, was attacked. As she was being attacked, she tried to memorize every detail of his face and physical characteristics, vowing that if she survived, she would help get him convicted. After the police were contacted, a composite sketch was made of the suspect, and Jennifer was shown six photos. She chose two, one of which was of Ronald Cotton. After looking at the photos for 4–5 minutes, she said, "Yeah. This is the one," and then she added, "I think this is the guy." When questioned about this by the detective who asked, "You're sure? Positive?" She said that it was him. Then she asked the detective if she did OK, and he reinforced her choice by telling her she did great. These kinds of unintended cues and suggestions by police officers can lead witnesses to identify the wrong suspect. The district attorney was concerned about her lack of certainty the first time, so she viewed a lineup of seven men. She said she was trying to decide between numbers 4 and 5, finally deciding that Cotton, number 5, "Looks most like him." He was 22 years old.

By the time the trial began, Jennifer Thompson had absolutely no doubt that she was attacked by Ronald Cotton. She testified at the court hearing, and her testimony was compelling enough that it helped convict him. How did she go from, "I think it's the guy" and it "Looks most like him," to such certainty? Wells and Quinlivan (2009) assert it's suggestive police identification procedures, such as stacking lineups to make the defendant stand out, telling the witness which person to identify, and confirming witnesses' choices by telling them "Good choice," or "You picked the guy."

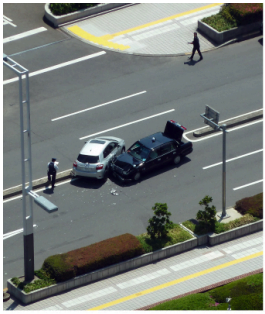
After Cotton was convicted, he was sent to prison for life plus 50 years. After 4 years in prison, he was able to get a new trial. Jennifer Thompson once again testified against him. This time Ronald Cotton was given two life sentences. After serving 11 years in prison, DNA evidence finally demonstrated that Ronald Cotton did not commit the crime, was innocent and had served over a decade in prison for a crime he did not commit.

The Misinformation Effect

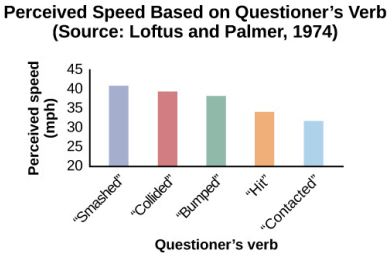
Cognitive psychologist Elizabeth Loftus has conducted extensive research on memory. She has studied false memories as well as recovered memories of childhood abuse. Loftus also developed the misinformation effect paradigm, which holds that after exposure to additional and possibly inaccurate information, 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 8.12). 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.



(a)



(b)

Figure 8.12When people are asked leading questions about an event, their memory of the event may be altered. (credit a: modification of work by Rob Young)

Controversies over Repressed and Recovered Memories

Other researchers have described how whole events, not just words, can be falsely recalled, even when they did not happen. The idea that memories of traumatic events could be repressed has been a theme in the field of psychology, beginning with Sigmund Freud, and the controversy surrounding the idea continues today.

Recall of false autobiographical memories is called false memory syndrome. This syndrome has received a lot of publicity, particularly as it relates to memories of events that do not have independent witnesses—often the only witnesses to the abuse are the perpetrator and the victim (e.g., abuse).

On one side of the debate are those who have recovered memories of childhood abuse years after it occurred. These researchers argue that some children's experiences have been so traumatizing and distressing that they must lock those memories away in order to lead some semblance of a normal life. They believe that repressed memories can be locked away for decades and later recalled intact through hypnosis and guided imagery techniques (Devilly, 2007).

On the other side, Loftus has challenged the idea that individuals can repress memories of traumatic events from childhood and then recover those memories years later through therapeutic techniques such as hypnosis, guided visualization, and age regression. Loftus is not saying that childhood trauma doesn't happen, but she does question whether or not those memories are accurate, and she is skeptical of the questioning process used to access these memories, given that even the slightest suggestion from the therapist can lead to misinformation effects.

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 the 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 states now inform jurors about the possibility of misidentification. Judges can also suppress eyewitness testimony if they deem it unreliable.

Forgetting

"I've a grand memory for forgetting," quipped Robert Louis Stevenson. Forgetting refers to the loss of information from long-term memory. We all forget things, like a loved one's birthday, someone's name, or where we put our car keys. As you've come to see, memory is fragile, and forgetting can be frustrating and even

embarrassing. But why do we forget? To answer this question, we will look at several perspectives on forgetting.

Encoding Failure

Sometimes memory loss happens before the actual memory process begins, which is an encoding failure. We can't remember something if we never stored it in our memory in the first place. This would be like trying to find a book on your e-reader that you never actually purchased and downloaded. Often, in order to remember something, we must pay attention to the details and actively work to process the information (effortful encoding). Lots of times we don't do this. For instance, think of how many times in your life you've seen a penny. Can you accurately recall what the front of a U.S. penny looks like? When researchers Raymond Nickerson and Marilyn Adams (1979) asked this question, they found that most Americans don't know which one it is. The reason is most likely encoding failure. Most of us never encode the details of the penny. 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.

Figure 8.13Can you tell which coin, (a), (b), (c), or (d) is the accurate depiction of a US nickel? The correct answer is (c).

Memory Errors

Psychologist Daniel Schacter (2001), a well-known memory

researcher, offers seven ways our memories fail us. He calls them the seven sins of memory and categorizes them into three groups: forgetting, distortion, and intrusion (Table 8.1).

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

Table 8.1

Let's look at the first sin of the forgetting errors: transience, which means that memories can fade over time. Here's an example of how this happens. Nathan's English teacher has assigned his students to read the novel *To Kill a Mockingbird*. Nathan comes home from school and tells his mom he has to read this book for class. "Oh, I loved that book!" she says. 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 attorney, 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.

In 1885, German psychologist Hermann Ebbinghaus analyzed the process of memorization. First, he memorized lists of nonsense syllables. Then he measured how much he learned (retained) when he attempted to relearn each list. He tested himself over different periods of time from 20 minutes later to 30 days later. The result is his famous forgetting curve (Figure 8.14). Due to storage decay, an average person will lose 50% of the memorized information after 20 minutes and 70% of the information after 24 hours (Ebbinghaus, 1885/1964). Your memory for new information decays quickly and then eventually levels out.

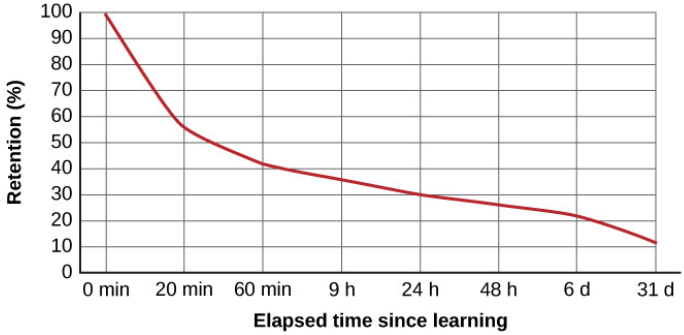


Figure 8.14 The Ebbinghaus forgetting curve shows how quickly memory for new information decays.

Are you constantly losing your cell phone? Have you ever driven back home to make sure you turned off the stove? 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, of 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 somewhere else.

Figure 8.15 Blocking is also known as the 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 three errors of distortion: misattribution, suggestibility, and bias. 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 and then angry look, Alejandra realized she'd committed the error of misattribution.

The second distortion error is suggestibility. Suggestibility is similar to misattribution since it also involves false memories, but it's different. With misattribution, you create the false memory entirely on your own, which is what the victim did in the Donald Thomson case above. With suggestibility, it comes from someone else, such as a therapist or police interviewer asking leading questions of a witness during an interview.

Memories can also be affected by bias, which is the final distortion error. Schacter (2001) says that your feelings and view of the world can actually distort your 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 White 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). Did you really score the winning goal in that big soccer match, or did you just assist?
- 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.

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. It's Schacter's seventh and last memory error. It's actually a failure of our memory system because we involuntarily recall unwanted memories, particularly unpleasant ones (Figure 8.16). 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 8.16Many veterans of military conflicts involuntarily recall unwanted, unpleasant memories. (credit: Department of Defense photo by U.S. Air Force Tech. Sgt. Michael R. Holzworth)

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 8.17). Have you ever gotten a new phone number or moved to a new address, but right after you tell 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 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.

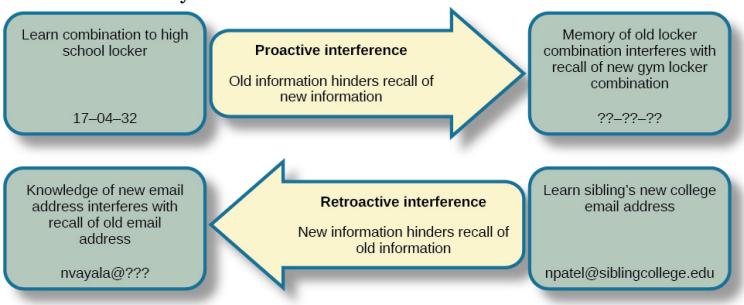


Figure 8.17Sometimes forgetting is caused by a failure to retrieve information. This can be due to interference, either retroactive or proactive.

Learning Objectives

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

- Recognize and apply memory-enhancing strategies
- Recognize and apply effective study techniques

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.

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 8.18). 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). Brian needs to learn the order of the planets in the solar system, but he's having a hard time remembering the correct order. His friend Kelly suggests a mnemonic device that can help him remember. Kelly tells Brian

to simply remember the name Mr. VEM J. SUN, and he can 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.

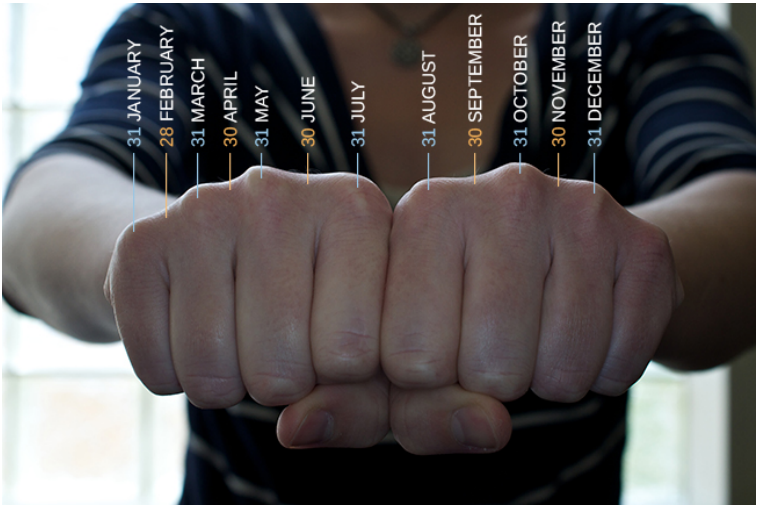


Figure 8.18 This is a knuckle mnemonic to help you remember the number of days in each month. Months with 31 days are represented by the protruding knuckles and shorter months fall in the spots between knuckles. (credit: modification of work by Cory Zanker)

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: Joshua Foer is a science writer who "accidentally" won the U.S. Memory Championships. Watch his TEDTalk, titled "Feats of

Memory Anyone Can Do," in which he explains a mnemonic device called the memory palace to learn more.

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 8.19). The key with any of these strategies is to figure out what works best for you.

Figure 8.19 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 an 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 about 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 keywords related to the concept, such as *i before e, except after c*.

Additional Supplemental Resources

Websites

- The Innocence Project
    - The *Innocence Project* is a non-profit that exonerates the wrongly convicted through DNA testing and reforms the

criminal justice system to prevent future injustices.

Videos

- Bugs Bunny Effect
  - Elizabeth Loftus describes the creation of a false memory. Closed captioning not available.
- Ted-Ed: How memories form and how we lose them
  - In this Ted-Ed video, learn more about the way our brains work to form memories, as well as how we can lose memories over time. A variety of discussion and assessment questions are included with the video (free registration is required to access the questions). Closed captioning available.
- Eyewitness Testimony (Video) Part 1
- Eyewitness Testimony (Video) Part 2
  - In these two videos, follow the story of Ronald Cotton, who was falsely accused and convicted of a crime he didn't commit, and learn how fragile our memory really is. Closed captioning not available.
- Tip of the Tongue
  - What is the Tip of the Tongue phenomenon? Watch this video to learn more about how you can overcome its effects. Closed captioning available.
- How reliable is your memory?
  - In this TED talk, psychologist Elizabeth Loftus discusses her research and work in the field of memory, as well as a variety of ways in which our memory can be unreliable. Closed captioning available.
- Crash Course Video #13 – How We Make Memories
  - This video on how we make memories includes

information on topics such as stages of memory, mnemonics, and levels of processing. Closed captioning available.

- Crash Course Video #14 – Remembering and Forgetting
  - This video on remembering and forgetting includes information on topics such as implicit and explicit memory, encoding, retrieval, and the misinformation effect. Closed captioning available.

- Chunking: Learning Technique for Better Memory and Understanding
  - Try chunking next time you feel the limits of your working memory. Just like how clever restaurants chunks their menus into starters, mains, desserts, with 3-4 options each. With chunking, it's easy to compare our options and make a decision.

- The Memory Palace: Can You Do It?
  - A Memory Palace is an imaginary location in your mind where you can store mental images to remember facts, strings of numbers, shopping lists or all kinds of things. It's hugely popular among memory champions.

- What happens when you remove the hippocampus? – Sam Kean
  - When Henry Molaison (now widely known as H.M.) cracked his skull in an accident, he began blacking out and having seizures. In an attempt to cure him, daredevil surgeon Dr. William Skoville removed H.M.'s hippocampus. Luckily, the seizures did go away – but so did his long-term memory! Sam Kean walks us through this astonishing medical case, detailing everything H.M. taught us about the brain and memory.

- Brain Games Car Crash Memory Experiment
  - Clip of car crash memory experiment from the Brain

Games episode “Retrain Your Brain”. All Rights belong to the National Geographic Channel

Access for free at https://openstax.org/books/psychology-2e/pages/1-introduction

8. Lifespan Development

Figure 9.1 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 (Figure 9.1), 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.

Learning Objectives

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

- Define and distinguish between the three domains of development: physical, cognitive, and psychosocial
- 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

Developmental psychologists study how humans change and grow from conception through childhood, adolescence, adulthood, and death. From the moment we are conceived until the moment we die, we continue to develop. 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.

CONNECT THE CONCEPTS: 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 behavior in its natural context. A developmental psychologist might observe how children behave on a playground, at a daycare center, 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 behavior.

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.

In one classic example of this research method being applied to a study of lifespan development, Sigmund Freud analyzed the development of a child known as

"Little Hans" (Freud, 1909/1949). Freud's findings helped inform his theories of psychosexual development in children, which you will learn about later in this chapter. Little Genie, the subject of a case study discussed in the chapter on thinking and intelligence, provides another example of how psychologists examine developmental milestones through detailed research on a single individual. In Genie's case, her neglectful and abusive upbringing led to her being unable to speak until, at age 13, she was removed from that harmful environment. As she learned to use language, psychologists were able to compare how her language acquisition abilities differed when occurring in her late-stage development compared to the typical acquisition of those skills during the ages of infancy through early childhood (Fromkin, Krashen, Curtiss, Rigler, & Rigler, 1974; Curtiss, 1981).

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, the 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 a 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 Ph.D. 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 behaviors observed in the laboratory translate to an individual's natural environment.

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 colors, 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). For example, in developed countries, children begin school around 5 or 6 years old, but in developing countries, like Nigeria, children often enter school at an advanced age, if at all (Huebler, 2005; United Nations Educational, Scientific, and Cultural Organization [UNESCO], 2013).

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, and keep in mind that all the approaches that we present 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 9.2). With this type of development, there is a 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.

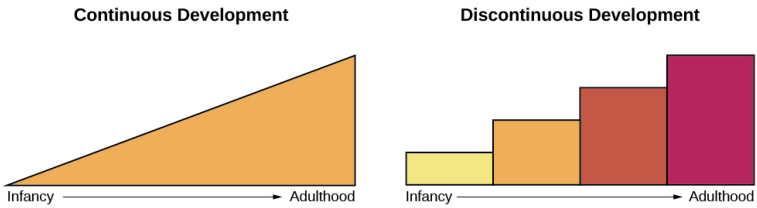


Figure 9.2 The concept of continuous development can be visualized as a smooth slope of progression, whereas discontinuous development sees growth in more discrete stages.

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 behavior?

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 accelerate or inhibit the achievement 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). As you can see, our development is influenced by multiple contexts, so the timing of basic motor functions may vary across cultures. However, the functions themselves are present in all societies (Figure 9.3).

(a)

(b)

Figure 9.3 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)

DIG DEEPER: The Achievement Gap: How Does Socioeconomic Status Affect Development?

The achievement gap refers to the persistent difference in grades, test scores, and graduation rates that exist among students of different ethnicities, races, and—in certain subjects—sexes (Winerman, 2011). Research suggests that these achievement gaps are strongly influenced by differences in socioeconomic factors that exist among the families of these children. While the researchers acknowledge that programs aimed at reducing such socioeconomic discrepancies would likely aid in equalizing the aptitude and performance of children from different backgrounds, they recognize that such large-scale interventions would be difficult to achieve. Therefore, it is recommended that programs aimed at fostering aptitude and achievement among disadvantaged children may be the best option for dealing with issues related to academic achievement gaps (Duncan & Magnuson, 2005).

Low-income children perform significantly more poorly than their middle- and high-income peers on a number of educational variables: They have significantly lower standardized test scores, graduation rates, and college entrance rates, and they have much higher school dropout rates. There have been attempts to correct the achievement gap through state and federal

legislation, but what if the problems start before the children even enter school?

Psychologists Betty Hart and Todd Risley (2006) spent their careers looking at early language ability and progression of children in various income levels. In one longitudinal study, they found that although all the parents in the study engaged and interacted with their children, middle- and high-income parents interacted with their children differently than low-income parents. After analyzing 1,300 hours of parent-child interactions, the researchers found that middle- and high-income parents talk to their children significantly more, starting when the children are infants. By 3 years old, high-income children knew almost double the number of words known by their low-income counterparts, and they had heard an estimated total of 30 million more words than the low-income counterparts (Hart & Risley, 2003). And the gaps only become more pronounced. Before entering kindergarten, high-income children score 60% higher on achievement tests than their low-income peers (Lee & Burkam, 2002).

There are solutions to this problem. At the University of Chicago, experts are working with low-income families, visiting them at their homes, and encouraging them to speak more to their children on a daily and hourly basis. Other experts are designing preschools in which students from diverse economic backgrounds are placed in the same classroom. In this research, low-income children made significant gains in their language development, likely as a result of attending the specialized preschool (Schechter & Byeb, 2007). What

other methods or interventions could be used to decrease the achievement gap? What types of activities could be implemented to help the children of your community or a neighboring community?

How Do Nature and Nurture Influence Development?

Are we who we are because of nature (biology and genetics), or are we who we are because of nurture (our environment and culture)? This longstanding question is known in psychology as the nature versus nurture debate. It seeks to understand how our personalities and traits are the product of our genetic makeup and biological factors, and how they are shaped by our environment, including our parents, peers, and culture. For instance, why do biological children sometimes act like their parents—is it because of genetics or because of early childhood environment and what the child has learned from the parents? What about children who are adopted—are they more like their biological families or more like their adoptive families? And how can siblings from the same family be so different?

We are all born with specific genetic traits inherited from our parents, such as eye color, height, and certain personality traits. Beyond our basic genotype, however, there is 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.

It may seem obvious that we are born with certain characteristics while others are acquired, and yet of the three great questions about humans' relationship with the natural world, only nature-nurture gets referred to as a "debate." In the history of psychology, no other question has caused so much controversy and offense: We are so concerned with nature-nurture because our very sense of moral character seems to depend on it. While we may admire the athletic skills of a great basketball player, we think of his height as simply a gift, a payoff in the "genetic lottery." For the same reason, no one blames a short person for his height or someone's congenital disability on poor decisions: To state the obvious, it's "not their fault." But we do praise the concert violinist (and perhaps her parents and teachers as well) for her dedication, just as we condemn cheaters, slackers, and bullies for their bad behavior.

The problem is, most human characteristics aren't usually as clear-cut as height or instrument-mastery, affirming our nature-nurture expectations strongly one way or the other. In fact, even the great violinist might have some inborn qualities—perfect pitch, or long, nimble fingers—that support and reward her hard work. And the basketball player might have eaten a diet while growing up that promoted his genetic tendency for being tall. When we think about our own qualities, they seem under our control in some respects, yet beyond our control in others. And often the traits that don't seem to have an obvious cause are the ones that concern us the most and are far more personally significant. What about how much we drink or worry? What about our honesty, or religiosity, or sexual orientation? They all come from that uncertain zone, neither fixed by nature nor totally under our own control.

Researchers have learned a great deal about the nature-nurture dynamic by working with animals. But of course, many of the techniques used to study animals cannot be applied to people. Separating these two influences in human subjects is a greater research challenge. [Image: Sebastián Dario, https://goo.gl/OPiIWd, CC BY-NC 2.0, https://goo.gl/FIlc2e]

One major problem with answering nature-nurture questions about people is, how do you set up an experiment? In nonhuman animals, there are relatively straightforward experiments for tackling nature-nurture questions. Say, for example, you are interested in aggressiveness in dogs. You want to test for the more important determinant of aggression: being born to aggressive dogs or being raised by them. You could mate two aggressive dogs–angry Chihuahuas–together, and mate two nonaggressive dogs–happy

beagles—together, then switch half the puppies from each litter between the different sets of parents to raise. You would then have puppies born to aggressive parents (the Chihuahuas) but being raised by nonaggressive parents (the Beagles), and vice versa, in litters that mirror each other in puppy distribution. The big questions are: Would the Chihuahua parents raise aggressive beagle puppies? Would the beagle parents raise *non*aggressive Chihuahua puppies? Would the puppies' *nature* win out, regardless of who raised them? Or… would the result be a combination of nature *and* nurture? Much of the most significant nature-nurture research has been done in this way (Scott & Fuller, 1998), and animal breeders have been doing it successfully for thousands of years. In fact, it is fairly easy to breed animals for behavioral traits.

With people, however, we can't assign babies to parents at random, or select parents with certain behavioral characteristics to mate, merely in the interest of science (though history does include horrific examples of such practices, in misguided attempts at "eugenics," the shaping of human characteristics through intentional breeding). In typical human families, children's biological parents raise them, so it is very difficult to know whether children act like their parents due to genetic (nature) or environmental (nurture) reasons. Nevertheless, despite our restrictions on setting up human-based experiments, we do see real-world examples of nature-nurture at work in the human sphere—though they only provide partial answers to our many questions.

The science of how genes and environments work together to influence behavior is called behavioral genetics. The easiest opportunity we have to observe this is the adoption study. When children are put up for adoption, the parents who give birth to them are no longer the parents who raise them. This setup isn't quite the same as the experiments with dogs (children aren't assigned to random adoptive parents in order to suit the particular interests of a scientist) but adoption still tells us some interesting things or at least confirms some basic expectations. For instance, if the biological child of tall parents were adopted into a family of short

people, do you suppose the child's growth would be affected? What about the biological child of a Spanish-speaking family adopted at birth into an English-speaking family? What language would you expect the child to speak? And what might these outcomes tell you about the difference between height and language in terms of nature-nurture?

Studies focused on twins have led to important insights into the biological origins of many personality characteristics.

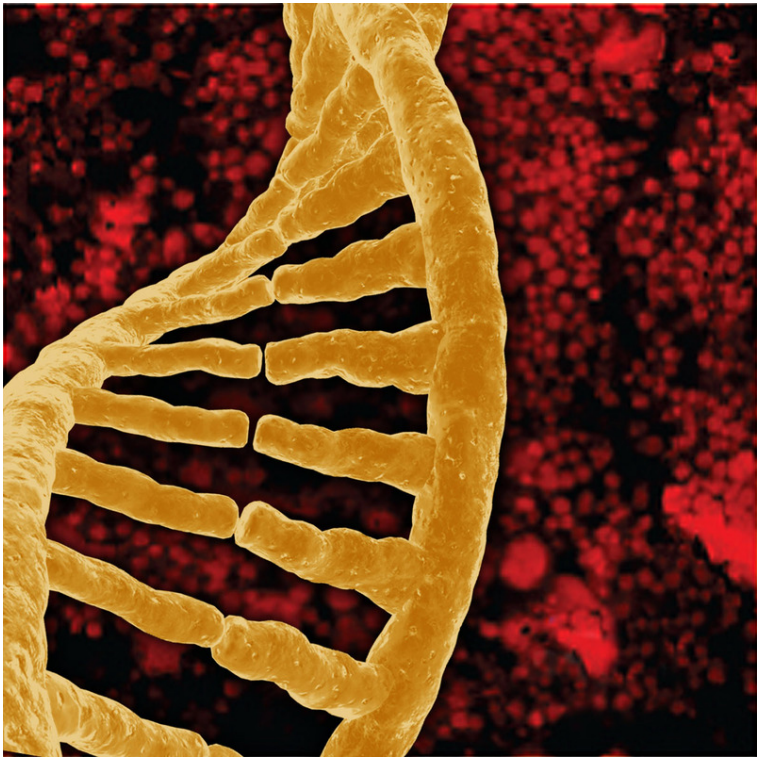
Another option for observing nature-nurture in humans involves twin studies. There are two types of twins: monozygotic

(MZ) and dizygotic (DZ). Monozygotic twins, also called "identical" twins, result from a single zygote (fertilized egg) and have the same DNA. They are essentially clones. Dizygotic twins, also known as "fraternal" twins, develop from two zygotes and share 50% of their DNA. Fraternal twins are ordinary siblings who happen to have been born at the same time. To analyze nature-nurture using twins, we compare the similarity of MZ and DZ pairs. Sticking with the features of height and spoken language, let's take a look at how nature and nurture apply: Identical twins, unsurprisingly, are almost perfectly similar for height. The heights of fraternal twins, however, are like any other sibling pairs: more similar to each other than to people from other families, but hardly identical. This contrast between twin types gives us a clue about the role genetics plays in determining height. Now consider spoken language. If one identical twin speaks Spanish at home, the co-twin with whom she is raised almost certainly does too. But the same would be true for a pair of fraternal twins raised together. In terms of spoken language, fraternal twins are just as similar as identical twins, so it appears that the genetic match of identical twins doesn't make much difference.

Twin and adoption studies are two instances of a much broader class of methods for observing nature-nurture called quantitative genetics, the scientific discipline in which similarities among individuals are analyzed based on how biologically related they are. We can do these studies with siblings and half-siblings, cousins, twins who have been separated at birth and raised separately (Bouchard, Lykken, McGue, & Segal, 1990; such twins are very rare and play a smaller role than is commonly believed in the science of nature-nurture), or with entire extended families (see Plomin, DeFries, Knopik, & Neiderhiser, 2012, for a complete introduction to research methods relevant to nature-nurture).

For better or for worse, contentions about nature-nurture have intensified because quantitative genetics produces a number called a heritability coefficient, varying from 0 to 1, that is meant to provide a single measure of genetics' influence on a trait. In a

general way, a heritability coefficient measures how strongly differences among individuals are related to differences among their genes. But beware Heritability coefficients, although simple to compute, are deceptively difficult to interpret. Nevertheless, numbers that provide simple answers to complicated questions tend to have a strong influence on the human imagination, and a great deal of time has been spent discussing whether the heritability of intelligence or personality or depression is equal to one number or another.



Quantitative genetics uses statistical methods to study the effects that both heredity and environment have on test subjects. These methods have provided us with the heritability coefficient which measures how strongly differences among individuals for a trait are related to differences among their genes. [Image: EMSL, https://goo.gl/IRfn9g, CC BY-NC-SA 2.0, https://goo.gl/fbv27n]

One reason nature-nurture continues to fascinate us so much is that we live in an era of great scientific discovery in genetics, comparable to the times of Copernicus, Galileo, and Newton, with regard to astronomy and physics. Every day, it seems, new discoveries are made, new possibilities proposed. When Francis Galton first started thinking about nature-nurture in the late-19th century he was very influenced by his cousin, Charles Darwin, but genetics *per se* was unknown. Mendel's famous work with peas, conducted at about the same time, went undiscovered for 20 years; quantitative genetics was developed in the 1920s; DNA was discovered by Watson and Crick in the 1950s; the human genome was completely sequenced at the turn of the 21st century; and we are now on the verge of being able to obtain the specific DNA sequence of anyone at a relatively low cost. No one knows what this new genetic knowledge will mean for the study of nature-nurture, but as we will see in the next section, answers to nature-nurture questions have turned out to be far more difficult and mysterious than anyone imagined.

What Have We Learned About Nature-Nurture?

It would be satisfying to be able to say that nature-nurture studies have given us conclusive and complete evidence about where traits come from, with some traits clearly resulting from genetics and others almost entirely from environmental factors, such as childrearing practices and personal will; but that is not the case. Instead, *everything* has turned out to have some footing in genetics. The more genetically-related people are, the more similar they are—for *everything*: height, weight, intelligence, personality, mental illness, etc. Sure, it seems like common sense that some traits have a genetic bias. For example, adopted children resemble their

biological parents even if they have never met them, and identical twins are more similar to each other than are fraternal twins. And while certain psychological traits, such as personality or mental illness (e.g., schizophrenia), seem reasonably influenced by genetics, it turns out that the same is true for political attitudes, how much television people watch (Plomin, Corley, DeFries, & Fulker, 1990), and whether or not they get divorced (McGue & Lykken, 1992).

Research over the last half-century has revealed how central genetics are to behavior. The more genetically related people are the more similar they are not just physically but also in terms of personality and behavior. [Image: Paul Altobelli, https://goo.gl/SWLwm2, CC BY 2.0, https://goo.gl/9uSnqN]

It may seem surprising, but the genetic influence on behavior is a relatively recent discovery. In the middle of the 20th century,

psychology was dominated by the doctrine of behaviorism, which held that behavior could only be explained in terms of environmental factors. Psychiatry concentrated on psychoanalysis, which probed for roots of behavior in individuals' early life-histories. The truth is, neither behaviorism nor psychoanalysis is incompatible with genetic influences on behavior, and neither Freud nor Skinner was naive about the importance of organic processes in behavior. Nevertheless, in their day it was widely thought that children's personalities were shaped entirely by imitating their parents' behavior and that schizophrenia was caused by certain kinds of "pathological mothering." Whatever the outcome of our broader discussion of nature-nurture, the basic fact that the best predictors of an adopted child's personality or mental health are found in the biological parents he or she has never met, rather than in the adoptive parents who raised him or her, presents a significant challenge to purely environmental explanations of personality or psychopathology. The message is clear: You can't leave genes out of the equation. But keep in mind, no behavioral traits are completely inherited, so you can't leave the environment out altogether, either.

Trying to untangle the various ways nature-nurture influences human behavior can be messy, and often common-sense notions can get in the way of good science. One very significant contribution of behavioral genetics that has changed psychology for good can be very helpful to keep in mind: When your subjects are biologically-related, no matter how clearly a situation may seem to point to environmental influence, it is never safe to interpret a behavior as wholly the result of nurture without further evidence. For example, when presented with data showing that children whose mothers read to them often are likely to have better reading scores in third grade, it is tempting to conclude that reading to your kids out loud is important to success in school; this may well be true, but the study as described is inconclusive because there are genetic *as well as* environmental pathways between the parenting practices of mothers and the abilities of their children. This is a case where "correlation does not imply causation," as they say. To establish

that reading aloud causes success, a scientist can either study the problem in adoptive families (in which the genetic pathway is absent) or by finding a way to randomly assign children to oral reading conditions.

The outcomes of nature-nurture studies have fallen short of our expectations (of establishing clear-cut bases for traits) in many ways. The most disappointing outcome has been the inability to organize traits from *more*– to *less*-genetic. As noted earlier, everything has turned out to be at least *somewhat* heritable (passed down), yet nothing has turned out to be *absolutely* heritable, and there hasn't been much consistency as to which traits are *more* heritable and which are *less* heritable once other considerations (such as how accurately the trait can be measured) are taken into account (Turkheimer, 2000). The problem is conceptual: The heritability coefficient, and, in fact, the whole quantitative structure that underlies it, does not match up with our nature-nurture intuitions. We want to know how "important" the roles of genes and environment are to the development of a trait, but in focusing on "important" maybe we're emphasizing the wrong thing. First of all, genes and environment are both crucial to *every* trait; without genes, the environment would have nothing to work on, and too, genes cannot develop in a vacuum. Even more important, because nature-nurture questions look at the differences among people, the cause of a given trait depends not only on the trait itself but also on the differences in that trait between members of the group being studied.

The answer to the nature-nurture question has not turned out to be as straightforward as we would like. The many questions we can ask about the relationships among genes, environments, and human traits may have many different answers, and the answer to one tells us little about the answers to the others. [Image: Sundaram Ramaswamy, https://goo.gl/Bv8lp6, CC BY 2.0, https://goo.gl/9uSnqN]

The difficulties with finding clear-cut solutions to nature-nurture problems bring us back to the other great questions about our relationship with the natural world: the mind-body problem and free will. Investigations into what we mean when we say we are aware of something reveal that consciousness is not simply the product of a particular area of the brain, nor does choice turn out to be an orderly activity that we can apply to some behaviors but

not others. So it is with nature and nurture: What at first may seem to be a straightforward matter, able to be indexed with a single number, becomes more and more complicated the closer we look. The many questions we can ask about the intersection among genes, environments, and human traits—how sensitive are traits to environmental change, and how common are those influential environments; are parents or culture more relevant; how sensitive are traits to differences in genes, and how much do the relevant genes vary in a particular population; does the trait involve a single gene or a great many genes; is the trait more easily described in genetic or more-complex behavioral terms?—may have different answers, and the answer to one tells us little about the answers to the others.

It is tempting to predict that the more we understand the wide-ranging effects of genetic differences on all human characteristics—especially behavioral ones—our cultural, ethical, legal, and personal ways of thinking about ourselves will have to undergo profound changes in response. Perhaps criminal proceedings will consider genetic background. Parents, presented with the genetic sequence of their children, will be faced with difficult decisions about reproduction. These hopes or fears are often exaggerated. In some ways, our thinking may need to change—for example, when we consider the meaning behind the fundamental American principle that all men are created equal. Human beings differ, and like all evolved organisms they differ genetically. The Declaration of Independence predates Darwin and Mendel, but it is hard to imagine that Jefferson—whose genius encompassed botany as well as moral philosophy—would have been alarmed to learn about the genetic diversity of organisms. One of the most important things modern genetics has taught us is that almost all human behavior is too complex to be nailed down, even from the most complete genetic information, unless we're looking at identical twins. The science of nature and nurture has demonstrated that genetic differences among people are vital to human moral equality, freedom, and self-determination, not

opposed to them. As Mordecai Kaplan said about the role of the past in Jewish theology, genetics gets a vote, not a veto, in the determination of human behavior. We should indulge our fascination with nature-nurture while resisting the temptation to oversimplify it.

CONNECT THE CONCEPTS: 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 behavior 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 (i.e., attenuating temperament), body (i.e., may be less prone to high blood pressure), and social environment (i.e., may seek people who are similar to them).

From the moment we are conceived until the moment we die, we continue to develop.

As discussed at the beginning of this chapter, developmental psychologists often divide our development into three areas: physical development, cognitive development, and psychosocial development. Mirroring Erikson's stages, lifespan development is divided into different stages that are based on age. We will discuss prenatal, infant, child, adolescent, and adult development.

Learning Objectives

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

- Describe the stages of prenatal development, infancy, childhood, and adolescence
- Describe the stages of emerging, early, middle, and late adulthood

Prenatal Development

Figure 4. *An embryo at 8 weeks of development.*

Conception occurs and development begins. There are three stages of prenatal development: germinal, embryonic, and fetal periods. All of the major structures of the body are forming and the health of the mother is of primary concern. There are various approaches to labor, delivery, and childbirth, with potential complications of pregnancy and delivery, as well as risks and complications with newborns, but also advances in tests, technology, and medicine. The influences of nature (e.g., genetics) and nurture (e.g., nutrition and teratogens, which are environmental factors during pregnancy that can lead to birth defects) are evident. Evolutionary psychology, along with studies of twins and adoptions, help us understand the interplay of factors and the relative influences of nature and nurture on human development.

Infancy and Toddlerhood

Figure 5*. Major development happens during the first two years of life, as evidenced by this newborn baby and his toddler brother.*

The first year and a half to two years of life are ones of dramatic growth and change. A newborn, with many involuntary reflexes and a keen sense of hearing but poor vision, is transformed into a walking, talking toddler within a relatively short period of time. Caregivers similarly transform their roles from those who manage feeding and sleep schedules to constantly moving guides and safety inspectors for mobile, energetic children. Brain development happens at a remarkable rate, as does physical growth and language development. Infants have their own temperaments and approaches to play. Interactions with primary caregivers (and others) undergo changes influenced by possible separation anxiety and the development of attachment styles. Social and cultural issues center around breastfeeding or formula-feeding, sleeping in cribs or in the bed with parents, toilet training, and whether or not to get vaccinations.

Early Childhood

Figure 6. *Early childhood, or the preschool years, around ages 2-6, is filled with incredible amounts of growth and change.*

Early childhood is also referred to as the preschool years, consisting of the years that follow toddlerhood and precede formal schooling, roughly from around ages 2 to 5 or 6. As a preschooler, the child is busy learning language (with amazing growth in vocabulary), is gaining a sense of self and greater independence, and is beginning to learn the workings of the physical world. This knowledge does not come quickly, however, and preschoolers may initially have interesting conceptions of size, time, space, and distance, such as demonstrating how long something will take by holding out their two index fingers several inches apart. A toddler's fierce determination to do something may give way to a four-year-old's sense of guilt for doing something that brings the disapproval of others.

Middle Childhood

Figure 7. *Middle childhood spans most of what is traditionally primary school, or the ages between 6-11.*

The ages of 6-11 comprise middle childhood and much of what children experience at this age is connected to their involvement in the early grades of school. Now the world becomes one of learning and testing new academic skills and assessing one's abilities and accomplishments by making comparisons between self and others. Schools participate in this process by comparing students and making these comparisons public through team sports, test scores, and other forms of recognition. The brain reaches its adult size around age seven, but it continues to develop. Growth rates slow down and children are able to refine their motor skills at this point in life. Children also begin to learn about social relationships beyond the family through interaction with friends and fellow students; same-sex friendships are particularly salient during this period.

Adolescence

Figure 8. *Adolescence, or the age roughly between 12–18, is marked by puberty and sexual maturation, accompanied by major socioemotional changes.*

Adolescence is a period of dramatic physical change marked by an overall physical growth spurt and sexual maturation, known as puberty; timing may vary by gender, cohort, and culture. It is also a time of cognitive change as the adolescent begins to think of new possibilities and to consider abstract concepts such as love, fear, and freedom. Ironically, adolescents have a sense of invincibility that puts them at greater risk of dying from accidents or contracting sexually transmitted infections that can have lifelong consequences. Research on brain development helps us understand teen risk-taking and impulsive behavior. A major developmental task during adolescence involves establishing one's own identity. Teens typically struggle to become more independent from their parents. Peers become more important, as teens strive for a sense of belonging and acceptance; mixed-sex peer groups become more common. New roles and responsibilities are explored, which may involve dating, driving, taking on a part-time job, and planning for future academics.

Emerging Adulthood

The next stage of development is emerging adulthood. This is a relatively newly defined period of lifespan development spanning from 18 years old to the mid-20s, characterized as an in-between time where identity exploration is focused on work and love. When does a person become an adult? There are many ways to answer this question. In the United States, you are legally considered an adult at 18 years old. But other definitions of adulthood vary widely; in sociology, for example, a person may be considered an adult when she becomes self-supporting, chooses a career, gets married, or starts a family. The ages at which we achieve these milestones vary from person to person as well as from culture to culture.

Why is it taking twentysomethings so long to grow up? It seems that emerging adulthood is a product of both Western culture and

our current times (Arnett, 2000). People in developed countries are living longer, allowing the freedom to take an extra decade to start a career and family. Changes in the workforce also play a role. For example, 50 years ago, a young adult with a high school diploma could immediately enter the workforce and climb the corporate ladder. That is no longer the case. Bachelor's and even graduate degrees are required more and more often—even for entry-level jobs (Arnett, 2000). In addition, many students are taking longer (five or six years) to complete a college degree as a result of working and going to school at the same time. After graduation, many young adults return to the family home because they have difficulty finding a job. Changing cultural expectations may be the most important reason for the delay in entering adult roles. Young 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 (Arnett, 2000).

Early Adulthood

Figure 9. *Early adulthood, roughly ages 20-40, may be split into yet another category of "emerging adulthood," as there are often profound differences between younger adults and those in their late 30s.*

Late teens, twenties, and thirties are often thought of as early adulthood (students who are in their mid to late 30s may love to hear that they are young adults!). It is a time when we are at our physiological peak but are most at risk for involvement in violent crimes and substance abuse. It is a time of focusing on the future and putting a lot of energy into making choices that will help one earn the status of a full adult in the eyes of others. Love and work are the primary concerns at this stage of life. In recent decades, it has been noted (in the U.S. and other developed countries) that young adults are taking longer to "grow up." They are waiting longer to move out of their parents' homes, finish their formal education, take on work/careers, get married, and have children. One psychologist, Jeffrey Arnett, has proposed that there is a new stage

of development after adolescence and before early adulthood, called "emerging adulthood," from 18 to 25 (or even 29) when individuals are still exploring their identities and don't quite feel like adults yet. Cohort, culture, time in history, the economy, and socioeconomic status may be key factors in when youth take on adult roles.

Middle Adulthood

Figure 10. *Middle adulthood spans the years between ages 40-65.*

Age 40 through the mid-60s are referred to as middle adulthood. This is a period in which physiological aging that began earlier becomes more noticeable and a period at which many people are at their peak of productivity in love and work. It may be a period of gaining expertise in certain fields and being able to understand problems and find solutions with greater efficiency than before. It can also be a time of becoming more realistic about possibilities

in life; of recognizing the difference between what is possible and what is likely. Referred to as the sandwich generation, middle-aged adults may be in the middle of taking care of their children and also taking care of their aging parents. While caring about others and the future, middle-aged adults may also be questioning their own mortality, goals, and commitments, though not necessarily experiencing a "mid-life crisis."

Late Adulthood

Figure 11. *Late adulthood is generally viewed as age 65 and older, but there are incredible variations in health and lifestyle between the "young old" and the "oldest old," who may be well into their 100s.*

This period of the lifespan, late adulthood, has increased in the last 100 years, particularly in industrialized countries, as average life expectancy has increased. Late adulthood covers a wide age range with a lot of variation, so it is helpful to divide it into categories such

as the “young old” (65-74 years old), “old old” (75-84 years old), and “oldest old” (85+ years old). The young old are similar to middle-aged adults; possibly still working, married, relatively healthy, and active. The old old have some health problems and challenges with daily living activities; the oldest old are often frail and in need of long-term care. However, many factors are involved and a better way to appreciate the diversity of older adults is to go beyond chronological age and examine whether a person is experiencing optimal aging (like the gentleman pictured in Figure 8 who is in very good health for his age and continues to have an active, stimulating life), normal aging (in which the changes are similar to most of those of the same age), or impaired aging (referring to someone who has more physical challenge and disease than others of the same age).

Death and Dying

Figure 12. *How people think about death, approach death, and cope with death vary depending on many factors. Photo Courtesy Robert Paul Young*

The study of death and dying is seldom given the amount of coverage it deserves. Of course, there is a certain discomfort in thinking about death, but there is also a certain confidence and acceptance that can come from studying death and dying. Factors such as age, religion, and culture play important roles in attitudes and approaches to death and dying. There are different types of death: physiological, psychological, and social. The most common causes of death vary with age, gender, race, culture, and time in history. Dying and grieving are processes and may share certain stages of reactions to loss. There are interesting examples of

cultural variations in death rituals, mourning, and grief. The concept of a "good death" is described as including personal choices and the involvement of loved ones throughout the process. Palliative care is an approach to maintain dying individuals' comfort level, and hospice is a movement and practice that involves professional and volunteer care and loved ones. Controversy surrounds euthanasia (helping a person fulfill their wish to die)—active and passive types, as well as physician-assisted suicide, and legality varies within the United States.

DIG DEEPER: Stress and Aging: A Tale of Telomeres

Have you ever wondered why people who are stressed often seem to have a haggard look about them? A pioneering study from 2004 suggests that the reason is that stress can actually accelerate the cell biology of aging.

Stress, it seems, can shorten telomeres, which are segments of DNA that protect the ends of chromosomes. Shortened telomeres can inhibit or block cell division, which includes the growth and proliferation of new cells, thereby leading to more rapid aging (Sapolsky, 2004). In the study, researchers compared telomere lengths in the white blood cells in mothers of chronically ill children to those of mothers of healthy children (Epel et al., 2004). Mothers of chronically ill children would be expected to experience more stress than would mothers of healthy children.

The longer a mother had spent caring for her ill child, the shorter her telomeres (the correlation between years of caregiving and telomere length was $r = -.40$). In addition, higher levels of perceived stress were negatively correlated with telomere size ($r = -.31$). These researchers also found that the average telomere length of the most stressed mothers, compared to the least stressed, was similar to what you would find in people who were 9–17 years older than they were on average.

Numerous other studies have continued to find associations between stress and eroded telomeres (Blackburn & Epel, 2012). Some studies have even demonstrated that stress can begin to erode telomeres in childhood and perhaps even before children are born. For example, childhood exposure to violence (e.g., maternal domestic violence, bullying victimization, and physical maltreatment) was found in one study to accelerate telomere erosion from ages 5 to 10 (Shalev et al., 2013). Another study reported that young adults whose mothers had experienced severe stress during their pregnancy had shorter telomeres than did those whose mothers had stress-free and uneventful pregnancies (Entringer et al., 2011). Further, the corrosive effects of childhood stress on telomeres can extend into young adulthood. In an investigation of over 4,000 U.K. women ages 41–80, adverse experiences during childhood (e.g., physical abuse, being sent away from home, and parent divorce) were associated with shortened telomere length (Surtees et al., 2010), and telomere size decreased as the amount of experienced adversity increased (Figure 14.16).

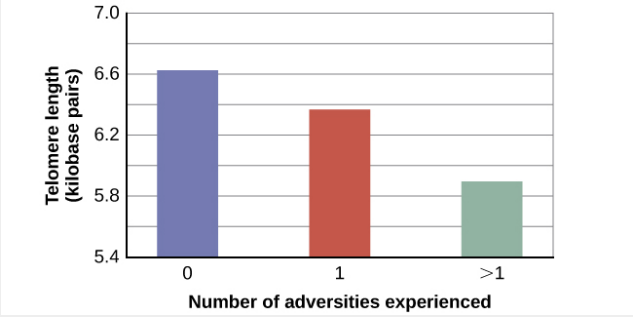


Figure 14.16Telomeres are shorter in adults who experienced more trauma as children (adapted from Blackburn & Epel, 2012).

Efforts to dissect the precise cellular and physiological mechanisms linking short telomeres to stress and disease are currently underway. For the time being, telomeres provide us with yet another reminder that stress, especially during early life, can be just as harmful to our health as smoking or fast food (Blackburn & Epel, 2012).

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 behavior 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.

Freud's Stages of Psychosexual Development				
Stage	**Age (years)**	**Erogenous Zone**	**Major Conflict**	**Adult Fixation Example**
Oral	0–1	Mouth	Weaning off breast or bottle	Smoking, overeating
Anal	1–3	Anus	Toilet training	Neatness, messiness
Phallic	3–6	Genitals	Oedipus/Electra complex	Vanity, overambition
Latency	6–12	None	None	None
Genital	12+	Genitals	None	None

Table 11.1

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. Other psychologists, often called the Neo-Freudians built off of Freud's original theories, but made them their own. One prominent Neo-Freudian was Erik Erikson.

Psychosocial Theory of Development

Erik Erikson (1902–1994) (Figure 9.4), 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 9.4 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.

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

Table 9.1

Cognitive Theory of Development

Jean Piaget (1896–1980) is another stage theorist who studied childhood development (Figure 9.5). 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 9.5Jean 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 Abdul learned the schema for dogs because his family has a Labrador retriever. When Abdul sees other dogs in his picture books, he says, “Look mommy, dog!” Thus, he has assimilated them into his schema for dogs. One day, Abdul sees

a sheep for the first time and says, “Look mommy, dog!” Having a basic schema that a dog is an animal with four legs and fur, Abdul thinks all furry, four-legged creatures are dogs. When Abdul’s mom tells him that the animal he sees is a sheep, not a dog, Abdul must accommodate his schema for dogs to include more information based on his new experiences. Abdul’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 9.2).

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

Table 9.2

As with other major contributors to theories of development, several of Piaget’s ideas have come under criticism based on the results of further research. For example, 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).

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 discerning right from wrong. Psychologist Lawrence Kohlberg (1927–1987) extended upon the foundation that Piaget built regarding cognitive development. Kohlberg believed that moral development, like cognitive development, follows a series of stages. To develop this theory, Kohlberg posed moral dilemmas to people of all ages, and then he analyzed their answers to find evidence of their particular stage of moral development.

After presenting people with this and various other moral dilemmas, Kohlberg reviewed people's responses and placed them in different stages of moral reasoning (Figure 9.6). According to Kohlberg, an individual progresses from the capacity for pre-conventional morality (before age 9) to the capacity for conventional

morality (early adolescence), and toward attaining post-conventional morality (once formal operational thought is attained), which only a few fully achieve.

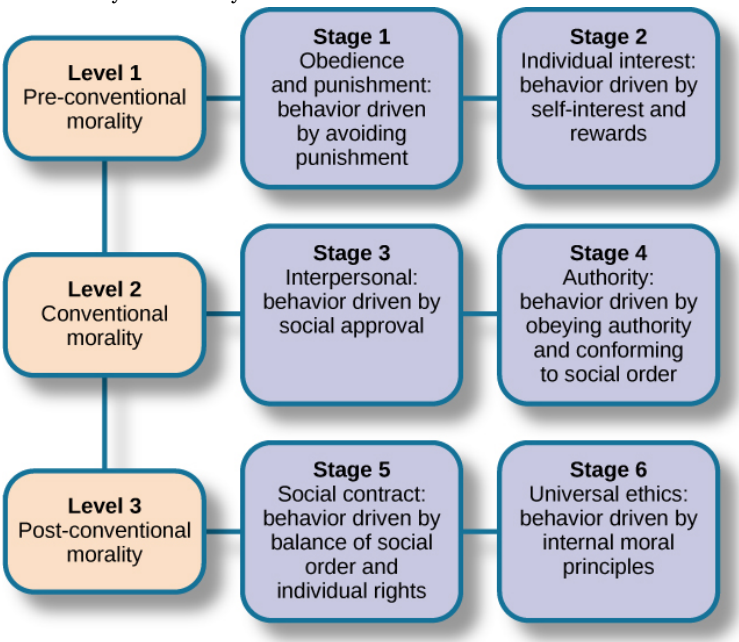


Figure 9.6Kohlberg identified three levels of moral reasoning: pre-conventional, conventional, and post-conventional: Each level is associated with increasingly complex stages of moral development.

It is important to realize that even those people who have the most sophisticated, post-conventional reasons for some choices may make other choices for the simplest of pre-conventional reasons. Many psychologists agree with Kohlberg's theory of moral development but point out that moral reasoning is very different from moral behavior. Sometimes what we say we would do in a situation is not what we actually do in that situation. In other words, we might "talk the talk," but not "walk the walk."

How does this theory apply to males and females? Kohlberg (1969) felt that more males than females move past stage four in their moral development. He went on to note that women seem to be

deficient in their moral reasoning abilities. These ideas were not well received by Carol Gilligan, a research assistant of Kohlberg, who consequently developed her own ideas of moral development. In her groundbreaking book, *In a Different Voice: Psychological Theory and Women's Development*, Gilligan (1982) criticized her former mentor's theory because it was based only on upper-class White men and boys. She argued that women are not deficient in their moral reasoning–she proposed that males and females reason differently. Girls and women focus more on staying connected and the importance of interpersonal relationships.

Additional Supplemental Resources

Websites

- Geropsychology: It's Your future
  - This website discusses the growing need for geropsychologists, psychologists who work with older adults and lists a variety of opportunities within the field.
- Exploring Careers in Aging Roadmaps
  - This step-by-step educational roadmap to help guide students through undergrad and graduate school to find a career in aging.

Videos

- What do Babies Think?
  - The ways in which we process information changes over

time, and in this video you'll take a look at how the thinking of infants differs from that of other age groups. Closed captioning available.

- Crash Course Video #18 – The Growth of Knowledge
  - This video on the growth of knowledge includes information on topics such as maturation, Piaget's theory, and Vygotsky's theory. Closed captioning available.
- Crash Course Video #19 – Monkeys and Morality
  - This video on monkeys and morality includes information on experiments by Harlow and Ainsworth, parenting styles, and the development of morality. Closed captioning available.
- Crash Course Video #20 – Adolescence
  - This video on adolescence includes information on topics such as Erikson's stages, fluid and crystallized intelligence, and dementia. Closed captioning available.
- Studying brains as we age
  - Learn more about how psychology research is conducted through the work of a neuropsychologist who studies how cultural experiences affect our brains as we age. Closed captioning available.
- Working with children to understand how brains develop
  - See how developmental psychologists conduct research with young children. Closed captioning available.

Access for free at https://openstax.org/books/psychology-2e/pages/1-introduction

9. Emotion and Motivation

Figure 10.1 Emotions can change in an instant, especially in response to an unexpected event. Surprise, fear, anger, and sadness are some immediate emotions that people experienced in the aftermath of the April 15, 2013 Boston Marathon bombing. What are emotions? What causes them? What motivated some bystanders to immediately help others, while other people ran for safety? (credit: modification of work by Aaron "tango" Tang)

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 behavior. You will learn about the physiological needs that drive some human behaviors, 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 behaviors. 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 on 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.

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 Maslow's hierarchy of needs

Why do we do the things we do? What motivations underlie our behaviors? Motivation describes the wants or needs that direct behavior toward a goal. In addition to biological motives, motivations can be intrinsic (arising from internal factors) or extrinsic (arising from external factors) (Figure 10.2). Intrinsically motivated behaviors are performed because of the sense of personal satisfaction that they bring, while extrinsically motivated behaviors are performed in order to receive something from others.

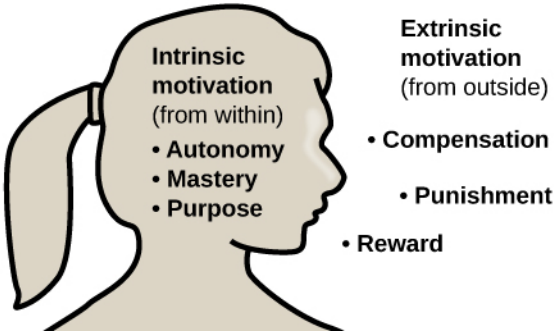


Figure 10.2 Intrinsic motivation comes from within the individual, while extrinsic motivation comes from outside the individual.

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 behaviors that we enjoy leads to those behaviors being thought of as work no longer providing that same enjoyment. As a result, we might spend less time engaging in these reclassified behaviors in the absence of any extrinsic reinforcement. For example, Odessa loves baking, so in her free time, she bakes for fun. Oftentimes, after stocking shelves at her grocery store job, she often whips up pastries in the evenings because she enjoys baking.

When a coworker in the store's bakery department leaves his job, Odessa applies for his position and gets transferred to the bakery department. Although she enjoys what she does in her new job, after a few months, she no longer has much desire to concoct tasty treats in her free time. Baking has become work in a way that changes her motivation to do it (Figure 10.3). 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 10.3 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 her free time might remain high if, for example, customers regularly compliment her 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 the 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 the intrinsic motivation for the task tends to persist (Deci et al., 1999).

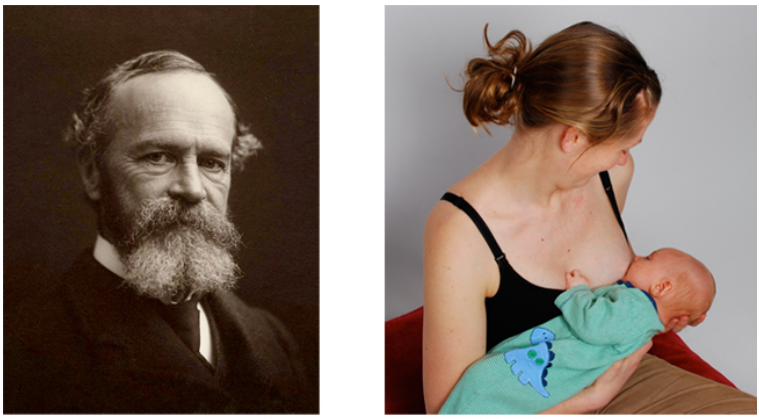
In addition, culture may influence motivation. For example, in collectivistic cultures, it is common to do things for your family members because the emphasis is on the group and what is best for the entire group, rather than what is best for any one individual (Nisbett, Peng, Choi, & Norenzayan, 2001). This focus on others provides a broader perspective that takes into account both situational and cultural influences on behavior; thus, a more nuanced explanation of the causes of others' behavior 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 Hakim, a first-year law student with two courses this semester: Family Law and Criminal Law. The Family Law professor has a rather intimidating classroom: He 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 centers on a student-designed research project on a crime issue of the student's choice. Research suggests that Hakim will be less intrinsically motivated in his Family Law course,

where students are intimidated in the classroom setting, and there is an emphasis on teacher-driven evaluations. Hakim is likely to experience a higher level of intrinsic motivation in his 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 behavior was driven by a number of instincts, which aid survival (Figure 10.4). From a biological perspective, an instinct is a species-specific pattern of behavior 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 mother's protection of her baby, the urge to lick sugar, and hunting prey were among the human behaviors proposed as true instincts during James's era. This view—that human behavior is driven by instincts—received a fair amount of criticism because of the undeniable role of learning in shaping all sorts of human behavior. In fact, as early as the 1900s, some instinctive behaviors 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 10.4 (a) William James proposed the instinct theory of motivation, asserting that behavior is driven by instincts. (b) In humans, instincts may include behaviors such as an infant's rooting for a nipple and sucking. (credit b: modification of work by "Mothering Touch"/Flickr)

Another early theory of motivation proposed that the maintenance of homeostasis is particularly important in directing behavior. 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 center (which is often part of the brain) receives input from receptors (which are often complexes of neurons). The control center directs effectors (which may be other neurons) to correct any imbalance detected by the control center.

According to the drive theory of motivation, deviations from homeostasis create physiological needs. These needs result in psychological drive states that direct behavior 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 10.5). 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 behavioral response in which we engage. A habit is a pattern of behavior in which we regularly engage. Once we have engaged in a behavior that successfully reduces a drive, we are more likely to engage in that behavior whenever faced with that drive in the future (Graham & Weiner, 1996).

Figure 10.5 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)

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 10.6). If we are under aroused, we become bored and will seek out some sort of stimulation. On the other hand, if we are over-aroused, we will engage in behaviors 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 the 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.

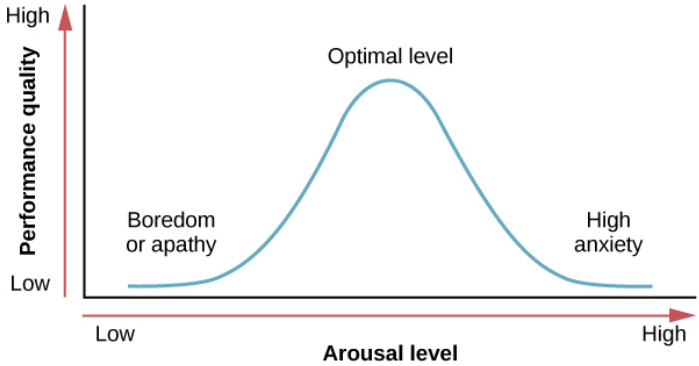


Figure 10.6 The concept of optimal arousal in relation to performance on a task is depicted here. Performance is maximized at the optimal level of arousal, and it tapers off during under- and overarousal.

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 favored 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 the 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 10.7). 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.

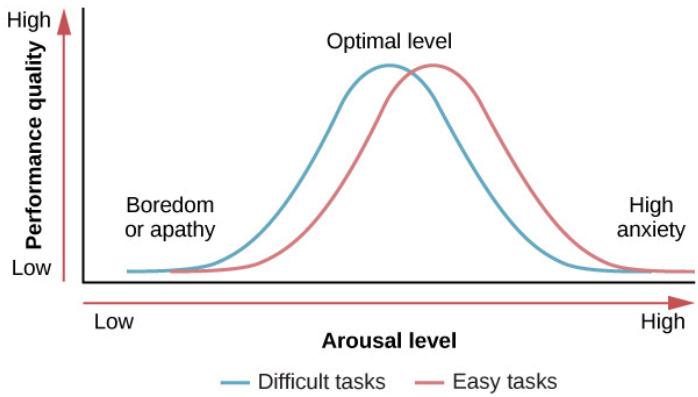


Figure 10.7 Task performance is best when arousal levels are in a middle range, with difficult tasks best performed under lower levels of arousal and simple tasks best performed under higher levels of arousal.

Self-efficacy and Social Motives

Self-efficacy is an individual's belief in her 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 behavior. Bandura argues that motivation derives from expectations that we have about the consequences of our behaviors, and ultimately, it is the appreciation of our capacity to engage in a given behavior 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 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.

Maslow's Hierarchy of Needs

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. These needs are often depicted as a pyramid (Figure 10.8).

Figure 10.8 Maslow's hierarchy of needs is illustrated here. In some versions of the pyramid, cognitive and aesthetic needs may not be

included between esteem and self-actualization. Others may not include self-transcendence.

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 he would spend an inordinate amount of time thinking about whether others viewed him as a good person or not. Instead, all of his 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. Mohandas K. Gandhi, a world-renowned advocate for independence through nonviolent protest, on several occasions, went on hunger strikes to protest a particular situation. People may starve themselves or otherwise, put themselves in danger displaying higher-level motives beyond their own needs.

Learning Objectives

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

- Describe how hunger and eating are regulated
- Differentiate between levels of overweight and obesity and the associated health consequences
- 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

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 behavior. 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 behavior.

For most people, once they have eaten, they feel satiation, or fullness and satisfaction, and their eating behavior 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 behavior (Figure 10.9).

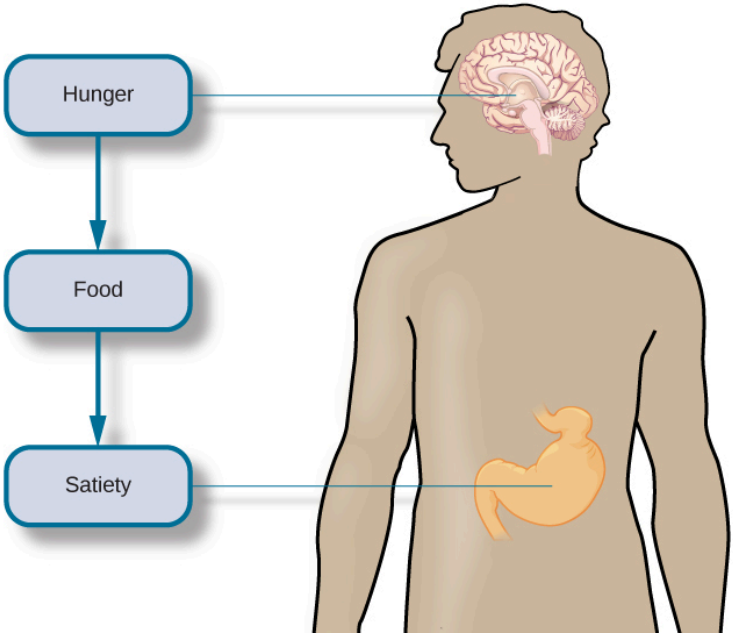


Figure 10.9 Hunger and eating are regulated by a complex interplay of hunger and satiety signals that are integrated in the brain.

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 setpoint, 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

When someone weighs more than what is generally accepted as healthy for a given height, they are considered overweight or obese. According to the Centers for Disease Control and Prevention (CDC), an adult with a body mass index (BMI) between 25 and 29.9 is considered overweight (Figure 10.10). An adult with a BMI of 30 or higher is considered obese (Centers for Disease Control and Prevention [CDC], 2012). People who are so overweight that they are at risk for death are classified as morbidly obese. Morbid obesity is defined as having a BMI of over 40. Note that although BMI has been used as a healthy weight indicator by the World Health Organization (WHO), the CDC, and other groups, its value as an assessment tool has been questioned. The BMI is most useful for studying populations, which is the work of these organizations. It is less useful in assessing an individual since height and weight measurements fail to account for important factors like fitness level. An athlete, for example, may have a high BMI because the tool doesn't distinguish between the body's percentage of fat and muscle in a person's weight.

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 the United States around one-third of the adult population is obese and that nearly two-thirds of adults and one in six children qualify as overweight

(CDC, 2012), there is substantial interest in trying to understand how to combat this important public health concern.

What causes someone to be overweight or obese? You have already read that both genes and environment are important factors for determining body weight, and if more calories are consumed than expended, excess energy is stored as fat. However, socioeconomic status and the physical environment must also be considered as contributing factors (CDC, 2012). For example, an individual who lives in an impoverished neighborhood that is overrun with crime may never feel comfortable walking or biking to work or to the local market. This might limit the amount of physical activity in which he engages and result in an increased body weight. Similarly, some people may not be able to afford healthy food options from their market, or these options may be unavailable (especially in urban areas or poorer neighborhoods); therefore, some people rely primarily on available, inexpensive, high fat, and high calorie fast food as their primary source of nutrition.

Generally, overweight and obese individuals are encouraged to try to reduce their weight through a combination of both diet and exercise. While some people are very successful with these approaches, many struggle to lose excess weight. In cases in which a person has had no success with repeated attempts to reduce weight or is at risk for death because of obesity, bariatric surgery may be recommended. Bariatric surgery is a type of surgery specifically aimed at weight reduction, and it involves modifying the gastrointestinal system to reduce the amount of food that can be eaten and/or limiting how much of the digested food can be absorbed (Figure 10.11) (Mayo Clinic, 2013). A recent meta-analysis suggests that bariatric surgery is more effective than non-surgical treatment for obesity in the two-years immediately following the procedure, but to date, no long-term studies yet exist (Gloy et al., 2013).

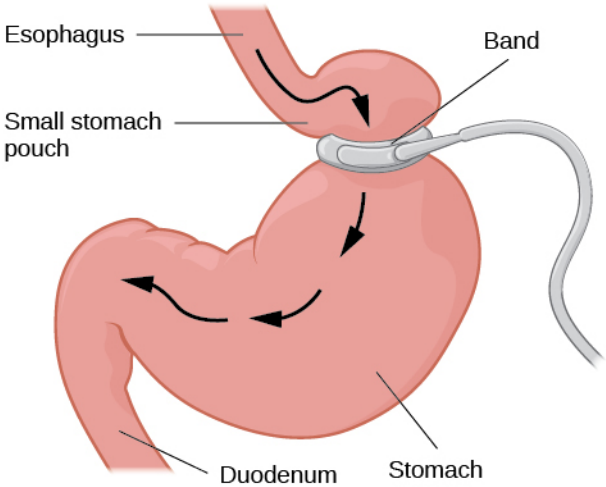


Figure 10.11 Gastric banding surgery creates a small pouch of the stomach, reducing the size of the stomach that can be used for digestion.

LINK TO LEARNING: Watch this video that describes two different types of bariatric surgeries to learn more.

Eating Disorders

While nearly two out of three US 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 behavior 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 behaviors. 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 bulimia, eating binges are not followed by inappropriate behavior, 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 bodyweight 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 men and women 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 10.13) (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 10.13 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)

Learning Objectives

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

- Understand basic biological mechanisms regulating sexual behavior 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—the perpetuation of the species. Sexual behavior in humans, however, involves much more than reproduction. This section provides an overview of research that has been conducted on human sexual behavior and motivation. This section will close with a discussion of issues related to gender and sexual orientation.

Physiological Mechanisms of Sexual Behavior and Motivation

Much of what we know about the physiological mechanisms that underlie sexual behavior and motivation comes from animal research. As you've learned, the hypothalamus plays an important role in motivated behaviors, 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 behavior. 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 10.14). This suggests that the ability to engage in sexual behavior and the motivation to do so may be mediated by neural systems distinct from one another.

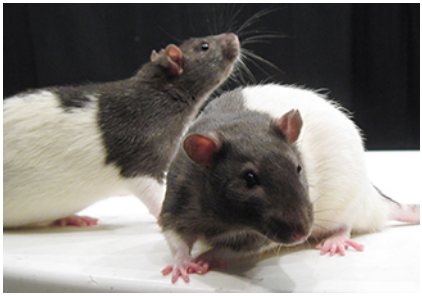


Figure 10.14 A male rat that cannot engage in sexual behavior still seeks receptive females, suggesting that the ability to engage in sexual behavior and the motivation to do so are mediated by different systems in the brain. (credit: Jason Snyder)

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 behavior while leaving the ability to do so intact (Figure 10.15) (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).

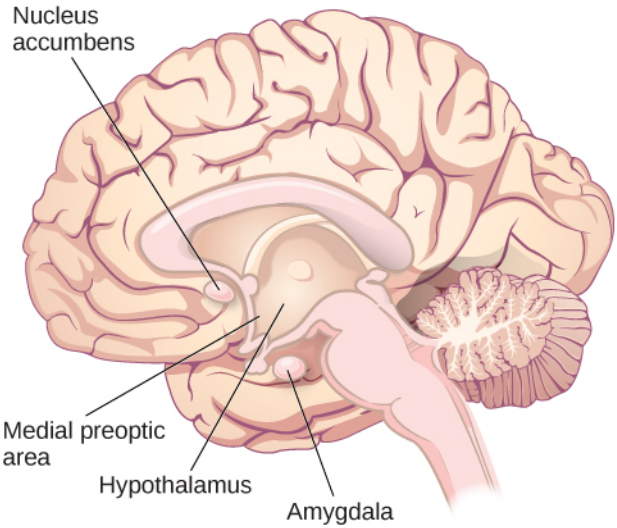


Figure 10.15 The medial preoptic area, an area of the hypothalamus, is involved in the ability to engage in sexual behavior, but it does not affect sexual motivation. In contrast, the amygdala and nucleus accumbens are involved in motivation for sexual behavior, but they do not affect the ability to engage in it.

Although human sexual behavior 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 behavior 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 behavior. 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

both men and women 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 10.16). 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).

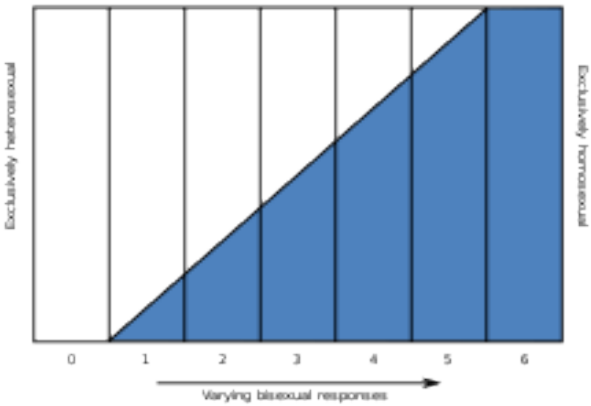
Figure 10.16 In 1947, Alfred Kinsey established The Kinsey Institute for Research, Sex, Gender and Reproduction at Indiana University, shown here in 2011. The Kinsey Institute has continued as a research site of important psychological studies for decades.

At the time, the Kinsey reports were quite sensational. Never before had the American public seen its private sexual behavior 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 for 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 behavior and motivation. Kinsey described a remarkably diverse range of sexual behaviors and experiences reported by the volunteers participating in his research. Behaviors 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 attraction to same-sexed individuals (homosexual), opposite-sexed individuals (heterosexual), or both (bisexual).



Kinsey scale of sexual responses, indicating degrees of sexual orientation.

Masters and Johnson's Research

Based on observations, Masters and Johnson divided the sexual response cycle into four phases that are fairly similar in men and women: excitement, plateau, orgasm, and resolution (Figure 10.17). The excitement phase is the arousal phase of the sexual response cycle. During plateau, both men and women experience increases in blood flood and muscle tone. Orgasm is marked in women by rhythmic contractions of the pelvis and uterus along with increased muscle tension. In men, 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. While many women can quickly repeat the sexual response cycle, men must pass through a longer refractory period as part of resolution. The refractory period is a period of time that follows an orgasm during which an individual is incapable of experiencing another orgasm. In men, 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. As men age, their refractory periods tend to span longer periods of time.

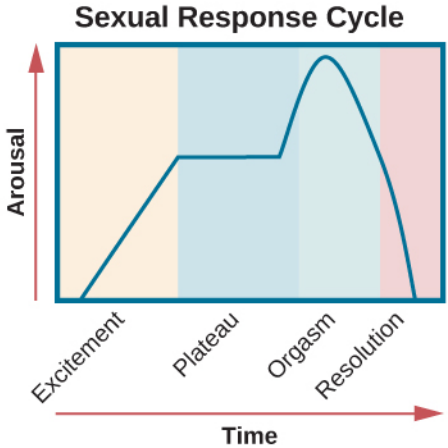


Figure 10.17 This graph illustrates the different phases of the sexual response cycle as described by Masters and Johnson.

Sexual Orientation

As mentioned earlier, a person's sexual orientation is their emotional and erotic attraction toward another individual (Figure 10.18). While the majority of people identify as heterosexual, there is a sizable population of people within the United States 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 10.18 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.

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 10.19). 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 of gender identity continue to evolve, and young people today have more opportunities to explore and openly express different ideas about what gender means than previous generations. Recent studies indicate that the majority of millennials (those aged 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 10.19 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)

Cultural Factors in Sexual Orientation and Gender Identity

Issues related to sexual orientation and gender identity are very much influenced by sociocultural factors. Even the ways in which we define sexual orientation and gender vary from one culture to the next. While in the United States heterosexuality has historically been viewed as the norm, there are societies that have different attitudes regarding gay behavior. In fact, in some instances, periods of exclusively homosexual behavior are socially prescribed as a part of normal development and maturation. For example, in parts of New Guinea, young boys are expected to engage in sexual behavior with other boys for a given period of time because it is believed

that doing so is necessary for these boys to become men (Baldwin & Baldwin, 1989).

There has historically been a two-gendered culture in the United States. We have tended to classify an individual as either male or female. However, in some cultures, there are additional gender variants resulting in more than two gender categories. For example, in Thailand, you can be male, female, or kathoey. A kathoey is an individual who would be described as intersexed or transgender in the United States (Tangmunkongvorakul, Banwell, Carmichael, Utomo, & Sleigh, 2010). Intersex is a broad term referring to people whose bodies are not strictly biologically male or female (Hughes, et al. 2006). Intersex conditions can present at any time during life (Creighton, 2001). Sometimes a child may be born with components of male and female genitals, and other times XY chromosomal differences are present (Creighton, 2001; Hughes, et al. 2006).

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 a 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. An emotion often begins with a subjective (individual) experience, which is a stimulus. Often the stimulus is external, but it does not have to be from the outside world. For example, it might be that one thinks about war and becomes sad, even though he or she never experienced war. Emotional expression refers to the way one displays an emotion and includes nonverbal and verbal behaviors (Gross, 1999). One also performs a cognitive appraisal in which a person tries to determine the way he or she will be impacted by a situation (Roseman & Smith, 2001). In addition, emotions include physiological responses, such as possible changes in heart rate, sweating, etc. (Soussignan, 2002).

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 10.20). 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 10.20 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)

We can be at the heights of joy or in the depths of despair. We might feel angry when we are betrayed, fear when we are threatened, and surprised when something unexpected happens. 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 10.21, have been proposed to explain how the various components of emotion interact with one another.

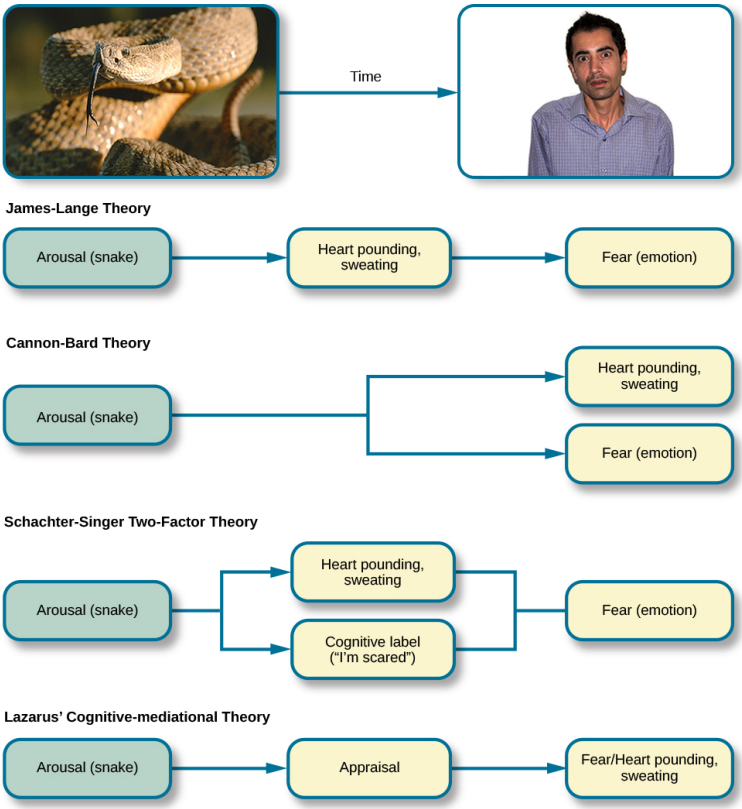


Figure 10.21 This figure illustrates the major assertions of the James-Lange, Cannon-Bard, and Schachter-Singer two-factor theories of emotion. (credit "snake": modification of work by "tableatny"/Flickr; credit "face": modification of work by Cory Zanker)

The James-Lange theory 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.

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 the 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.

G. Marañon Posadillo was a Spanish physician who studied the psychological effects of adrenaline to create a model for the experience of emotion. Marañon's model preceded Schachter's two-factor or arousal-cognition theory of emotion (Cornelius, 1991). 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. Male 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 men were told to expect these reactions as side effects of the injection. The other men 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 behavior (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 men 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 behavior. 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 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 behaviors 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.

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.

LINK TO LEARNING: Watch this video in which Dr. Barrett explains constructed emotions to learn more.

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.

The Biology of Emotions

Earlier, you learned about the limbic system, which is the area of the brain involved in emotion and memory (Figure 10.22). The limbic system includes the hypothalamus, thalamus, amygdala, and 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 center 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).

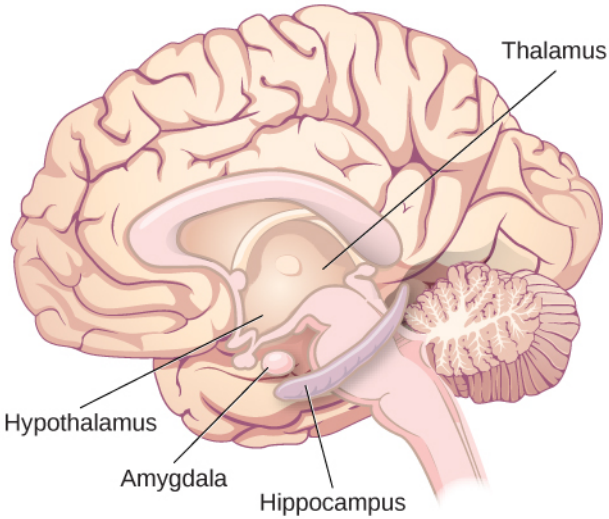


Figure 10.22 The limbic system, which includes the hypothalamus, thalamus, amygdala, and hippocampus, is involved in mediating emotional response and memory.

LINK TO LEARNING: Work through this Open Colleges interactive 3D brain simulator for a refresher on the brain's parts and their functions. To begin, click the "Start Exploring" button. To access the limbic system, click the plus sign 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 10.23). 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).

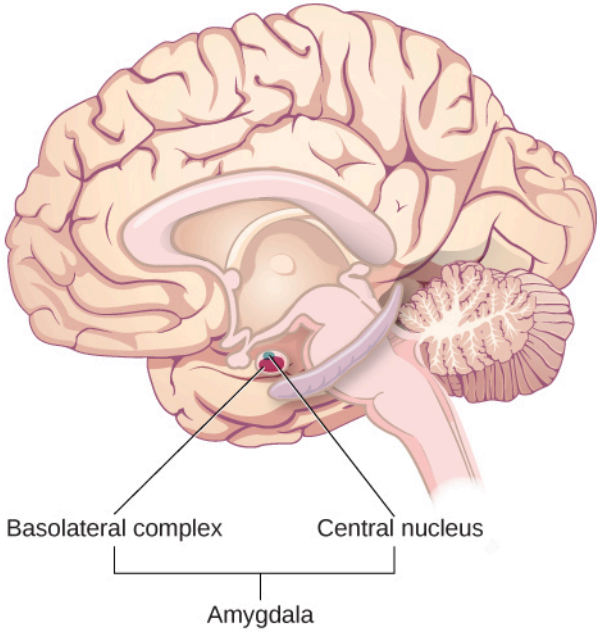


Figure 10.23 The anatomy of the basolateral complex and central nucleus of the amygdala are illustrated in this diagram.

Animal research has demonstrated that there is increased activation of the amygdala in rat pups that have odor cues paired with an electrical shock when their mother is absent. This leads to an aversion to the odor cue that suggests the rats learned to fear the odor cue. Interestingly, when the mother was present, the rats actually showed a preference for the odor 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 odor 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 behavior 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 her cage to build a proper nest that resulted in her spending more time away from her pups trying to construct a nest and less time nursing her pups. The second form of abusive treatment had an associative learning task that involved pairing odors 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 mothers 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 behaviors 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 behavioral improvements and hippocampal volume increases following either pharmacological or cognitive-behavioral 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 the 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, disgust, contempt, and anger (Figure 10.24) (Ekman & Keltner, 1997).

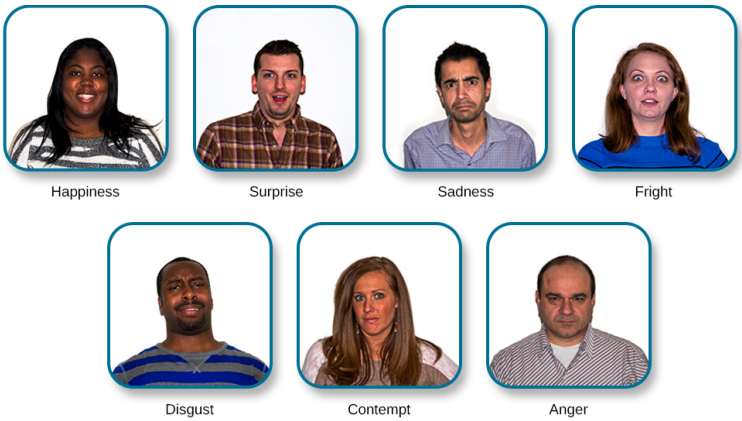


Figure 10.24 The seven universal facial expressions of emotion are shown. (credit: modification of work by Cory Zanker)

Of course, emotion is not only displayed through facial expression. We also use the tone of our voices, various behaviors, 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).

Additional Supplemental Resources

Websites

- Sexual Orientation and Homosexuality
  - This APA resource talks about sexual orientation.
- Science Brief: Reading Facial Expressions of Emotion

    - This article describes basic research that has led to training programs that improve people's ability to detect emotions.
- Atlas of Emotions
    - This interactive tool builds your vocabulary of emotions. It represents what researchers have learned from the psychological study of emotion.
- How to Read MicroExpressions
    - This online resource is a brief guide to understanding microexpressions.

Videos

- Ted-Ed: What is Love?
    - How can we operationally define "love"? In this Ted-Ed video, we'll see a variety of components that play into our understanding of love, including our biology, perceptions, experiences, and culture. A variety of discussion and assessment questions are included with the video (free registration is required to access the questions). Closed captioning available.
- Drive: The Surprising Truth about What Animates Us
    - Animated drawing accompanying lecture by author Daniel Pink. Presented by the Royal Society of Arts. Closed captioning available.
- Crash Course Video #17 – The Power of Motivation
    - This video on the power of motivation includes information on topics such as drive-reduction theory, incentive theory, arousal theory, and Maslow. Closed captioning available.
- Crash Course Video #27 – Let's Talk About Sex

    - This video includes information on topics such as Kinsey, Masters and Johnson, sexuality, gender identity, hormones, and more. Closed captioning available.
- Crash Course Video #33 – Eating and Body Dysmorphic Disorders
    - This video on eating and body dysmorphic disorders includes information on topics such as anorexia, bulimia, and body dysmorphic disorders. Closed captioning available.
- Crash Course Video #25 – Feeling All the Feels
    - This video includes information on topics such as theories of emotion, pathways of emotion, and the autonomic nervous system. Closed captioning available.

Access for free at https://openstax.org/books/psychology-2e/pages/1-introduction

10. Personality

Figure 11.1What 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.

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 he or she 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 11.2).

Figure 11.2 Happy, sad, impatient, shy, fearful, curious, helpful. What

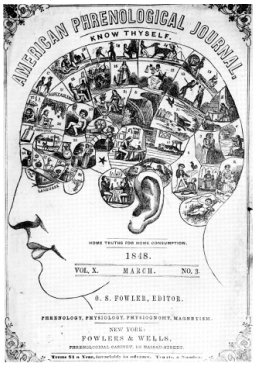
characteristics describe your personality?

Historical Perspectives

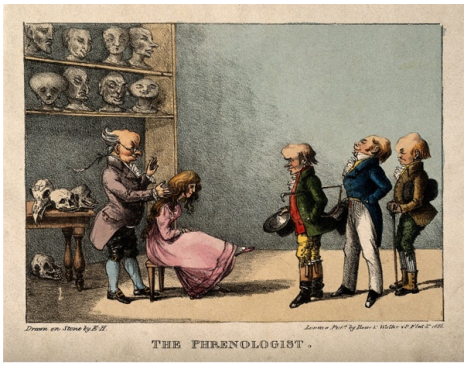
The concept of personality has been studied for at least 2,000 years, beginning with Hippocrates in 370 BCE (Fazeli, 2012). Hippocrates theorized that personality traits and human behaviors are based on four separate temperaments associated with four fluids ("humors") of the body: choleric temperament (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 11.3). 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 11.3 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)

Sigmund Freud's psychodynamic perspective of personality was the first comprehensive theory of personality, explaining a wide variety of both normal and abnormal behaviors. 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.

Learning Objectives

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

- Describe the assumptions of the psychodynamic perspective on personality development
- Define and describe the nature and function of the id, ego, and superego
- Define and describe the defense mechanisms
- Define and describe the psychosexual stages of personality development

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 controversies 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.

Levels of Consciousness

To explain the concept of conscious versus unconscious experience, Freud compared the mind to an iceberg (Figure 11.5). 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).

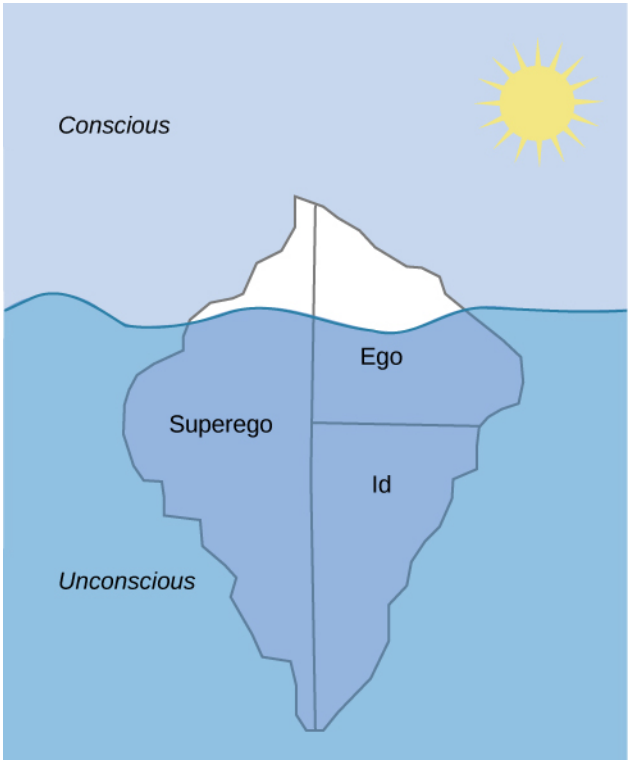


Figure 11.5 Freud believed that we are only aware of a small amount

of our mind's activities and that most of it remains hidden from us in our unconscious. The information in our unconscious affects our behavior, 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 11.6).

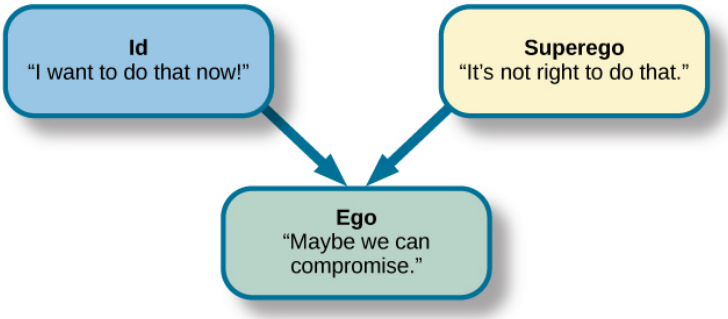


Figure 11.6 The job of the ego, or self, is to balance the aggressive/pleasure-seeking drives of the id with the moral control of the superego.

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 behavior, 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 behaviors. 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 defense mechanisms).

Defense 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 defense

mechanisms (Figure 11.7). 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 defense mechanisms, unconscious protective behaviors 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 defense 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 defense mechanisms.

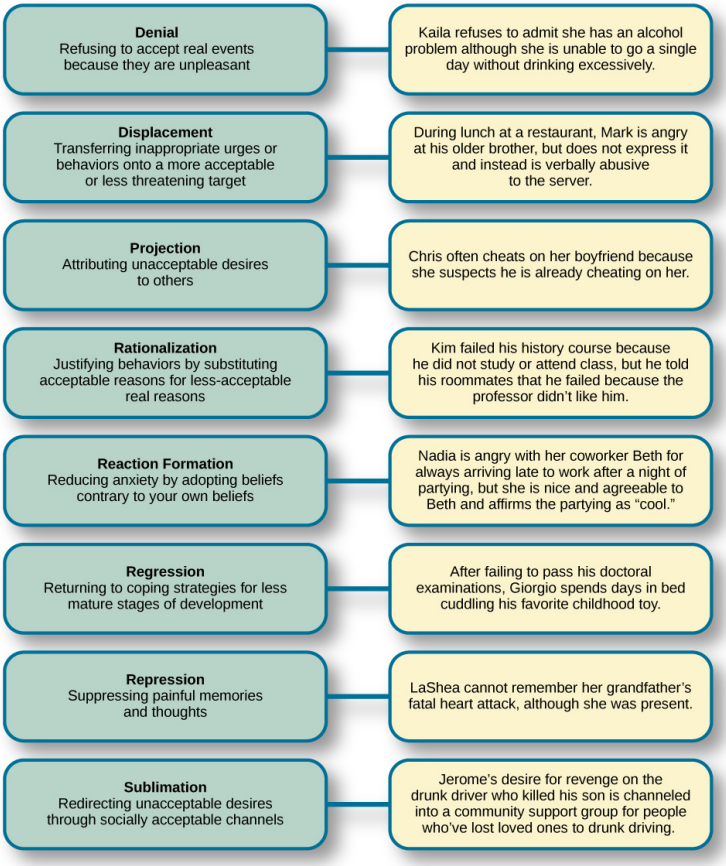


Figure 11.7 Defense mechanisms are unconscious protective behaviors that work to reduce anxiety.

While everyone uses defense 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 defense 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 defense mechanism is reaction formation, in which someone expresses feelings, thoughts, and behaviors 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 defense mechanisms include rationalization, displacement, and sublimation.

Stages of Psychosexual Development

Freud believed that personality develops during early childhood: Childhood experiences shape our personalities as well as our behavior as adults. As discussed in the lifespan development chapter, he asserted that we develop via a series of stages during childhood. Each of us must pass through these childhood stages, and if we do not have the proper nurturing and parenting during a stage, we will be stuck, or fixated, in that stage, even as adults.

In each psychosexual stage of development, the child's pleasure-seeking urges, coming from the id, are focused on a different area of the body, called an erogenous zone. The stages are oral, anal, phallic, latency, and genital.

Freud's psychosexual development theory is quite controversial. To understand the origins of the theory, it is helpful to be familiar with the political, social, and cultural influences of Freud's day in Vienna at the turn of the 20th century. During this era, a climate of sexual repression, combined with limited understanding and education surrounding human sexuality, heavily influenced Freud's perspective. Given that sex was a taboo topic, Freud assumed that negative emotional states (neuroses) stemmed from the suppression of unconscious sexual and aggressive urges. For Freud, his own recollections and interpretations of patients' experiences and dreams were sufficient proof that psychosexual stages were universal events in early childhood.

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. It was Freud who pointed out that a large part of our mental life is influenced by the experiences of early childhood and takes place outside of our conscious awareness; his theories paved the way for others.

While Freud's focus on biological drives led him to emphasize the impact of sociocultural factors on personality development, his followers quickly realized that biology alone could not account for

the diversity they encountered as the practice of psychoanalysis spread during the time of the Nazi Holocaust. The antisemitism which was prevalent during this period of time may have led mainstream psychoanalysts to focus primarily on the universality of the psychological structures of the mind.

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 11.8). 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 behaviors.

Figure 11.8 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 interrelatedness 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 behavior 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 11.2). As previously discussed in the lifespan development chapter, the development of a healthy personality and a sense of competence depend on the successful completion of each task.

Carl Jung

Carl Jung (Figure 11.9) 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 11.9 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 11.3). 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.

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

Table11.3

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 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.

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 11.4). 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*, centers 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).

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

Table 11.4

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.

Learning Objectives

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

- Describe the behaviorist perspective on personality
- Describe the cognitive perspective on personality
- Describe the social cognitive perspective on personality

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 behavior. This illustrates one significant advantage of the learning approaches over psychodynamics: Because learning approaches involve observable, measurable phenomena, they can be scientifically tested.

The Behavioral Perspective

Behaviorists 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 behaviorist, believed that the environment was solely responsible for all behavior, including the enduring, consistent behavior patterns studied by personality theorists.

As you may recall from your study on the psychology of learning, Skinner proposed that we demonstrate consistent behavior patterns because we have developed certain response tendencies (Skinner, 1953). In other words, we *learn* to behave in particular ways. We increase the behaviors that lead to positive consequences, and we decrease the behaviors 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 woman, Greta, a risk-taker. She drives fast and participates in dangerous sports such as hang gliding. But after she gets married and has children, the system of reinforcements and punishments in her environment changes. Speeding and extreme sports are no longer reinforced, so she no longer engages in those behaviors. In fact, Greta now describes herself 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 behaviorist 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 behavior, Bandura (1990) proposed the concept of reciprocal determinism, in which cognitive processes, behavior, and context all interact, each factor influencing and being influenced by the others simultaneously (Figure 11.10). *Cognitive processes* refer to all characteristics previously learned, including beliefs, expectations, and personality characteristics. *Behavior* refers to anything that we do that may be rewarded or punished. Finally, the *context* in which the behavior occurs refers to the environment or situation, which includes rewarding/punishing stimuli.

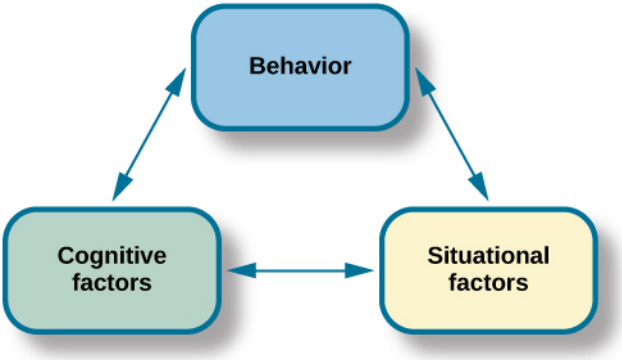


Figure 11.10 Bandura proposed the idea of reciprocal determinism: Our behavior, cognitive processes, and situational context all influence each other.

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 behavior is bungee jumping. Cognitive factors that might influence this behavior include your beliefs and values, and your past experiences with similar behaviors. Finally, context refers

to the reward structure for the behavior. 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 behavior 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 behaviors, we learn new behavior patterns when we see them performed by other people or models. Drawing on the behaviorists' ideas about reinforcement, Bandura suggested that whether we choose to imitate a model's behavior depends on whether we see the model reinforced or punished. Through observational learning, we come to learn what behaviors are acceptable and rewarded in our culture, and we also learn to inhibit deviant or socially unacceptable behaviors by seeing what behaviors are punished.

We can see the principles of reciprocal determinism at work in observational learning. For example, personal factors determine which behaviors 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 behaviors 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 behaviors 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 behaviors we choose to imitate as well as our success in performing those behaviors.

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 a 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 her 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 refers 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 11.11). 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).

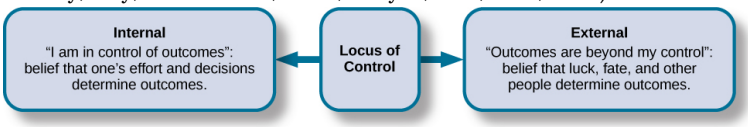


Figure 11.11 Locus of control occurs on a continuum from internal to external.

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.

Learning Objectives

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

- Discuss the contributions of Abraham Maslow and Carl Rogers to personality development

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 behaviorists' 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, behaviorist, 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, 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 behavioral concerns arise as a result of failing to meet these hierarchical needs.

Another humanistic theorist was Carl Rogers. 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.

Learning Objectives

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

- 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

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 favor 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 the costly signaling 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 behavioral 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.

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.

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 him; another can only sleep on the left side of the bed, and yet another always orders her 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 11.5). 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.

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

Table11.5

LINK TO LEARNING: Take this assessment based on Cattell's 16PF questionnaire to see which personality traits dominate your personality.

Psychologists Hans and Sybil Eysenck were personality theorists (Figure 11.12) 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 Eysenck's (Eysenck, 1990, 1992; Eysenck & Eysenck, 1963) viewed people as having two specific personality dimensions: extroversion/introversion and neuroticism/stability.

Figure 11.12 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 behaviors, 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 Eysenck's' 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 11.13).

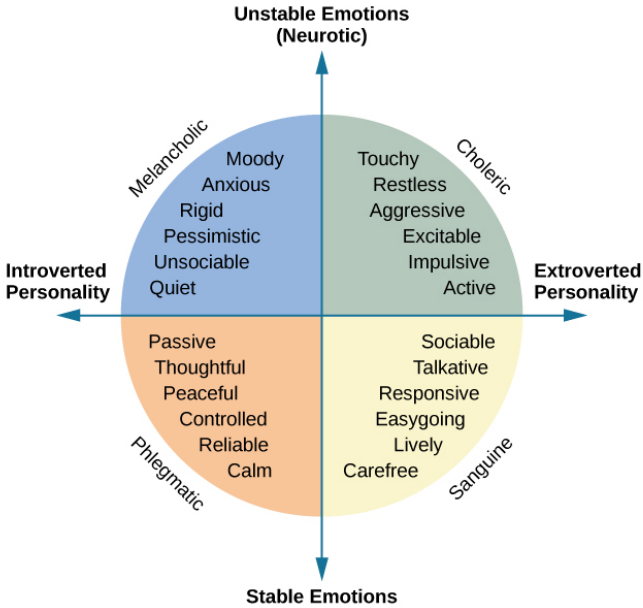


Figure 11.13 The Eysencks described two factors to account for variations in our personalities: extroversion/introversion and emotional stability/instability.

Later, the Eysenck's 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, Eysenck's two-factor system has been criticized for being too narrow. Another personality theory, called the Five-Factor Model, 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 11.14). A helpful way to remember the factors is by using the mnemonic OCEAN.

In the Five-Factor Model, 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 behavior). 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.

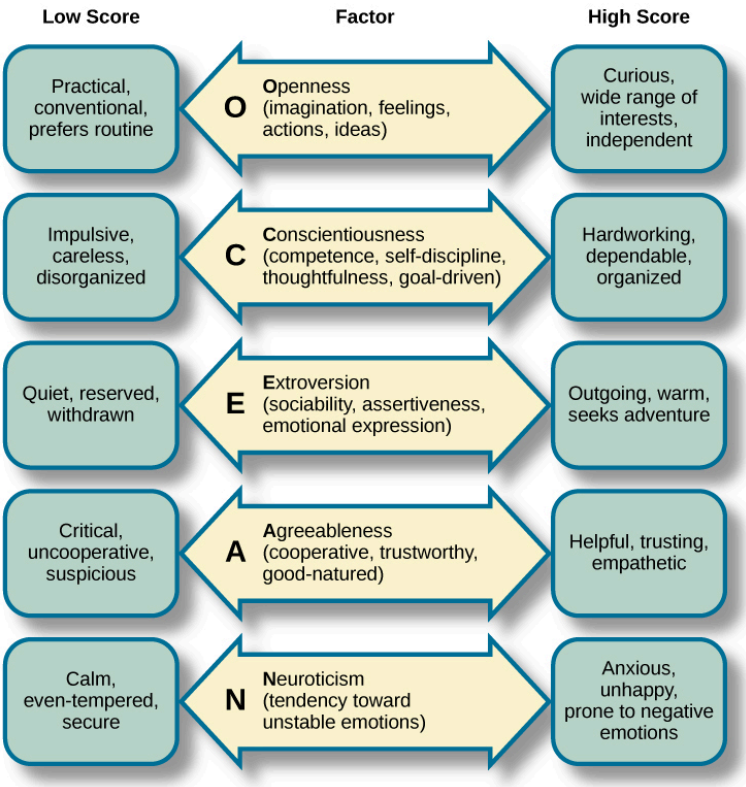


Figure 11.14 In the Five Factor Model, each person has five factors, each scored on a continuum from high to low. In the center column, notice that the first letter of each factor spells the mnemonic OCEAN.

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).

LINK TO LEARNING: Take the Big Five Personality test to find out about your personality and where you fall on the Big Five factors.

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 modeling of culturally acceptable and nonacceptable

behaviors 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 11.15). 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).

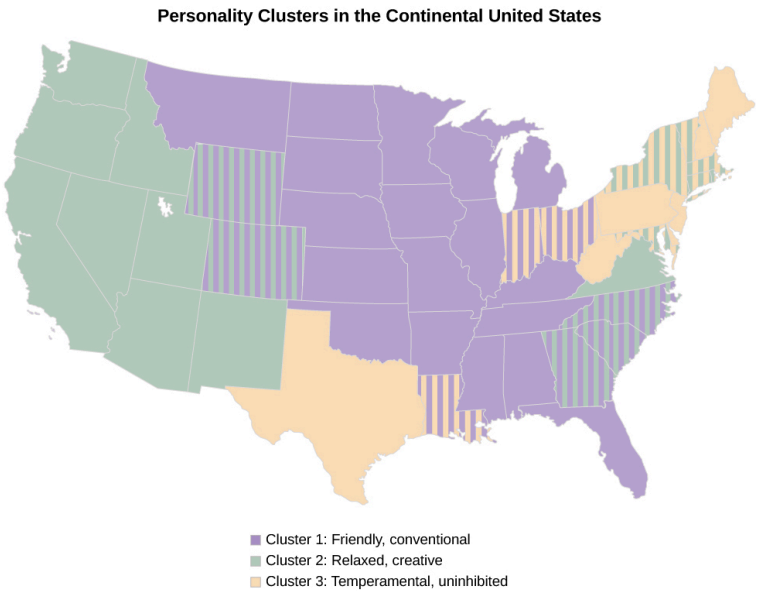


Figure 11.15 Researchers found three distinct regional personality clusters in the United States. People tend to be friendly and conventional in the Upper Midwest and Deep South; relaxed, emotionally stable, and creative in the West; and stressed, irritable, and depressed in the Northeast (Rentfrow et 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).

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

Roberto, Mikhail, and Nat are college friends and all want to be police officers. Roberto is quiet and shy, lacks self-confidence, and usually follows others. He is a kind person, but lacks motivation. Mikhail is loud and boisterous, a leader. He works hard, but is impulsive and drinks too much on the weekends. Nat 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 11.16). 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 11.16 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 11.17). 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 counseling (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 11.17 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 defense 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 his 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 11.18). 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 counseling 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 11.18 This image from the Thematic Apperception Tests (TAT) can be used in counseling 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 11.19). 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 counseling (Holaday, Smith, & Sherry, 2010; Rotter & Rafferty 1950).

1. I feel...	
2. I regret...	
3. At home...	
4. My mother...	
5. My greatest worry...	

Figure 11.19 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 color 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).

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 etiology 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 15.2 provides a description of each of the DSM-5 personality disorders:

DSM-5 Personality Disorders

DSM-5 Personality Disorder	Description	Cluster
Paranoid	harbors 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 offense 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 behavior; 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
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

DSM-5 Personality Disorders

DSM-5 Personality Disorder	Description	Cluster
Histrionic	excessively overdramatic, emotional, and theatrical; feels uncomfortable when not the center of others' attention; behavior 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
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 behaviors; takes advantage of others; lacks empathy	B
Borderline	unstable in self-image, mood, and behavior; cannot tolerate being alone and experiences chronic feelings of emptiness; unstable and intense relationships with others; behavior is impulsive, unpredictable, and sometimes self-damaging; shows inappropriate and intense anger; makes suicidal gestures	B
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

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

Table 15.2

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 behaviors 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 behavior) 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 behavior) (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 behaviors themselves (Alegria et al., 2013).

Table 15.3 shows some of the differences in the specific types of antisocial behaviors that men and women with antisocial personality disorder exhibit (Alegria et al., 2013).

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

Table 15.3

Family, twin, and adoption studies suggest that both genetic and environmental factors influence the development of antisocial personality disorder, as well as general antisocial behavior (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 behavior 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 behaviors 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 behavior. 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 15.20.

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 15.20 Longitudinal studies have helped to identify risk factors for predicting violent behavior.

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 behavior 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.

Additional Supplemental Resources

Websites

- Big Five factors personality test
    - Here is a short and clean personality test made by Cambridge University to determine a user's levels of each of the big 5 personality factors.

- Psychology of Words: Projective Tests and Language
    - Experience a simple demonstration of a Thematic Apperception Test in this online assessment.

Videos

- Ted-Ed: The power of introverts
    - In this Ted-Ed video, you'll learn more about how introverts and extroverts differ, as well as the role introverts play in a world designed for extroverts. A variety of discussion and assessment questions are included with the video (free registration is required to access the questions). Closed captioning available.
- Ted-Ed: How do Personality Tests Work?
    - In 1942, a mother-daughter duo named Katherine Cook Briggs and Isabel Briggs Myers developed a questionnaire that classified people's personalities into 16 types. Called the Myers-Briggs Type Indicator, or MBTI, it would go on to become one of the world's most widely-used personality tests. But do these tests actually reveal truths about personality? Merve Emre examines their design flaws.
- The Big 5 Personality Traits
    - The theory of the Big Five Personality Traits, claims that we can describe ourselves with five main characteristics: Openness, Conscientiousness, Extraversion, Agreeableness, Neuroticism. Each of us varies in how much of each trait is shown in our personality. In order to understand what each trait really means, let's look at these five characters who stranded on an island in the middle of the ocean.

- How does the Rorschach inkblot test work?
    - What are the origins of the Rorschach test and how does it work? Explore the inkblot tool psychologists use to test a subject's perceptions and mental health. –For nearly a century, ten inkblots have been used as an almost mystical personality test. Long kept confidential for psychologists and their patients, the mysterious images were said to draw out the workings of a person's mind. But what can inkblots really tell us, and how does this test work? Damion Searls details how the Rorschach Test can help us understand the patterns of our perceptions
- Crash Course Video #21 – Rorschach and Freudians
    - This video on Rorschach & Freudians includes information on topics such as Defense Mechanisms, psychoanalytic theory, humanistic theory, Freud, Jung, Adler, and Rogers. Closed captioning available.
- Crash Course Video #22 – Measuring Personality
    - This video on measuring personality includes information on topics such as trait theory, the locus of control and measure of personality. Closed captioning available.

Access for free at https://openstax.org/books/psychology-2e/pages/1-introduction

11. Social Psychology

Figure 12.1 (credit "signs": modification of work by David Shankbone; credit "walk": modification of work by "Fibonacci Blue"/Flickr)

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 behavior is influenced by who else is present in a given situation and the composition of social groups.

Learning Objectives

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

- Define social psychology
- Describe situational versus dispositional influences on behavior
- 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 behavior." Throughout this chapter, we will examine how the presence of other individuals and groups of people impacts a person's behaviors, thoughts, and feelings. Essentially, people will change their behavior to align with the social situation at hand. If we are in a new situation or are unsure of 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 behavior (Figure 12.2), aggression, prejudice and discrimination, attraction and close relationships, and group processes and intergroup relationships.

Figure 12.2 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 behaviors (Ross & Nisbett, 1991). Thus, social psychology studies individuals in a social context and how situational variables interact to influence behavior. 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 Behavior

Behavior 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 behavior over others. Situationism is the view that our behavior and actions are determined by our immediate environment and surroundings. In contrast, dispositionism holds that our behavior 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 behavior (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 behavior (Mischel, 1977; Richard, Bond, & Stokes-Zoota, 2003).

Fundamental Attribution Error

In the United States, the predominant culture tends to favor a dispositional approach in explaining human behavior. Why do you think this is? We tend to think that people are in control of their own behaviors, and, therefore, any behavior 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 behavior of other people. They tend to assume that the behavior of another person is a *trait* of that person and to underestimate the power of the situation on the behavior of others. They tend to fail to recognize when the behavior 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).

The fundamental attribution error is so powerful that people often overlook obvious situational influences on behavior. 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 (Figure 12.3). 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.

Figure 12.3 In the quizmaster study, people tended to disregard the influence of the situation, and wrongly concluded that a questioner's knowledge was greater than their own. (credit: Steve Jurvetson)

The halo effect refers to the tendency to let the overall impression of an individual color the way in which we feel about their character. For instance, we might assume that people who are physically

attractive are more likely to be good people than less attractive individuals. Another example of how the halo effect might manifest would involve assuming that someone whom we perceive to be outgoing or friendly has a better moral character than someone who is not.

As demonstrated in the examples above, the fundamental attribution error is considered a powerful influence on how we explain the behaviors 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). 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.

Actor-Observer Bias

Why do you think we underestimate the influence of the situation on the behaviors 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 behavior. The only information we might have is what is observable. Due to this lack of information, we have a tendency to assume the behavior is due to a dispositional, or internal, factor. When it comes to explaining our own behaviors, 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 behavior to internal factors (fundamental attribution error) while attributing our own behavior to situational forces (Jones & Nisbett, 1971; Nisbett, Caputo, Legant, & Marecek, 1973; Choi & Nisbett, 1998). As actors of behavior, we have more information available to explain our own behavior. 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 the 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 a few internal explanations but many situational explanations for their own behavior. In contrast, observers tend to provide more dispositional explanations for a friend's behavior (Figure 12.5).

Figure 12.5 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 to 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 favorable 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 behavior ("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 behavior, they would never be able to take credit and feel good about their accomplishments.

Consider the example of how we explain our favorite sports team's wins. Research shows that we make internal, stable, and controllable attributions for our team's victory (Figure 12.6) (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 favorite 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 12.6 We tend to believe that our team wins because it's better, but loses for reasons it cannot control (Roesch & Amirkham, 1997). (credit: "TheAHL"/Flickr)

Just-World Hypothesis

One consequence of westerners' tendency to provide dispositional explanations for behavior 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 12.7). 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 12.7 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)

Learning Objectives

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

- Describe social roles and how they influence behavior
- Explain what social norms are and how they influence behavior
- Define script
- Describe the findings of Zimbardo's Stanford prison experiment

As you've learned, social psychology is the study of how people affect one another's thoughts, feelings, and behaviors. 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 behavior. In this section, we examine situational forces that have a strong influence on human behavior 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 behavior 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 behavior is our social roles. A social role is a pattern of behavior 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 behavior? Social roles are defined by culturally shared knowledge. That is, nearly everyone in a given culture knows what behavior is expected of a person in a given role. For example, what is the social role of a student? If you look around a college classroom you will likely see students engaging in studious behavior, taking notes, listening to the professor, reading the textbook, and sitting quietly at their desks (Figure 12.8). Of course, you may see students deviating from the expected studious behavior 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 12.8 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 behavior, 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 an employee at your workplace. It is very likely that your behavior 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 behavior 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 behavior 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 behavior 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' behavior in the role of student and workplaces have social norms for employees' behaviors 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?

Figure 12.9 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 behavior 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 behavior 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?

Zimbardo's Stanford Prison Experiment

The famous Stanford prison experiment, conducted by social psychologist Philip Zimbardo and his colleagues at Stanford University, demonstrated the power of social roles, social norms, and scripts. In the summer of 1971, an advertisement was placed in a California newspaper asking for male volunteers to participate in a study about the psychological effects of prison life. More than 70 men volunteered, and these volunteers then underwent psychological testing to eliminate candidates who had underlying psychiatric issues, medical issues, or a history of crime or drug abuse. The pool of volunteers was whittled down to 24 healthy male college students. Each student was paid $15 per day (equivalent to about $80 today) and was randomly assigned to play the role of either a prisoner or a guard in the study. Based on what you have learned about research methods, why is it important that participants were randomly assigned?

A mock prison was constructed in the basement of the psychology building at Stanford. Participants assigned to play the role of prisoners were "arrested" at their homes by Palo Alto police officers, booked at a police station, and subsequently taken to the mock prison. The experiment was scheduled to run for several weeks. To the surprise of the researchers, both the "prisoners" and "guards" assumed their roles with zeal. On the second day of the experiment, the guards forced the prisoners to strip, took their beds, and isolated the ringleaders using solitary confinement. In a relatively short time, the guards came to harass the prisoners in an increasingly sadistic manner, through a complete lack of privacy,

lack of basic comforts such as mattresses to sleep on, and through degrading chores and late-night counts.

The prisoners, in turn, began to show signs of severe anxiety and hopelessness—they began tolerating the guards' abuse. Even the Stanford professor who designed the study and was the head researcher, Philip Zimbardo, found himself acting as if the prison was real and his role, as prison supervisor, was real as well. After only six days, the experiment had to be ended due to the participants' deteriorating behavior. Zimbardo explained,

> At this point it became clear that we had to end the study. We had created an overwhelmingly powerful situation—a situation in which prisoners were withdrawing and behaving in pathological ways, and in which some of the guards were behaving sadistically. Even the "good" guards felt helpless to intervene, and none of the guards quit while the study was in progress. Indeed, it should be noted that no guard ever came late for his shift, called in sick, left early, or demanded extra pay for overtime work. (Zimbardo, 2013)

The Stanford prison experiment demonstrated the power of social roles, norms, and scripts in affecting human behavior. The guards and prisoners enacted their social roles by engaging in behaviors appropriate to the roles: The guards gave orders and the prisoners followed orders. Social norms require guards to be authoritarian and prisoners to be submissive. When prisoners rebelled, they violated these social norms, which led to upheaval. The specific acts engaged by the guards and the prisoners derived from scripts. For example, guards degraded the prisoners by forcing them to do push-ups and by removing all privacy. Prisoners rebelled by throwing pillows and trashing their cells. Some prisoners became so immersed in their roles that they exhibited symptoms of mental breakdown; however, according to Zimbardo, none of the participants suffered long-term harm (Alexander, 2001).

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 behaviors. 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 favorable or unfavorable: positive or negative (Eagly & Chaiken, 1993). And, they have three components: an affective component (feelings), a behavioral component (the effect of the attitude on behavior), 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 behavior: You actually recycle as often as you can. Finally, this attitude will be reflected in favorable 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 behavior, 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 behavior (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 behavior, 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, behaviors, or cognitions (thoughts, beliefs, or opinions). Festinger's theory of cognitive dissonance states that when we experience a conflict in our behaviors, 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 behavior (Figure 12.11).

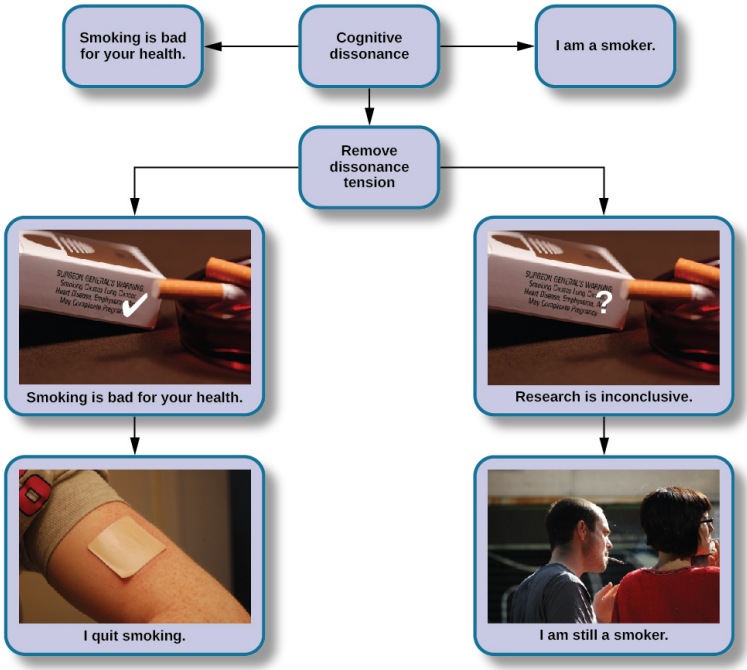


Figure 12.11 Cognitive dissonance is aroused by inconsistent beliefs and behaviors. Believing cigarettes are bad for your health, but smoking cigarettes anyway can cause cognitive dissonance. To reduce cognitive dissonance, individuals can change their behavior, as in quitting smoking or change their 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 behaviors in line—that is, making them harmonious. This can be done in different ways, such as:

- changing our discrepant behavior (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 Joaquin, a 20-year-old who enlists in the military. During boot camp he 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 12.12). It gets worse. Recruits that make it to week 11 of boot camp have to do 54 hours of continuous training.

Figure 12.12 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, Joaquin is miserable. No one likes to be miserable.

In this type of situation, people can change their beliefs, attitudes, or behaviors. The last option, a change of behaviors, is not available to Joaquin. He has signed on to the military for four years, and he cannot legally leave.

If Joaquin keeps thinking about how miserable he is, it is going to be a very long four years. He will be in a constant state of cognitive dissonance. As an alternative to this misery, Joaquin can change his beliefs or attitudes. He can tell himself, "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 his belief, he will realize that he is becoming stronger through his challenges. He then will feel better and not experience cognitive dissonance, which is an uncomfortable state.

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 favorably than did participants with an easy initiation or no initiation (Figure 12.13).

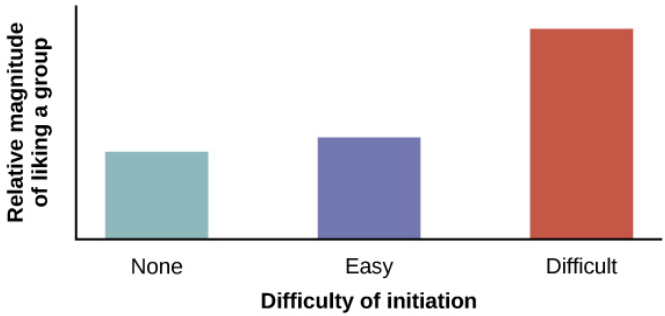


Figure 12.13 Justification of effort has a distinct effect on a person liking a group. Students in the difficult initiation condition liked the group more than students in other conditions due to the justification of effort.

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).

Persuasion

In the previous section, we discussed that the motivation to reduce cognitive dissonance leads us to change our attitudes, behaviors, 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 behaviors (Figure 12.14)? What communications do you receive that attempt to persuade you to change your attitudes, beliefs, and behaviors?

Figure 12.14 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 12.15).

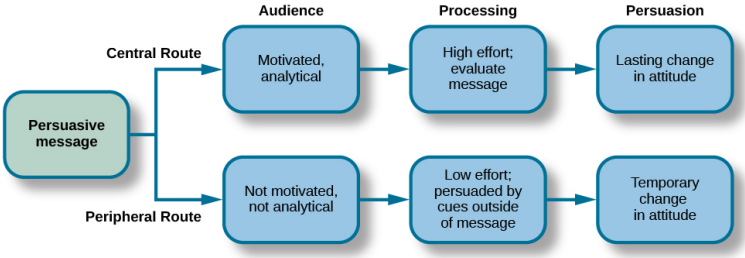


Figure 12.15 Persuasion can take one of two paths, and the durability of the end result depends on the path.

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 behaviors, 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 the 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 behavior 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 attitudes, ideas, and behaviors. 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 favor or to buy a small item, only to later request a larger favor 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 a 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 12.16). Research on this technique also illustrates the principle of consistency (Cialdini, 2001): Our past behavior often directs our future behavior, and we have a desire to maintain consistency once we have a committed to a behavior.

(a)

(b)

Figure 12.16 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 campaign 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.

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 facilitation, and social loafing

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 behaviors. 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 behaviors 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 12.17). 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.

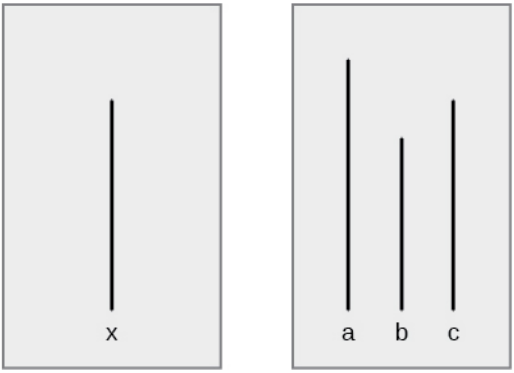


Figure 12.17 These line segments illustrate the judgment task in Asch's conformity study. Which line on the right—a, b, or c—is the same length as line x on the left?

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 behavior to go along with the group, even if he does 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 leveled 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 12.18). 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 obviously wrong answers were correct.

Figure 12.18 Voting for government officials in the United States 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 theater watching a film and what seems to be smoke comes in the theater 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 behavior of others in the theater. 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 12.19).

(a)

(b)

Figure 12.19 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 confirm, 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).

Stanley Milgram's Experiment

Conformity is one effect of the influence of others on our thoughts, feelings, and behaviors. Another form of social influence is obedience to authority. Obedience is the change of an individual's behavior 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 defense for the atrocities he committed was that he was "just following orders." Milgram (1963) wanted to test the validity of this defense, 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 12.20). What makes someone obey authority to the point of potentially causing serious harm to another person?

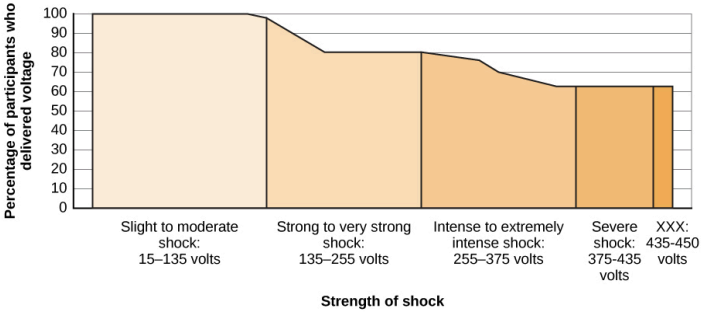


Figure 12.20 The Milgram experiment showed the surprising degree to which people obey authority. Two out of three (65%) participants continued to administer shocks to an unresponsive learner.

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.

Groupthink

When in group settings, we are often influenced by the thoughts, feelings, and behaviors of people around us. Whether it is due to normative or informational social influence, groups have the 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 decisions 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 favors 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 hostile attitudes and behaviors 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 to use a flocking method to form

groups. Harding (2018) compared groups of students who had self-selected into groups for the 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 workgroup, 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).

Deindividuation

Another way that being part of a group can affect behavior 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 behaviors occur (Zimbardo, 1969), but research on the subject and the role that deindividuation plays in such behaviors has resulted in inconsistent results (as discussed in Granström, Guvå, Hylander, & Rosander, 2009).

Table 12.2 summarizes the types of social influence you have learned about in this chapter.

Types of Social Influence	
Type of Social Influence	**Description**
Conformity	Changing your behavior 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 behavior 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 behavior 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

Table 12.2

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 12.21 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

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 a given culture (Devine, 1989).

Sometimes people will act on their prejudiced attitudes toward a group of people, and this behavior is known as discrimination. Discrimination is a 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 Ph.D. 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 Ph.D. because she was a woman

(Harvard University, 2019). Table 12.3 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?

Connecting Stereotypes, Prejudice, and Discrimination			
Item	**Function**	**Connection**	**Example**
Stereotype	Cognitive; thoughts about people	Overgeneralized beliefs about people may lead to prejudice.	"Yankees 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 Yankees fans; they make me angry."
Discrimination	Behavior; positive or negative treatment of others	Holding stereotypes and harboring 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 Yankees fan."

Table 12.3

So far, we've discussed stereotypes, prejudice, and discrimination as negative thoughts, feelings, and behaviors because these are typically the most problematic. However, it is important to also point out that people can hold positive thoughts, feelings, and behaviors 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 favorite sports team.

LINK TO LEARNING: Watch this video of a social experiment conducted in a park that demonstrates the concepts of prejudice, stereotypes, and discrimination. In the video, three people try to steal a bike out in the open. The race and gender of the thief are varied: a White male teenager, a Black male teenager, and a White female. Does anyone try to stop them? The treatment of the teenagers in the video demonstrates the concept of racism.

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, sexual orientation, and age group different from your own?

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 behaviors. 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 behavior 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 behavior, 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 at the beginning of the interview. Instead, the employer focused on the job applicant's performance in the latter part of the interview, after the applicant changed his demeanor and behavior 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 12.23). 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 12.23 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 behaviors.

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).

Learning Objectives

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

- Define aggression
- Define bullying
- Describe the bystander effect

Throughout this chapter, we have discussed how people interact and influence one another's thoughts, feelings, and behaviors in both positive and negative ways. People can work together to achieve great things, such as helping each other in emergencies. 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. In this section, we will discuss the negative side of human behavior—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 the 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 the 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 12.24). Sexual jealousy is part of male aggression; males endeavor 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 12.24 Human males and nonhuman male primates endeavor to gain and display dominance over other males, as demonstrated in the behavior 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 behavior 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 behavior. 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 rumors, 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 behavior?

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 of 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.

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 neighbors helped her or called the police when she was being attacked. However, Kassin (2017) noted that her killer was apprehended due to neighbors 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.

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
- Explain social exchange theory in relationships

You've learned about many of the negative behaviors of social psychology, but the field also studies many positive social interactions and behaviors. 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 Behavior and Altruism

Do you voluntarily help others? Voluntary behavior with the intent to help other people is called prosocial behavior. 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 12.26). 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 12.26 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.

Forming Relationships

What do you think is the single most influential factor in determining with whom you become friends and with 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. The 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 neighborhood 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 12.27) (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 12.27 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 jawline, 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 behavior).

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 12.30) (Rusbult & Van Lange, 2003).

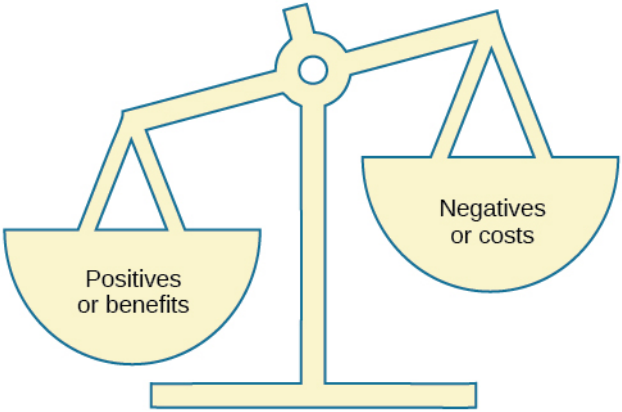


Figure 12.30 Acting like naïve economists, people may keep track of the costs and benefits of maintaining a relationship. Typically, only those relationships in which the benefits outweigh the costs will be maintained.

People are motivated to maximize the benefits of social exchanges or relationships and minimize 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.

Additional Supplemental Resources

Websites

- Implicit Association Test
  - The IAT measures the strength of associations between concepts and evaluations or stereotypes.
- Social Psychology Studies: Human Interactions
  - This APA resource gives a definition of social psychology as well as its application in science and everyday life.

Videos

- Ted-Ed: Why we love repetition in music
  - In this Ted-Ed video, you'll learn more about the mere-exposure effect, and how repetition impacts our love of music, language, people, etc. A variety of discussion and assessment questions are included with the video (free registration is required to access the questions). Closed captioning available.
- Jane Elliot's Blue Eyes Brown Eyes Demonstration
  - Story of a teacher who famously put her students through an in-group/out-group situation. Closed captioning available.
- Human Research Ethics: Milgram's Obedience Study
  - In 2007, ABC News's Primetime recreated Milgram's experiment and found very similar results. This can prompt a discussion on ethics, particularly on the use of deception.

- Crash Course Video #37 – Social Thinking
  - This video on social thinking includes information on topics such as attribution theory, persuasion, and the Stanford Prison Experiment. Closed captioning available.
- Crash Course Video #38 – Social Influence
  - This video on social influence includes information on topics such as conformity, social loafing, and groupthink. Closed captioning available.
- Crash Course Video #39 – Prejudice and Discrimination
  - This video on prejudice and discrimination includes information on topics such as prejudice, stereotypes, and discrimination. Closed captioning available.
- Crash Course Video #40 – Aggression vs Altruism
  - This video on aggression vs. altruism includes information on topics such as conflict, altruism, and the bystander effect. Closed captioning available.

Access for free at https://openstax.org/books/psychology-2e/pages/1-introduction

12. Stress, Lifestyle, and Health

Figure 14.1 Exams are a stressful, but unavoidable, element of college life. (credit "left": modification of work by Travis K. Mendoza; credit "center": modification of work by "albertogp123"/Flickr; credit "right": modification of work by Jeffrey Pioquinto, SJ)

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.

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 14.2).

Figure 14.2 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: Timothy Zanker)

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 14.3). 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).

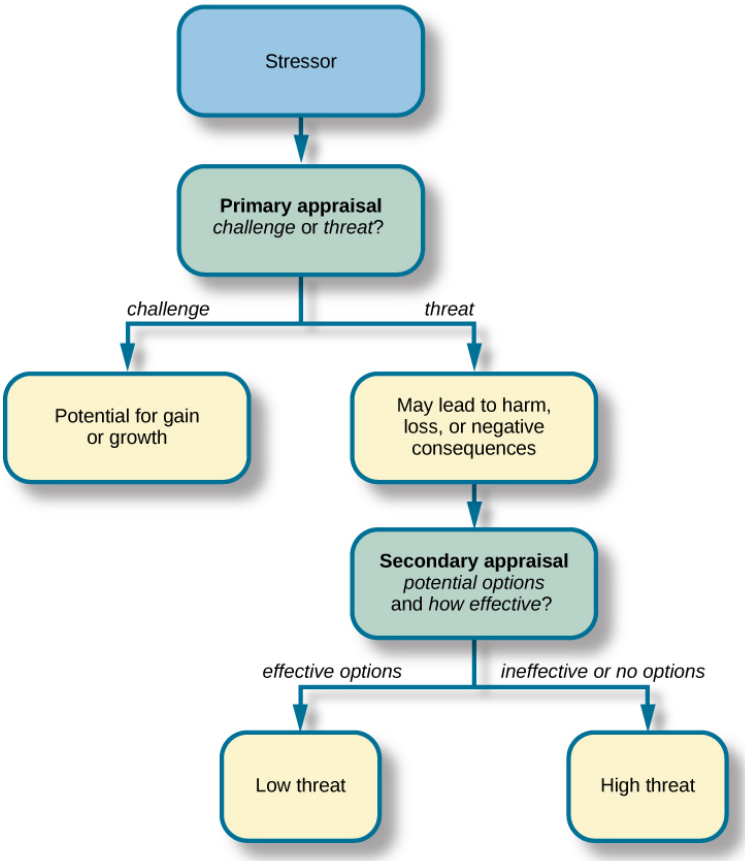


Figure 14.3 When encountering a stressor, a person judges its potential threat (primary appraisal) and then determines if effective options are available to manage the situation. Stress is likely to result if a stressor is perceived as extremely threatening or threatening with few or no effective coping 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 14.4, 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 his game, meaning he feels 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.

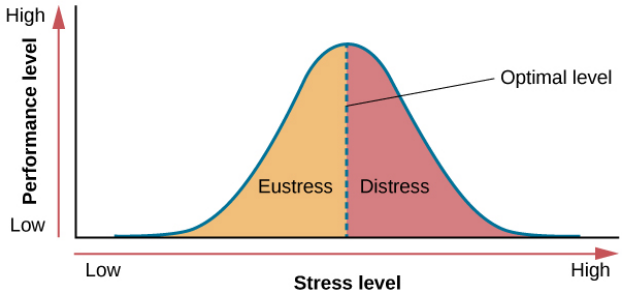


Figure 14.4 As the stress level increases from low to moderate, so does performance (eustress). At the optimal level (the peak of the curve), performance has reached its peak. If stress exceeds the optimal level, it will reach the distress region, where it will become excessive and debilitating, and performance will decline (Everly & Lating, 2002).

The Prevalence of Stress

Stress is everywhere and, as shown in Figure 14.5, it has been on

the rise over the last several years. 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.

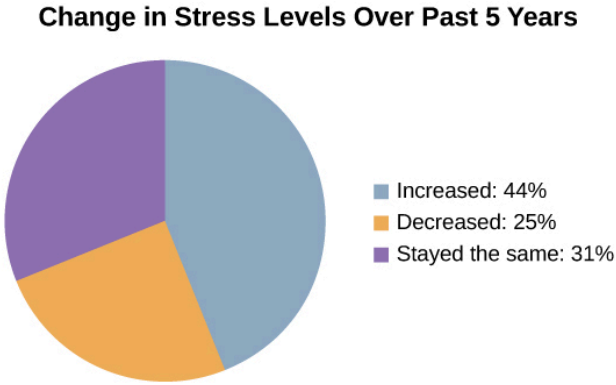


Figure 14.5 Nearly half of U.S. adults indicated that their stress levels have increased over the last five years (Neelakantan, 2013).

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 behavioral (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 behavioral 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 behaviors). Health psychologists also design and investigate the effectiveness of interventions aimed at changing unhealthy behaviors. 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 behavioral 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 14.6 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.

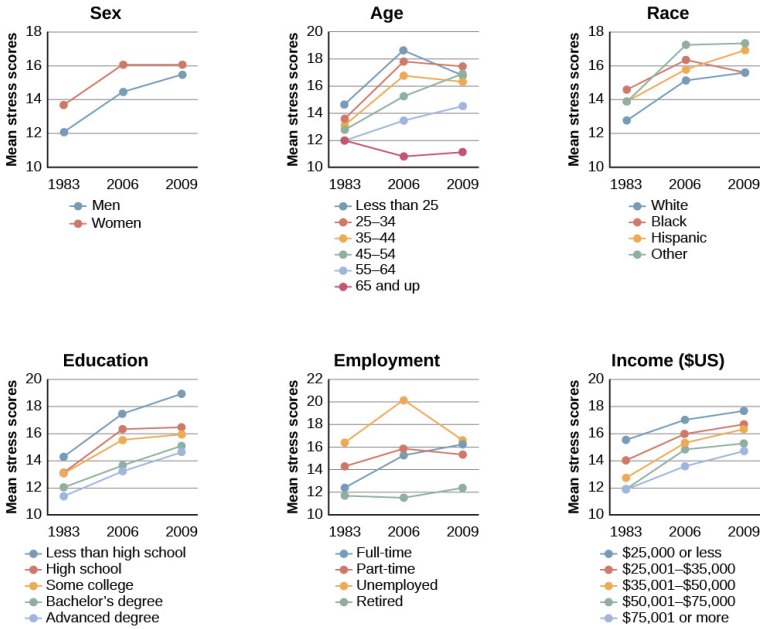


Figure 14.6 The charts above, adapted from Cohen & Janicki-Deverts (2012), depicts the mean stress level scores among different demographic groups during the years 1983, 2006, and 2009. Across categories of sex, age, race, education level, employment status, and income, stress levels generally show a marked increase over this quarter-century time span.

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 the activation of both the sympathetic nervous system and the endocrine system (Figure 14.8). This arousal helps prepare the person to either fight or flee from a perceived threat.

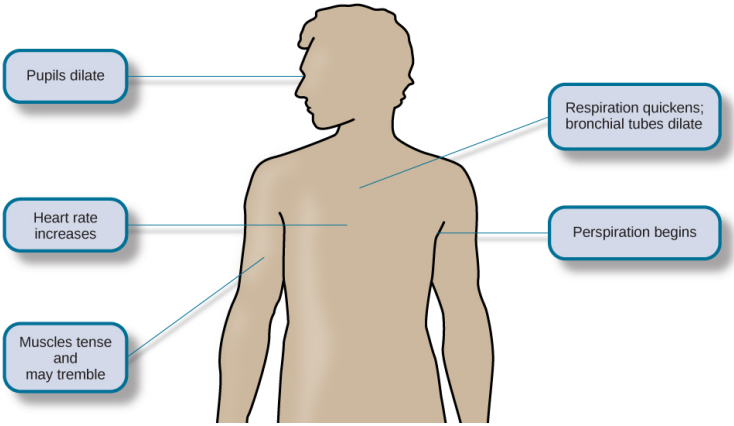


Figure 14.8 Fight or flight is a physiological response to a stressor.

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 14.9). 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 14.9 Hans Selye specialized in research about stress. In 2009, his native Hungary honored his work with this stamp, released in conjunction with the 2nd annual World Conference on Stress.

The general adaptation syndrome, shown in Figure 14.10, 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.

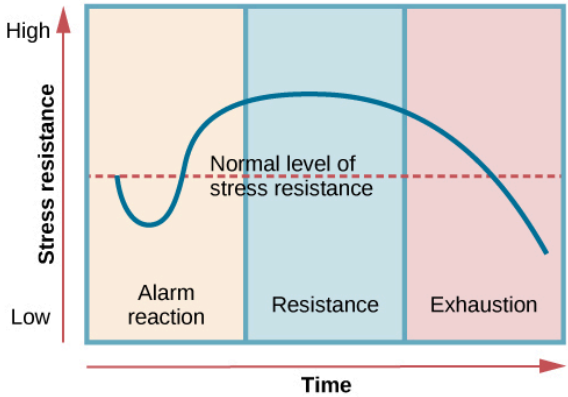


Figure 14.10 The three stages of Selye's general adaptation syndrome are shown in this graph. Prolonged stress ultimately results in exhaustion.

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 the 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 14.11). 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.

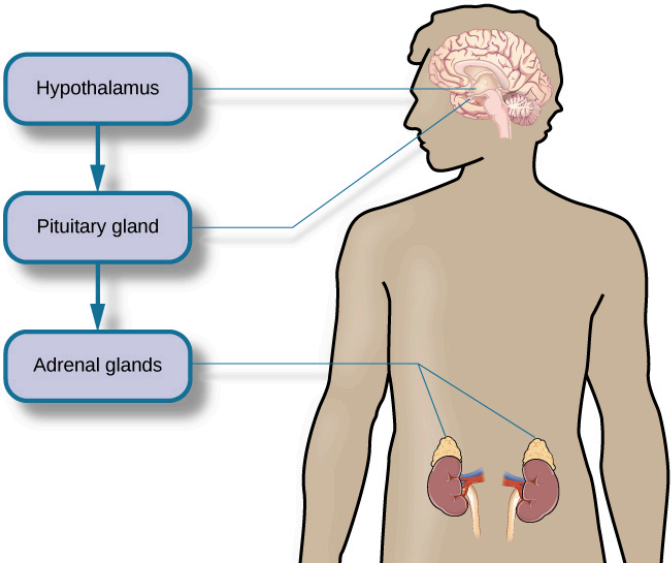


Figure 14.11 This diagram shows the functioning of the hypothalamic-pituitary-adrenal (HPA) axis. The hypothalamus activates the pituitary gland, which in turn activates the adrenal glands, increasing their secretion of cortisol.

In short bursts, this process can have some favorable 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.

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, they 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, sexual assault, robbery, childhood 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 behaviors 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 the death of a close family member, marriage, divorce, and moving (Figure 14.12).

Figure 14.12 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 14.1). 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 totaled 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).

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

Table 14.1

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).

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, the 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.

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 14.13) (Kanner, Coyne, Schaefer, & Lazarus, 1981).

(a)

(b)

Figure 14.13 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 distressing 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 the 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 14.14). 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 14.2 lists several occupations and some of the specific stressors associated with those occupations (Sulsky & Smith, 2005).

(a)

(b)

Figure 14.14 (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)

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, 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

Table 14.2

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 14.2 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).

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, and police officers). 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 her 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).

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).

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 regarding killer stress and the other is an excellent 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 14.3.

Types 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

Table 14.3

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).

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 flavored 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 flavored 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 14.15).

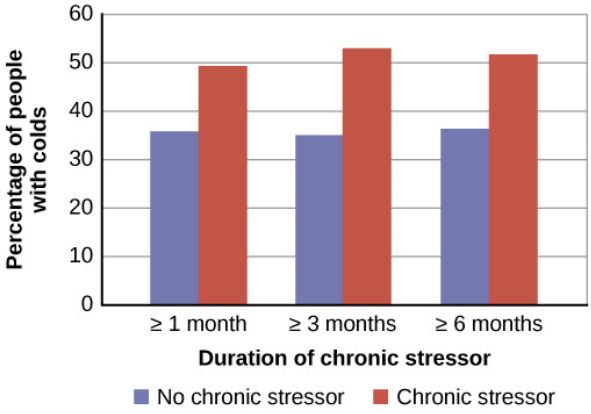


Figure 14.15 This graph shows the percentages of participants who developed colds (after receiving the cold virus) after reporting having experienced chronic stressors lasting at least one month, three months, and six months (adapted from Cohen et al., 1998).

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).

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

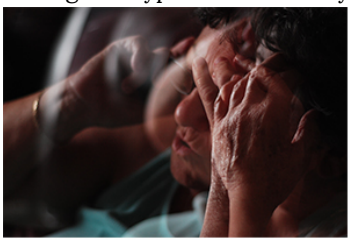
as aging, income, education, and employment status, as well as behavioral risk factors that include unhealthy diet, tobacco use, physical inactivity, and excessive alcohol consumption; obesity and diabetes, are additional risk factors (World Health Organization [WHO], 2013).

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, mirror tracing, and public speaking have all been shown to elevate blood pressure (Phillips, 2011).

Are You Type A or Type B?

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 behavior pattern; those who are more relaxed and laid-back were characterized as Type B (Figure 14.18). 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 14.18(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).

Extensive research clearly suggests that the anger/hostility dimension of Type A behavior 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 14.19).

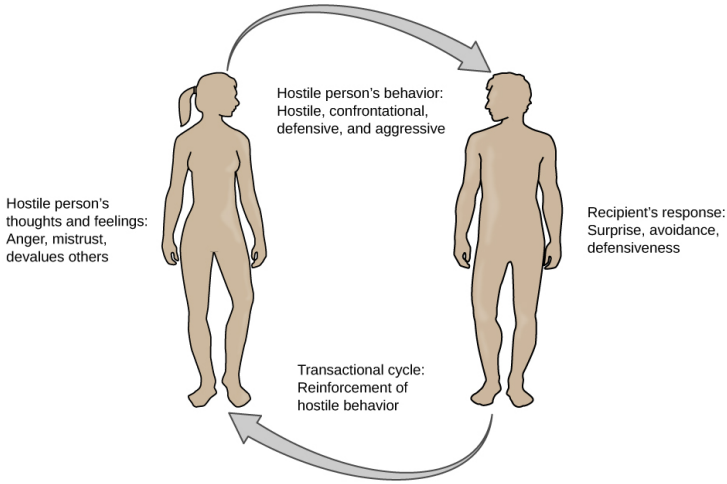


Figure 14.19 According to the transactional model of hostility for predicting social interactions (Vella et al., 2012), the thoughts and feelings of a hostile person promote antagonistic behavior toward others, which in turn reinforces complimentary reactions from others, thereby intensifying ones' hostile disposition and intensifying the cyclical nature of this relationship.

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.

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 14.20 illustrates the gradation in the risk of heart attacks for both men and women.

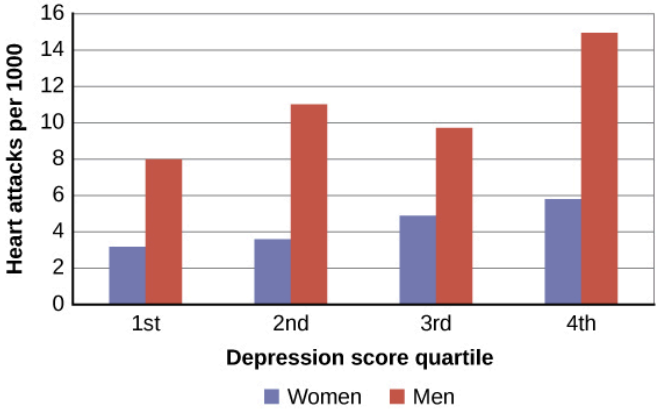


Figure 14.20 This graph shows the incidence of heart attacks among men and women by depression score quartile (adapted from Barefoot & Schroll, 1996).

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).

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 unfavorable 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.

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 14.21) (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).

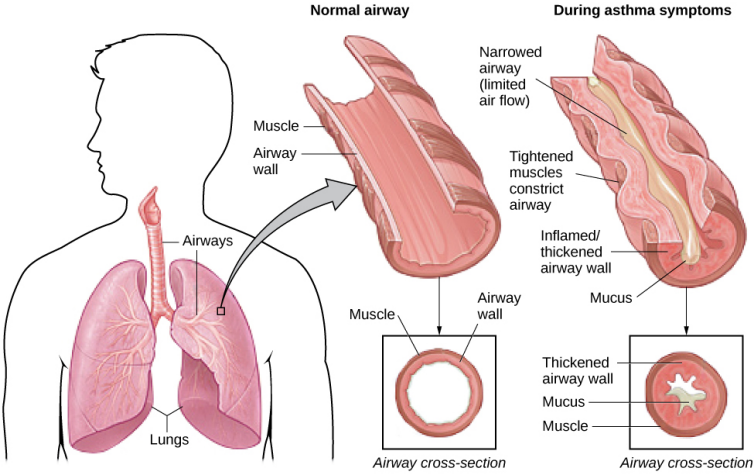


Figure 14.21 In asthma, the airways become inflamed and narrowed.

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 signaled 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).

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).

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 behavioral 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 Bradford receives a midterm notice that he is failing statistics class. If Bradford adopts a problem-focused coping approach to managing his stress, he would be proactive in trying to alleviate the source of the stress. He might contact his professor to discuss what must be done to raise his grade, he might also decide to set aside two hours daily to study statistics assignments, and he 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 she is"), 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 Bradford adopted an emotion-focused approach to managing his midterm deficiency stress, he might watch a comedy movie, play video games, or spend hours on social media to take his 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 her 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 behavior (Everly & Lating, 2002). Albert Bandura (1997) stated that "the intensity and chronicity of human stress are 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 favorable 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 14.22).

Figure 14.22 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 were 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 a 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 behaviors 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.

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 fueled 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 14.23).

(a)

(b)

Figure 14.23 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 support 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 favorable 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 behaviors, 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 14.24). 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 14.24 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.

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).

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

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 14.25 (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 a 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. A 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).

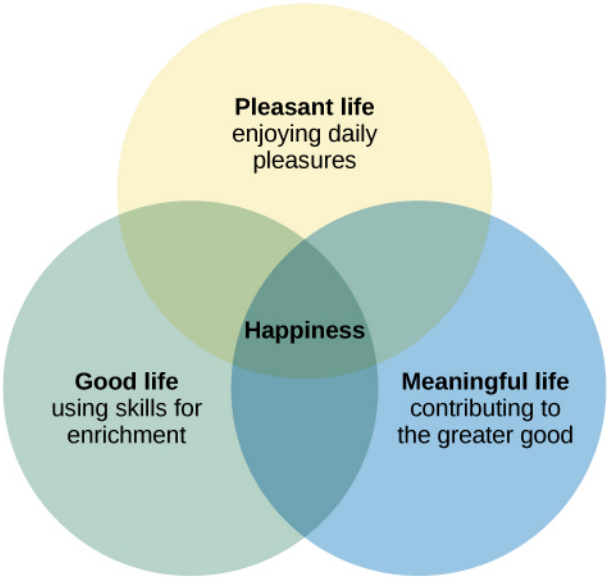


Figure 14.25 Happiness is an enduring state of well-being involving satisfaction in the pleasant, good, and meaningful aspects of life.

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 in 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 14.26) (Helliwell et al., 2013).

(a)

(b)

Figure 14.26 (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 color, 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 savor 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 savoring 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 favorable living conditions. Among those who live in nations with difficult living conditions, religiosity is associated with greater well-being; in nations with more favorable 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 her 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 theater 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 widowhood, 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 luster and becomes the status quo (Figure 14.27). Indeed, dramatic life events have a much less long-lasting impact on happiness than might be expected (Brickman, Coats, & Janoff-Bulman, 1978).

(a)

(b)

Figure 14.27 (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 14.28, 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.

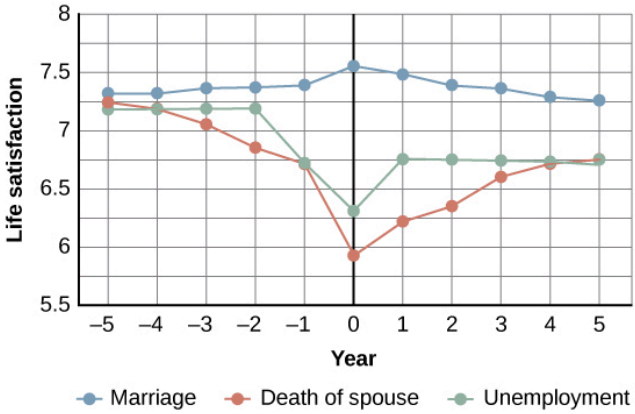


Figure 14.28 This graph shows life satisfaction scores several years before and after three significant life events (0 represents the year the event happened) (Diener et al., 2006).

Increasing Happiness

Some recent findings of 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 policymakers 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, savoring 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 favorable health outcomes (especially improved cardiovascular health) mainly

through their relationships with biological functions and health behaviors (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 favorable 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 behaviors, 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 endeavors 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 to 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 a 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 endeavors 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.

Additional Supplemental Resources

Websites

- Health Psychology Promotes Wellness
  - This APA website provides information on health psychology, which examines how biological, social, and psychological factors influence health and illness.

Videos

- Ted-Ed: How stress affects your brain
  - In this Ted-Ed video, you'll learn more about the benefits and dangers of stress, as well as how it impacts our bodies and our minds. A variety of discussion and assessment questions are included with the video (free registration is

required to access the questions). Closed captioning available.

- Ted-Ed: How stress affects your body
  - In this Ted-Ed video, you'll learn more about the dangers of chronic stress, focusing on how it impacts our bodies. A variety of discussion and assessment questions are included with the video (free registration is required to access the questions). Closed captioning available.
- Crash Course Video #26 – Emotion, Stress, and Health
  - This video on emotion, stress, and health includes information on topics such as the facial feedback hypothesis, external stressors, and the connection between stress and heart disease. Closed captioning available.
- What it takes to get people to adopt healthier behaviors
  - See how the work of a health psychologist helps to improve the lives of people. Closed captioning available.

Access for free at https://openstax.org/books/psychology-2e/pages/1-introduction

13. Psychological Disorders

Figure 15.1 (credit: modification of work by D. Myles Cullen, US Department of Defense)

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 behaviors 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 behaviors. 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 behaviors are truly abnormal in the sense that they genuinely indicate the presence of psychopathology. Certain patterns of behavior and inner experience can easily be labeled as abnormal and clearly signify some kind of psychological disturbance. The person who washes his hands 40 times per day and the person who claims to hear the voices of demons exhibit behaviors and inner experiences that most would regard as abnormal: beliefs and behaviors 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 behaviors represent a true psychological disorder? Psychologists work to distinguish psychological disorders from inner experiences and behaviors that are merely situational, idiosyncratic, or unconventional.

Definition of a Psychological Disorder

Perhaps the simplest approach to conceptualizing psychological disorders is to label behaviors, 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 4% of people in the United States have red hair, so red hair is considered an atypical characteristic (Figure 15.2), 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 15.2 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 having a psychological disorder, is it reasonable to consider behavior 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 behavior; 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 behavior 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 15.3).

Figure 15.3 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 a headband, legwarmers, and the big hair of the 1980s would go over on your campus today.

Harmful Dysfunction

If none of the criteria 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).

The American Psychiatric Association (APA) Definition

Many of the features of the harmful dysfunction model are incorporated into 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 behaviors**.
- **The disturbances reflect some kind of biological, psychological, or developmental dysfunction**.
- **The disturbances lead to significant distress or disability in one's life**.
- **The disturbances do not reflect expected or culturally approved responses to certain events**.

Some believe that there is no essential criterion or set of criteria that can definitively distinguish all cases of disorder from nondisorder (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 behavior at other times may not make much sense to ourselves or to others. These inner experiences and behaviors 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.

Learning Objectives

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

- Explain why classification systems are necessary for 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 behaviors 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. 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).

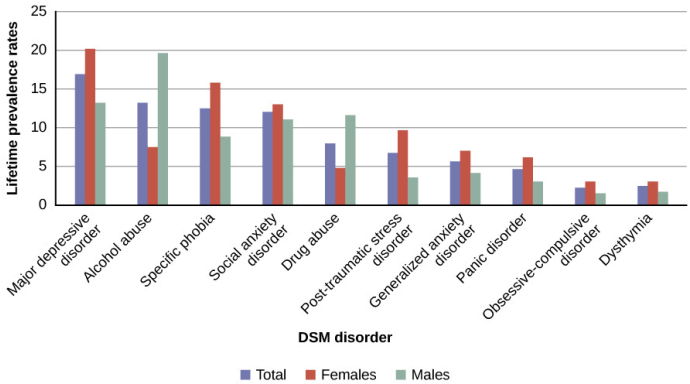


Figure 15.4 The graph shows the breakdown of psychological disorders, comparing the percentage prevalence among adult males and adult females in the United States. Because the data is from 2007, the categories shown here are from the DSM-IV, which has been supplanted by the DSM-5. Most categories remain the same; however, alcohol abuse now falls under a broader Alcohol Use Disorder category.

The 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 behavior. 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 behaviors 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 *has*—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.

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.

Biological Perspectives on 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 15.8 shows heritability estimates for schizophrenia.

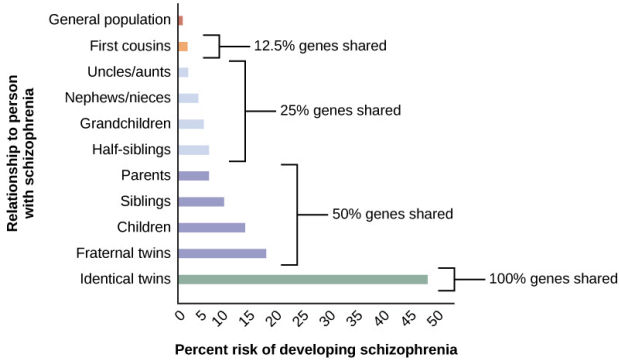


Figure 15.8 A person's risk of developing schizophrenia increases if a relative has schizophrenia. The closer the genetic relationship, the higher the risk.

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 for 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.

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 etiology 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. For example, suppose a student who came to the U.S. as a "Dreamer" (someone whose parents didn't lawfully immigrate) is concerned about the possibility of being unable to continue in the university

program or of losing access to academic financial aid, due to changes and litigation around the Deferred Action for Childhood Arrivals (DACA) program. This person likely would experience anxiety of greater intensity and duration than would a 21-year-old junior who entered college as a birthright citizen. 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 behavior (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 are 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 15.1.

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
Xenophobia	strangers

Table 15.1

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 modeling. 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 behaviors: mental or behavioral acts that reduce anxiety in social situations by reducing the chance of negative social outcomes. Safety behaviors include avoiding eye contact, rehearsing sentences before speaking, talking only briefly, and not talking about oneself (Alden & Bieling, 1998). Other examples of safety behaviors 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 behaviors 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 behavioral inhibition (Clauss & Blackford, 2012). Behavioral 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). Behavioral inhibition is displayed very early in life; behaviorally 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 behavioral inhibition was associated with more than a sevenfold increase in the risk of development of social anxiety disorder, demonstrating that behavioral 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, she tells you that you have experienced a panic attack (Figure 15.9). 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.

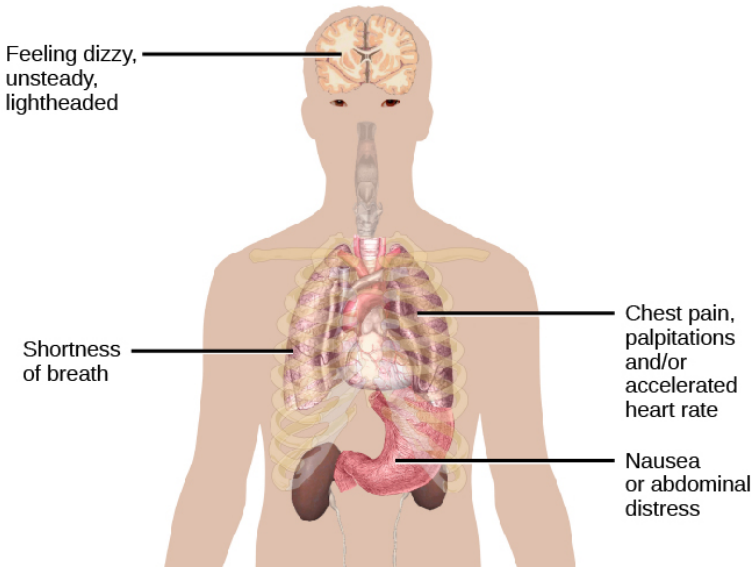


Figure 15.9 Some of the physical manifestations of a panic attack are shown. People may also experience sweating, trembling, feelings of faintness, or a fear of losing control, among other symptoms.

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 behavior 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 behavior in an effort to avoid future panic attacks. For this reason, panic disorder is often characterized as a 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 twin 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 as 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 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 15.10). 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 15.10 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 of 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.

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 behaviors. Many of us experience unwanted thoughts from time to time (e.g., craving double cheeseburgers when dieting), and many of us engage in repetitive behaviors on occasion (e.g., pacing when nervous). However, obsessive-compulsive and related disorders elevate the unwanted thoughts and repetitive behaviors 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 behaviors 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 heads 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 behaviors 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 15.11). 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).

(a)

(b)

Figure 15.11 (a) Repetitive hand washing and (b) checking (e.g., that a door is locked) are common compulsions among those with obsessive-compulsive disorder. (credit a: modification of work by the USDA; credit b: modification of work by Bradley Gordon)

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 behavioral 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 15.12). Often, the quantity of cluttered items is so excessive that the person is unable to use his kitchen, or sleep in his 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 15.12 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 15.13). 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 behavioral 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).

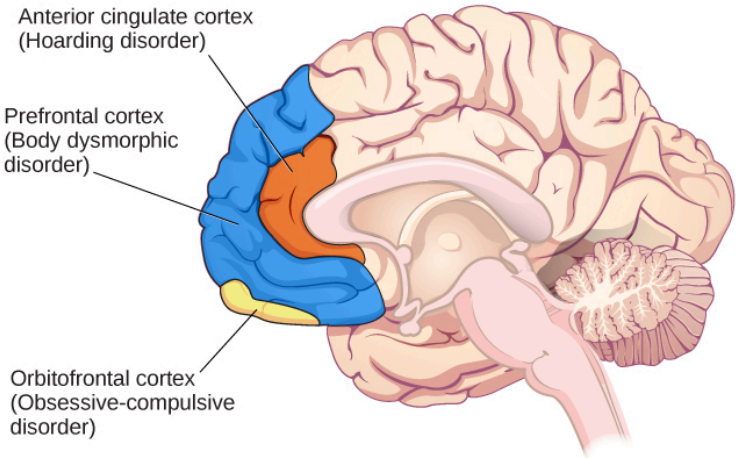


Figure 15.13 Different regions of the brain may be associated with different psychological disorders.

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).

Learning Objectives

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

- Describe the nature and symptoms of posttraumatic stress disorder

- Identify the risk factors associated with this disorder
- Understand the role of learning and cognitive factors in its development

Extremely stressful or traumatic events, such as combat, natural disasters, and terrorist attacks, place the people who experience them at an increased risk for developing psychological disorders such as posttraumatic stress disorder (PTSD). Throughout much of the 20th century, this disorder was called *shell shock* and *combat neurosis* because its symptoms were observed in soldiers who had engaged in wartime combat. The term *posttraumatic stress disorder* was developed given that these symptoms could happen to anyone who experienced psychological trauma.

A Broader Definition of PTSD

PTSD was listed among the anxiety disorders in previous DSM editions. In DSM-5, it is now listed among a group called Trauma-and-Stressor-Related Disorders. For a person to be diagnosed with PTSD, she must be exposed to, witness, or experience the details of a traumatic experience (e.g., a first responder), one that involves "actual or threatened death, serious injury, or sexual violence" (APA, 2013, p. 271). These experiences can include such events as combat, threatened or actual physical attack, sexual assault, natural disasters, terrorist attacks, and automobile accidents. This criterion makes PTSD the only disorder listed in the DSM in which a cause (extreme trauma) is explicitly specified.

Symptoms of PTSD include intrusive and distressing memories of the event, flashbacks (states that can last from a few seconds

to several days, during which the individual relives the event and behaves as if the event were occurring at that moment [APA, 2013]), avoidance of stimuli connected to the event, persistently negative emotional states (e.g., fear, anger, guilt, and shame), feelings of detachment from others, irritability, proneness toward outbursts, and an exaggerated startle response (jumpiness). For PTSD to be diagnosed, these symptoms must occur for at least one month.

Roughly 7% of adults in the United States, including 9.7% of women and 3.6% of men, experience PTSD in their lifetime (National Comorbidity Survey, 2007), with higher rates among people exposed to mass trauma and people whose jobs involve duty-related trauma exposure (e.g., police officers, firefighters, and emergency medical personnel) (APA, 2013).

Risk Factors For PTSD

Of course, not everyone who experiences a traumatic event will go on to develop PTSD; several factors strongly predict the development of PTSD: trauma experience, greater trauma severity, lack of immediate social support, and more subsequent life stress (Brewin, Andrews, & Valentine, 2000). Traumatic events that involve harm by others (e.g., combat, rape, and sexual molestation) carry greater risk than do other traumas (e.g., natural disasters) (Kessler, Sonnega, Bromet, Hughes, & Nelson, 1995). Women are more likely to have been traumatized because of sexual trauma, childhood neglect, and childhood physical abuse. Men are more likely to have been traumatized by natural disaster, life-threatening accident, and physical violence, either witnessed or directed at them. Adolescent boys are more likely to experience accident, physical assault, and witness death/injury; adolescent girls are more likely to experience rape/sexual assault, intimate partner violence, or unexpected death or injury of a loved one. Assaultive violence and witnessing trauma to others is more prevalent among non-whites when compared to

whites. African American males are more likely to be exposed to and victims of violence than males of other races (Kilpatrick, Badour, & Resnick, 2017). A 2012 study found that 27% of corrections officers reported experiencing symptoms of PTSD in the past 30 days. Rates were higher for males (31%) than females (22%) (Spinaris, Denhof, & Kellaway, 2012). A study conducted by Jaegers et al (2019) found that 53.4% of jail correctional officers screened positively for PTSD. PTSD is more prevalent in prison populations than in the general public, with prevalence estimates of 6% in male prisoners and 21% in female prisoners (Facer-Irwin et al, 2019). Factors that increase the risk of PTSD include female gender, low socioeconomic status, low intelligence, personal history of mental disorders, history of childhood adversity (abuse or other trauma during childhood), and family history of mental disorders (Brewin et al., 2000). Personality characteristics such as neuroticism and somatization (the tendency to experience physical symptoms when one encounters stress) have been shown to elevate the risk of PTSD (Bramsen, Dirkzwager, & van der Ploeg, 2000). People who experience childhood adversity and/or traumatic experiences during adulthood are at significantly higher risk of developing PTSD if they possess one or two short versions of a gene that regulates the neurotransmitter serotonin (Xie et al., 2009). This suggests a possible diathesis-stress interpretation of PTSD: its development is influenced by the interaction of psychosocial and biological factors.

Figure 15.14 PTSD was first recognized in soldiers who had engaged in combat. Research has shown that strong social support decreases the risk of PTSD. This person stands at the Vietnam Traveling Memorial Wall. (credit: Kevin Stanchfield)

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
- Discuss the relationship between mood disorders and suicidal ideation, as well as factors associated with suicide

Mood disorders (Figure 15.15) 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 favorite 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 15.15 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 behaviors 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 of 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).

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 his 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 a 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 endeavor. 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 behaviors 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.

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 15.16).

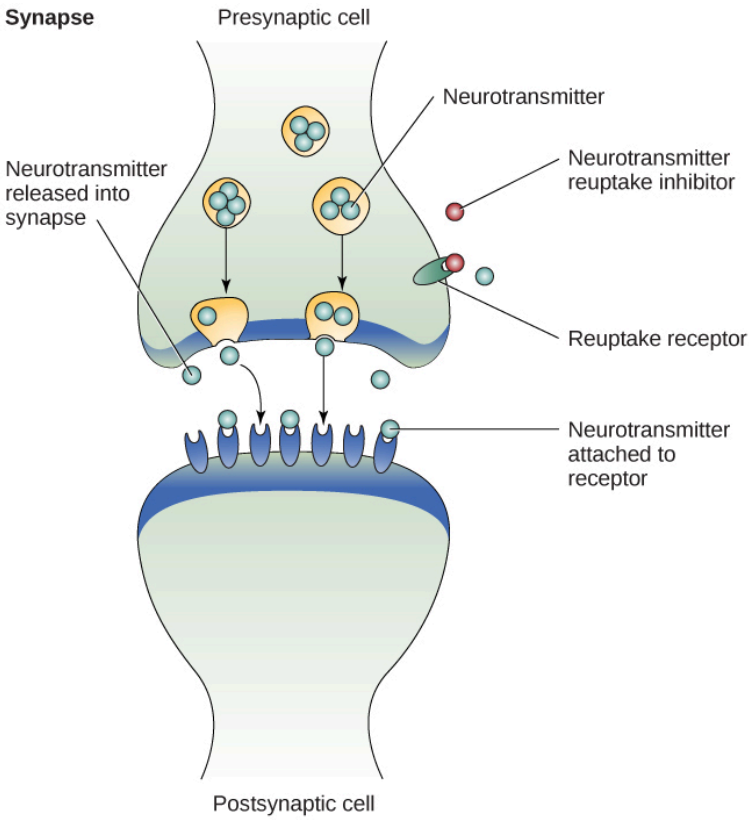


Figure 15.16 Many medications designed to treat mood disorders work by altering neurotransmitter activity in the neural synapse.

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 15.17) (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 15.17 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 the 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.

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 than 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)

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

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.

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 females 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 that 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).

Learning Objectives

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

- Describe the nature and symptoms of attention deficit/hyperactivity disorder and autism spectrum disorder
- Discuss the prevalence and factors that contribute to the development of these disorders

Most of the disorders we have discussed so far are typically diagnosed in adulthood, although they can and sometimes do occur during childhood. However, there are a group of conditions that, when present, are diagnosed early in childhood, often before the time a child enters school. These conditions are listed in the DSM-5 as neurodevelopmental disorders, and they involve developmental problems in personal, social, academic, and intellectual functioning (APA, 2013). In this section, we will discuss two such disorders: attention deficit/ hyperactivity disorder and autism.

Attention Deficit/Hyperactivity Disorder

Diego is always active, from the time he wakes up in the morning until the time he goes to bed at night. His mother reports that he came out of the womb kicking and screaming, and he has not stopped moving since. He has a sweet disposition but always seems to be in trouble with his teachers, parents, and after-school program counselors. He seems to accidentally break things; he lost his jacket three times last winter, and he never seems to sit still. His teachers believe he is a smart child, but he never finishes anything he starts and is so impulsive that he does not seem to learn much in school.

Diego likely has attention deficit/hyperactivity disorder (ADHD). The symptoms of this disorder were first described by Hans Hoffman in the 1920s. While taking care of his son while his wife was in the hospital giving birth to a second child, Hoffman noticed that the boy had trouble concentrating on his homework, had a short attention span, and had to repeatedly go over easy homework to learn the material (Jellinek & Herzog, 1999). Later, it was discovered that many hyperactive children—those who are fidgety, restless, socially disruptive, and have trouble with impulse control—also display short attention spans, problems with concentration, and distractibility. By the 1970s, it had become clear that many children who display attention problems often also exhibit signs of hyperactivity. In recognition of such findings, the DSM-III (published in 1980) included a new disorder: attention deficit disorder with and without hyperactivity, now known as attention deficit/hyperactivity disorder (ADHD).

A child with ADHD shows a constant pattern of inattention and/or hyperactive and impulsive behavior that interferes with normal functioning (APA, 2013). Some of the signs of inattention include great difficulty with and avoidance of tasks that require sustained attention (such as conversations or reading), failure to follow instructions (often resulting in failure to complete schoolwork and other duties), disorganization (difficulty keeping things in order, poor time management, sloppy and messy work), lack of attention to detail, becoming easily distracted, and forgetfulness. Hyperactivity is characterized by excessive movement, and includes fidgeting or squirming, leaving one's seat in situations when remaining seated is expected, having trouble sitting still (e.g., in a restaurant), running about and climbing on things, blurting out responses before another person's question or statement has been completed, difficulty waiting for one's turn for something, and interrupting and intruding on others. Frequently, the hyperactive child comes across as noisy and boisterous. The child's behavior is hasty, impulsive, and seems to occur without much forethought; these characteristics may explain why adolescents and young adults diagnosed with ADHD

receive more traffic tickets and have more automobile accidents than do others (Thompson, Molina, Pelham, & Gnagy, 2007).

ADHD occurs in about 5% of children (APA, 2013). On average, boys are three times more likely to have ADHD than are girls; however, such findings might reflect the greater propensity of boys to engage in aggressive and antisocial behavior and thus incur a greater likelihood of being referred to psychological clinics (Barkley, 2006). Children with ADHD face severe academic and social challenges. Compared to their non-ADHD counterparts, children with ADHD have lower grades and standardized test scores and higher rates of expulsion, grade retention, and dropping out (Loe & Feldman, 2007). they also are less well-liked and more often rejected by their peers (Hoza et al., 2005).

Previously, ADHD was thought to fade away by adolescence. However, longitudinal studies have suggested that ADHD is a chronic problem, one that can persist into adolescence and adulthood (Barkley, Fischer, Smallish, & Fletcher, 2002). A recent study found that 29.3% of adults who had been diagnosed with ADHD decades earlier still showed symptoms (Barbaresi et al., 2013). Somewhat troubling, this study also reported that nearly 81% of those whose ADHD persisted into adulthood had experienced at least one other comorbid disorder, compared to 47% of those whose ADHD did not persist.

Causes of ADHD

Family and twin studies indicate that genetics play a significant role in the development of ADHD. Burt (2009), in a review of 26 studies, reported that the median rate of concordance for identical twins was .66 (one study reported a rate of .90), whereas the median concordance rate for fraternal twins was .20. This study also found that the median concordance rate for unrelated (adoptive) siblings was .09; although this number is small, it is greater than 0, thus suggesting that the environment may have at least some influence.

Another review of studies concluded that the heritability of inattention and hyperactivity were 71% and 73%, respectively (Nikolas & Burt, 2010).

The specific genes involved in ADHD are thought to include at least two that are important in the regulation of the neurotransmitter dopamine (Gizer, Ficks, & Waldman, 2009), suggesting that dopamine may be important in ADHD. Indeed, medications used in the treatment of ADHD, such as methylphenidate (Ritalin) and amphetamine with dextroamphetamine (Adderall), have stimulant qualities and elevate dopamine activity. People with ADHD show less dopamine activity in key regions of the brain, especially those associated with motivation and reward (Volkow et al., 2009), which provides support to the theory that dopamine deficits may be a vital factor in the development of this disorder (Swanson et al., 2007).

Brain imaging studies have shown that children with ADHD exhibit abnormalities in their frontal lobes, an area in which dopamine is in abundance. Compared to children without ADHD, those with ADHD appear to have smaller frontal lobe volume, and they show less frontal lobe activation when performing mental tasks. Recall that one of the functions of the frontal lobes is to inhibit our behavior. Thus, abnormalities in this region may go a long way toward explaining the hyperactive, uncontrolled behavior of ADHD.

By the 1970s, many had become aware of the connection between nutritional factors and childhood behavior. At the time, much of the public believed that hyperactivity was caused by sugar and food additives, such as artificial coloring and flavoring. Undoubtedly, part of the appeal of this hypothesis was that it provided a simple explanation of (and treatment for) behavioral problems in children. A statistical review of 16 studies, however, concluded that sugar consumption has no effect at all on the behavioral and cognitive performance of children (Wolraich, Wilson, & White, 1995). Additionally, although food additives have been shown to increase hyperactivity in non-ADHD children, the effect is rather small

(McCann et al., 2007). Numerous studies, however, have shown a significant relationship between exposure to nicotine in cigarette smoke during the prenatal period and ADHD (Linnet et al., 2003). Maternal smoking during pregnancy is associated with the development of more severe symptoms of the disorder (Thakur et al., 2013).

Is ADHD caused by poor parenting? Not likely. Remember, the genetics studies discussed above suggested that the family environment does not seem to play much of a role in the development of this disorder; if it did, we would expect the concordance rates to be higher for fraternal twins and adoptive siblings than has been demonstrated. All things considered, the evidence seems to point to the conclusion that ADHD is triggered more by genetic and neurological factors and less by social or environmental ones.

Autism Spectrum Disorder

A seminal paper published in 1943 by psychiatrist Leo Kanner described an unusual neurodevelopmental condition he observed in a group of children. He called this condition early infantile autism, and it was characterized mainly by an inability to form close emotional ties with others, speech and language abnormalities, repetitive behaviors, and an intolerance of minor changes in the environment and in normal routines (Bregman, 2005). What the DSM-5 refers to as autism spectrum disorder today, is a direct extension of Kanner's work.

Autism spectrum disorder is probably the most misunderstood and puzzling of the neurodevelopmental disorders. Children with this disorder show signs of significant disturbances in three main areas: (a) deficits in social interaction, (b) deficits in communication, and (c) repetitive patterns of behavior or interests. These disturbances appear early in life and cause serious impairments in

functioning (APA, 2013). The child with autism spectrum disorder might exhibit deficits in social interaction by not initiating conversations with other children or turning their head away when spoken to. Typically, these children do not make eye contact with others and seem to prefer playing alone rather than with others. In a certain sense, it is almost as though these individuals live in a personal and isolated social world others are simply not privy to or able to penetrate. Communication deficits can range from a complete lack of speech to one-word responses (e.g., saying "Yes" or "No" when replying to questions or statements that require additional elaboration), to echoed speech (e.g., parroting what another person says, either immediately or several hours or even days later), to difficulty maintaining a conversation because of an inability to reciprocate others' comments. These deficits can also include problems in using and understanding nonverbal cues (e.g., facial expressions, gestures, and postures) that facilitate normal communication.

Repetitive patterns of behavior or interests can be exhibited in a number of ways. The child might engage in stereotyped, repetitive movements (rocking, head-banging, or repeatedly dropping an object and then picking it up), or she might show great distress at small changes in routine or the environment. For example, the child might throw a temper tantrum if an object is not in its proper place or if a regularly-scheduled activity is rescheduled. In some cases, the person with autism spectrum disorder might show highly restricted and fixated interests that appear to be abnormal in their intensity. For instance, the person might learn and memorize every detail about something even though doing so serves no apparent purpose. Importantly, autism spectrum disorder is not the same thing as intellectual disability, although these two conditions are often comorbid. The DSM-5 specifies that the symptoms of autism spectrum disorder are not caused or explained by intellectual disability.

Life Problems From Autism Spectrum Disorder

Autism spectrum disorder is referred to in everyday language as autism; in fact, the disorder was termed "autistic disorder" in earlier editions of the DSM, and its diagnostic criteria were much narrower than those of autism spectrum disorder. The qualifier "spectrum" in autism spectrum disorder is used to indicate that individuals with the disorder can show a range, or spectrum, of symptoms that vary in their magnitude and severity: some severe, others less severe. The previous edition of the DSM included a diagnosis of Asperger's disorder, generally recognized as a less severe form of autistic disorder; individuals diagnosed with Asperger's disorder were described as having average or high intelligence and a strong vocabulary, but exhibiting impairments in social interaction and social communication, such as talking only about their special interests (Wing, Gould, & Gillberg, 2011). However, because research has failed to demonstrate that Asperger's disorder differs qualitatively from autistic disorder, the DSM-5 does not include it, which is prompting concerns among some parents that their children may no longer be eligible for special services ("Asperger's Syndrome Dropped," 2012). Some individuals with autism spectrum disorder, particularly those with better language and intellectual skills, can live and work independently as adults. However, most do not because the symptoms remain sufficient to cause serious impairment in many realms of life (APA, 2013).

Current estimates from the Center for Disease Control and Prevention's Autism and Developmental Disabilities Monitoring Network indicate that 1 in 59 children in the United States has autism spectrum disorder; the disorder is 4 times more common among boys (1 in 38) than in girls (1 in 152) (Baio et al., 2018). Rates of autistic spectrum disorder have increased dramatically since the 1980s. For example, California saw an increase of 273% in reported cases from 1987 through 1998 (Byrd, 2002); between 2000 and 2008, the rate of autism diagnoses in the United States increased 78% (CDC, 2012). Although it is difficult to interpret this increase, it is

possible that the rise in prevalence is the result of the broadening of the diagnosis, increased efforts to identify cases in the community, and greater awareness and acceptance of the diagnosis. In addition, mental health professionals are now more knowledgeable about autism spectrum disorder and are better equipped to make the diagnosis, even in subtle cases (Novella, 2008).

Causes of Autism Spectrum Disorder

Early theories of autism placed the blame squarely on the shoulders of the child's parents, particularly the mother. Bruno Bettelheim (an Austrian-born American child psychologist who was heavily influenced by Sigmund Freud's ideas) suggested that a mother's ambivalent attitudes and her frozen and rigid emotions toward her child were the main causal factors in childhood autism. In what must certainly stand as one of the more controversial assertions in psychology over the last 50 years, he wrote, "I state my belief that the precipitating factor in infantile autism is the parent's wish that his child should not exist" (Bettelheim, 1967, p. 125). As you might imagine, Bettelheim did not endear himself to a lot of people with this position; incidentally, no scientific evidence exists supporting his claims.

The exact causes of autism spectrum disorder remain unknown despite massive research efforts over the last two decades (Meek, Lemery-Chalfant, Jahromi, & Valiente, 2013). Autism appears to be strongly influenced by genetics, as identical twins show concordance rates of 60%–90%, whereas concordance rates for fraternal twins and siblings are 5%–10% (Autism Genome Project Consortium, 2007). Many different genes and gene mutations have been implicated in autism (Meek et al., 2013). Among the genes involved are those important in the formation of synaptic circuits that facilitate communication between different areas of the brain (Gauthier et al., 2011). A number of environmental factors are also thought to be associated with increased risk for autism spectrum

disorder, at least in part, because they contribute to new mutations. These factors include exposure to pollutants, such as plant emissions and mercury, urban versus rural residence, and vitamin D deficiency (Kinney, Barch, Chayka, Napoleon, & Munir, 2009).

In the late 1990s, a prestigious medical journal published an article purportedly showing that autism is triggered by the MMR (measles, mumps, and rubella) vaccine. These findings were very controversial and drew a great deal of attention, sparking an international forum on whether children should be vaccinated. In a shocking turn of events, some years later the article was retracted by the journal that had published it after accusations of fraud on the part of the lead researcher. Despite the retraction, the reporting in popular media led to concerns about a possible link between vaccines and autism persisting. A recent survey of parents, for example, found that roughly a third of respondents expressed such a concern (Kennedy, LaVail, Nowak, Basket, & Landry, 2011); and perhaps fearing that their children would develop autism, more than 10% of parents of young children refuse or delay vaccinations (Dempsey et al., 2011).

Why does concern over vaccines and autism spectrum disorder persist? The notion that autism spectrum disorder is caused by vaccinations is appealing to some because it provides a simple explanation for this condition. Like all disorders, however, there are no simple explanations for autism spectrum disorder. Although the research discussed above has shed some light on its causes, science is still a long way from a complete understanding of the disorder.

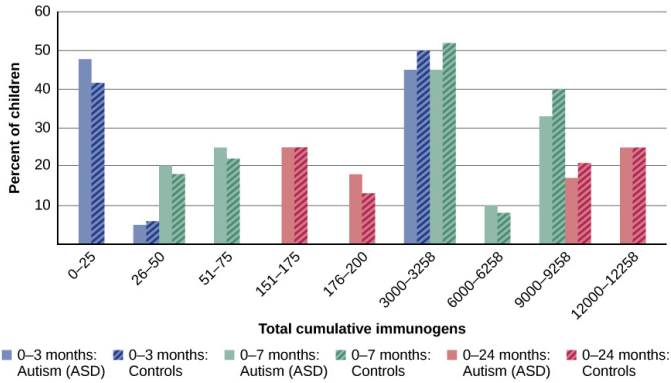


Figure 15.19 In terms of their exposure to immunogens in vaccines, overall, there is not a significant difference between children with autism spectrum disorder and their age-matched controls without the disorder (DeStefano et al., 2013).

Additional Supplemental Resources

Websites

- NIH Mental Health Information
  - The National Institute of Mental Health (NIMH) offers expert-reviewed information on mental disorders, a range of related topics, and the latest mental health research.
- SAMSHA Substance Abusive and Mental Health Alliance
  - Find treatment facilities and programs in the United States or U.S. Territories for mental and substance use disorders
- NAMI National Alliance on Mental Illness
  - NAMI provides advocacy, education, support and public awareness so that all individuals and families affected by mental illness can build better lives.

Videos

- Ted-Ed: What is depression?
  - How is having depression different from feeling depressed? Watch this Ted-Ed video to learn more about the causes, symptoms, and treatment of depression. A variety of discussion and assessment questions are included with the video (free registration is required to access the questions). Closed captioning available.
- Crash Course Video #28 – Psychological Disorders
  - This video on psychological disorders includes information on topics such as mental health reform, definitions of psychological disorders, and the advantages and disadvantages of the DSM. Closed captioning available.
- Crash Course Video #29 – OCD and Anxiety Disorders
  - This video on Obsessive-Compulsive Disorder (OCD) and Anxiety Disorder includes information on topics such as stigma, anxiety disorders, and OCD. Closed captioning available.
- Crash Course Video #30 – Depressive and Bipolar Disorders
  - This video includes information on topics such as Bipolar Disorder, causes of Mood Disorders, and Major Depression. Closed captioning available.
- Crash Course Video #31 – Trauma and Addiction
  - This video on trauma and addiction includes information on topics such as causes of Post-Traumatic Stress Disorder, substance abuse, and the dual diagnosis model of treatment. Closed captioning available.
- Crash Course Video #32 – Schizophrenia and Dissociative Disorders
  - This video on Schizophrenia and Dissociative Disorders includes information on topics such as delusions,

hallucinations, positive vs. negative symptoms, and dissociative disorders. Closed captioning available.

- Crash Course Video #34 – Personality Disorders
  - This video on personality disorders includes information on topics such as borderline personality disorder, antisocial personality disorder, and treatment. Closed captioning available.

Access for free at https://openstax.org/books/psychology-2e/pages/1-introduction

14. Therapy and Treatment

Figure 16.1 Many forms of therapy have been developed to treat a wide array of problems. These marines who served in Iraq and Afghanistan, together with community mental health volunteers, are part of the Ocean Therapy program at Camp Pendleton, a program in which learning to surf is combined with group discussions. The program helps vets recover, especially vets who suffer from post-traumatic stress disorder (PTSD).

What comes to mind when you think about therapy for psychological problems? You might picture someone lying on a couch talking about his 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 problems can originate from various sources—biology, genetics, childhood experiences, conditioning, and sociocultural influences—psychologists have developed many different therapeutic techniques and approaches.

The Ocean Therapy program shown in Figure 16.1 uses multiple approaches to support the mental health of veterans in the group.

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

Before we explore the various approaches to therapy used today, let's begin our study of therapy by looking at how many people experience mental illness and how many receive treatment. According to the U.S. Department of Health and Human Services (2017), 18.9% of U.S. adults experienced mental illness in 2017. For teens (ages 13–18), the rate is similar to that of adults, and for children ages 8–15, current estimates suggest that approximately 13% experience mental illness in a given year (National Institute of Mental Health [NIMH], 2017).

With many different treatment options available, approximately how many people receive mental health treatment per year? According to the Substance Abuse and Mental Health Services Administration (SAMHSA), in 2017, 14.8% of adults received treatment for a mental health issue (NIMH, 2017). These percentages, shown in Figure 16.2, reflect the number of adults who

received care in inpatient and outpatient settings and/or used prescription medication for psychological disorders.

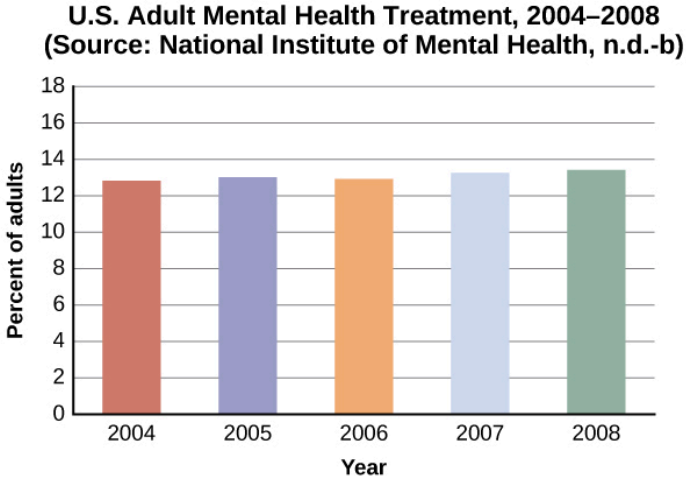


Figure 16.2 The percentage of adults who received mental health treatment in 2004–2008 is shown. Adults seeking treatment increased slightly from 2004 to 2008.

Children and adolescents also receive mental health services. The Centers for Disease Control and Prevention's National Health and Nutrition Examination Survey (NHANES) found that approximately half (50.6%) of children with mental disorders had received treatment for their disorder within the past year (NIMH, n.d.). However, there were some differences between treatment rates by category of disorder (Figure 16.3). For example, children with anxiety disorders were least likely to have received treatment in the past year, while children with ADHD or a conduct disorder were more likely to receive treatment. Can you think of some possible reasons for these differences in receiving treatment?

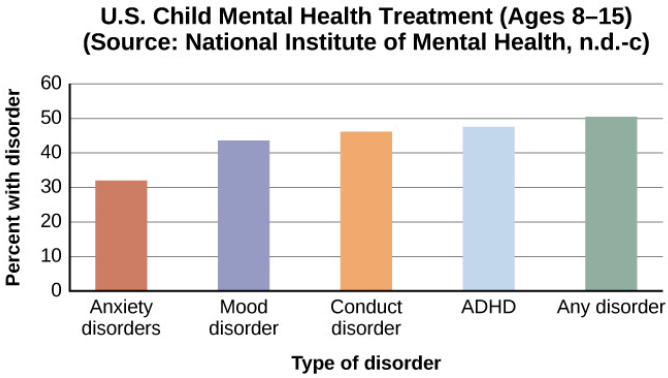


Figure 16.3 About one-third to one-half of U.S. adolescents (ages 8–15) with mental disorders receive treatment, with behavior-related disorders more likely to be treated.

Considering the many forms of treatment for mental health disorders available today, how did these forms of treatment emerge? Let's take a look at the history of mental health treatment from the past (with some questionable approaches in light of modern understanding of mental illness) to where we are today.

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 behaviors 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. One 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. 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 behaviors 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 was that those who acted differently were considered to be witches. They were tried and condemned by courts and 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 16.4). 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 16.4 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 16.5). Patients benefited from this more humane treatment, and many were able to leave the hospital.

Figure 16.5 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 16.6). 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 16.6 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 centers (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 centers across the nation. They are located in neighborhoods 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 centers, but the system was not set up effectively. Centers were underfunded, the 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 16.7). 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 16.7 (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, he or she might seek psychological treatment. A friend, spouse, or parent might refer someone for treatment. The individual might go see his 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 16.8).

Figure 16.8 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 counseling sessions might be a condition of parole. If an individual is mandated to attend therapy, she is 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 center or a practitioner in private or community practice. A child might see a school counselor, 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 counseling 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, the 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 1,669 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.

Learning Objectives

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

- Distinguish between psychotherapy and biomedical therapy
- Recognize various orientations to psychotherapy
- Discuss psychotropic medications and recognize which medications are used to treat specific psychological disorders

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.

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 16.1 (many of these orientations were discussed in the Introduction chapter).

Various Psychotherapy Techniques		
Type	**Description**	**Example**
Psychodynamic psychotherapy	Talk therapy based on belief that the unconscious and childhood conflicts impact behavior	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
Behavior therapy	Principles of learning applied to change undesirable behaviors	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-behavioral therapy	Work to change cognitive distortions and self-defeating behaviors	Patient learns to identify self-defeating behaviors to overcome an eating disorder
Humanistic therapy	Increase self-awareness and acceptance through focus on conscious thoughts	Patient learns to articulate thoughts that keep her from achieving her goals

Table 16.1

Psychotherapy Techniques: Psychoanalysis

Psychoanalysis was developed by Sigmund Freud and was the first form of psychotherapy. It was the dominant therapeutic technique in the early 20th century, but it has since waned significantly in popularity. Freud believed most of our psychological problems are the result of repressed impulses and trauma experienced in childhood, and he believed psychoanalysis would help uncover long-buried feelings. In a psychoanalyst's office, you might see a patient lying on a couch speaking of dreams or childhood memories, and the therapist using various Freudian methods such as free association and dream analysis (Figure 16.9). In free association, the patient relaxes and then says whatever comes to mind at the moment. However, Freud felt that the ego would at times try to block, or repress, unacceptable urges or painful conflicts during free association. Consequently, a patient would demonstrate resistance to recalling these thoughts or situations. In dream analysis, a therapist interprets the underlying meaning of dreams.

Psychoanalysis is a therapy approach that typically takes years. Over the course of time, the patient reveals a great deal about himself to the therapist. Freud suggested that during this patient-therapist relationship, the patient comes to develop strong feelings for the therapist—maybe positive feelings, maybe negative feelings. Freud called this transference: the patient transfers all the positive or negative emotions associated with the patient's other relationships to the psychoanalyst. For example, Crystal is seeing a psychoanalyst. During the years of therapy, she comes to see her therapist as a father figure. She transfers her feelings about her father onto her therapist, perhaps in an effort to gain the love and attention she did not receive from her own father.

Figure 16.9 This is the famous couch in Freud's consulting room. Patients were instructed to lie comfortably on the couch and to face away from Freud in order to feel less inhibited and to help them focus. Today, psychotherapy patients are not likely to lie on a couch; instead, they are more likely to sit facing the therapist (Prochaska & Norcross, 2010). (credit: Robert Huffstutter)

Today, Freud's psychoanalytical perspective has been expanded upon by the developments of subsequent theories and methodologies: the psychodynamic perspective. This approach to therapy remains centered on the role of people's internal drives and forces, but treatment is less intensive than Freud's original model.

LINK TO LEARNING: View a brief video overview of psychoanalysis theory, research, and practice to learn more.

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 16.10). 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 disturbing behavior. 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 16.10 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: Behavior Therapy

In psychoanalysis, therapists help their patients look into their past to uncover repressed feelings. In behavior therapy, a therapist employs principles of learning to help clients change undesirable behaviors—rather than digging deeply into one's unconscious.

Therapists with this orientation believe that dysfunctional behaviors, like phobias and bedwetting, can be changed by teaching clients new, more constructive behaviors. Behavior therapy employs both classical and operant conditioning techniques to change behavior.

One type of behavior therapy utilizes classical conditioning techniques. Therapists using these techniques believe that dysfunctional behaviors are conditioned responses. Applying the conditioning principles developed by Ivan Pavlov, these therapists seek to recondition their clients and thus change their behavior. Emmie is eight years old and frequently wets her bed at night. She's been invited to several sleepovers, but she won't go because of her problem. Using a type of conditioning therapy, Emmie begins to sleep on a liquid-sensitive bed pad that is hooked to an alarm. When moisture touches the pad, it sets off the alarm, waking up Emmie. When this process is repeated enough times, Emmie develops an association between urinary relaxation and waking up, and this stops the bedwetting. Emmie has now gone three weeks without wetting her bed and is looking forward to her 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 behavior. Two counterconditioning techniques are aversive conditioning and exposure therapy. Aversive conditioning uses an unpleasant stimulus to stop an undesirable behavior. Therapists apply this technique to eliminate addictive behaviors, such as smoking, nail biting, and drinking. In aversion therapy, clients will typically engage in a specific behavior (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 behavior, the client can learn to stop the unwanted behavior.

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 behavior 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 16.11). 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).

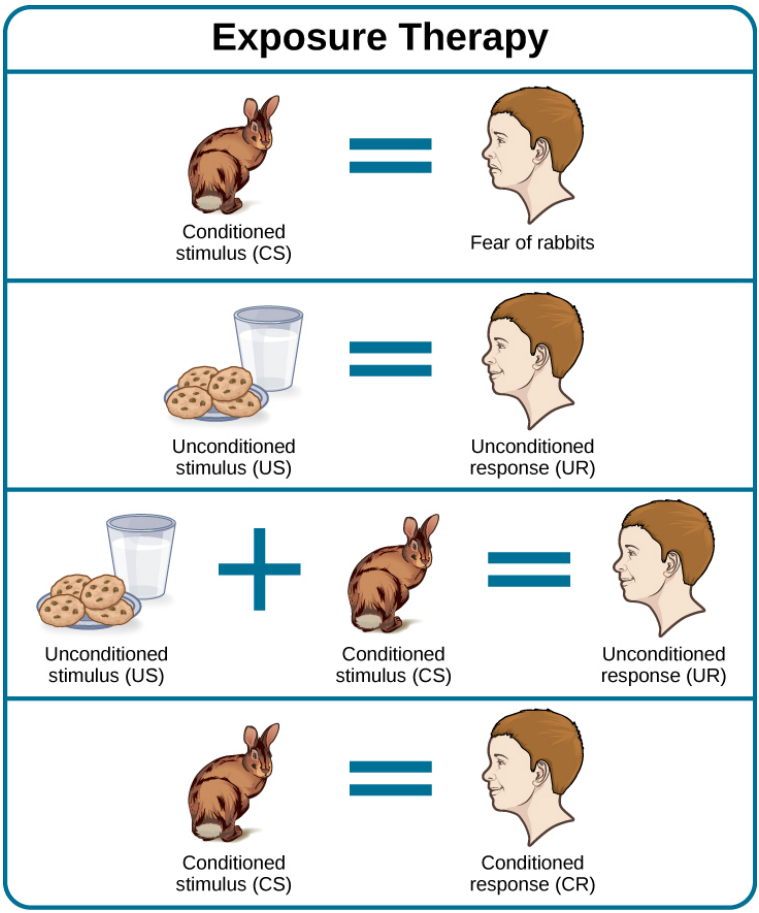


Figure 16.11 Exposure therapy seeks to change the response to a conditioned stimulus (CS). An unconditioned stimulus is presented over and over just after the presentation of the conditioned stimulus. This figure shows conditioning as conducted in Mary Cover Jones' 1924 study.

Thirty years later, Joseph Wolpe (1958) refined Jones's techniques, giving us the behavior 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 16.12).

Figure 16.12 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 him on an elevator, but he's so afraid of elevators that he will always take the stairs. That wasn't a problem when Jayden worked on the second floor of an office building, but now he has a new job—on the 29th floor of a skyscraper in downtown Los Angeles. Jayden knows he can't climb 29 flights of stairs in order to get to work each day, so he decided to see a behavior 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. She teaches Jayden how to relax each of his muscle groups so that he achieves a drowsy, relaxed, and comfortable state of mind. Once he's in this state, she 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, he lifts his finger. The therapist would then tell Jayden to forget the scene and return to his relaxed state. She repeats this scenario over and over until Jayden can imagine himself 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 he becomes desensitized to each one. After this, Jayden and the therapist begin to practice what he 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 his 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).

Some behavior therapies employ operant conditioning. Recall what you learned about operant conditioning: We have a tendency to repeat behaviors that are reinforced. What happens to behaviors 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 behaviors and punish unwanted behaviors are effective behavior 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 behavior is charted and analyzed. The ABA therapist, along with the caregivers, determines what reinforces the child, what sustains a behavior to continue, and how best to manage

a behavior. 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 him and places him in a special room where he can relax. Going into the special room and getting the aide's attention are reinforcing for Nur. In order to change Nur's behavior, he must be presented with other options before he becomes overwhelmed, and he cannot receive reinforcement for displaying maladaptive behaviors.

One popular operant conditioning intervention is called the token economy. This involves a controlled setting where individuals are reinforced for desirable behaviors 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 behaviors (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 Ray failed one test in Psychology 101, he feels he is stupid and worthless. These thoughts then cause his mood to worsen. Therapists also help clients recognize when they blow things out of proportion. Because Ray failed his Psychology 101 test, he has concluded that he's going to fail the entire course and

probably flunk out of college altogether. These errors in thinking have contributed to Ray's feelings of distress. His therapist will help him 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 16.13). 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).

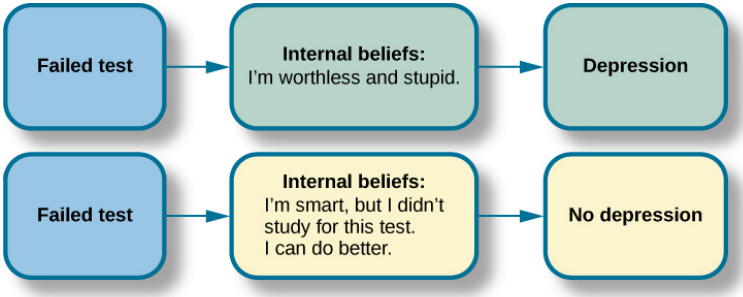


Figure 16.13 Your emotional reactions are the result of your thoughts about the situation rather than the situation itself. For instance, if you consistently interpret events and emotions around the themes of loss and defeat, then you are likely to be depressed. Through therapy, you can learn more logical ways to interpret situations.

LINK TO LEARNING: View a brief video in which Judith Beck talks about cognitive therapy and conducts a session with a client.

Psychotherapy: Cognitive-Behavioral Therapy

Cognitive-behavioral 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-behavioral therapy was rational emotive therapy (RET), which was founded by Albert Ellis and grew out of his dislike of Freudian psychoanalysis (Daniel, n.d.). Behaviorists such as Joseph Wolpe also influenced Ellis's therapeutic approach (National Association of Cognitive-Behavioral Therapists, 2009).

Cognitive-behavioral therapy (CBT) helps clients examine how their thoughts affect their behavior. It aims to change cognitive distortions and self-defeating behaviors. 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 behavior 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-behavioral 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-behavioral therapy has also been effective in reducing PTSD in specific populations, such as transit workers (Lowinger & Rombom, 2012).

Cognitive-behavioral therapy aims to change cognitive distortions and self-defeating behaviors 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 Jon and Joe both go to a party. Jon and Joe each have met an interesting person at the party and spend a few hours chatting with them. At the end of the party, Jon and Joe ask to exchange phone numbers with the person they've been talking to, and the request is refused. Both Jon and Joe are surprised, as they thought things were going well. What can Jon and Joe tell themselves about why the person was not interested? Let's say Jon tells himself he is a loser, or is ugly, or "has no game." Jon then gets depressed and decides not to go to another party, which starts a cycle that keeps him depressed. Joe tells himself that he had bad breath, goes out and buys a new toothbrush, goes to another party, and meets someone new.

Jon's belief about what happened results in a consequence of further depression, whereas Joe's belief does not. Jon is internalizing the attribution or reason for the rebuffs, which triggers his depression. On the other hand, Joe is externalizing the cause, so his thinking does not contribute to feelings of depression. Cognitive-behavioral 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," the man 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, Jon begins to think, "No woman will ever go out with me. I'm going to be alone forever." He 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 Savannah and Hillaire, who recently met at a party. They have a lot in common, and Savannah thinks they could

become friends. She calls Hillaire to invite her for coffee. Since Hillaire doesn't answer, Savannah leaves her a message. Several days go by and Savannah never hears back from her potential new friend. Maybe Hillaire never received the message because she lost her phone or she is too busy to return the phone call. But if Savannah believes that Hillaire didn't like Savannah or didn't want to be her friend, she is demonstrating the cognitive distortion of jumping to conclusions.

How effective is CBT? One client said this about his cognitive-behavioral 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 counseling, 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.)

Psychotherapy: Humanistic Therapy

Humanistic psychology focuses on helping people achieve their potential. So it makes sense that the goal of humanistic therapy is to help people become more self-aware and accepting of themselves.

In contrast to psychoanalysis, humanistic therapists focus on conscious rather than unconscious thoughts. They also emphasize the patient's present and future, as opposed to exploring the patient's past.

Psychologist Carl Rogers developed a therapeutic orientation known as Rogerian or client-centered therapy. Note the change from *patients* to *clients*. Rogers (1951) felt that the term patient suggested the person seeking help was sick and looking for a cure. Since this is a form of nondirective therapy, a therapeutic approach in which the therapist does not give advice or provide interpretations but helps the person to identify conflicts and understand feelings, Rogers (1951) emphasized the importance of the person taking control of his own life to overcome life's challenges.

In client-centered therapy, the therapist uses the technique of active listening. In active listening, the therapist acknowledges, restates, and clarifies what the client expresses. Therapists also practice what Rogers called unconditional positive regard, which involves not judging clients and simply accepting them for who they are. Rogers (1951) also felt that therapists should demonstrate genuineness, empathy, and acceptance toward their clients because this helps people become more accepting of themselves, which results in personal growth.

LINK TO LEARNING: View a brief video of Carl Rogers describing his therapeutic approach to learn more.

Evaluating Various Forms of Psychotherapy

How can we assess the effectiveness of psychotherapy? Is one technique more effective than another? For anyone considering therapy, these are important questions. According to the American Psychological Association, three factors work together to produce

successful treatment. The first is the use of evidence-based treatment that is deemed appropriate for your particular issue. The second important factor is the clinical expertise of the psychologist or therapist. The third factor is your own characteristics, values, preferences, and culture. Many people begin psychotherapy feeling like their problem will never be resolved; however, psychotherapy helps people see that they can do things to make their situation better. Psychotherapy can help reduce a person's anxiety, depression, and maladaptive behaviors. Through psychotherapy, individuals can learn to engage in healthy behaviors designed to help them better express emotions, improve relationships, think more positively, and perform more effectively at work or school.

Many studies have explored the effectiveness of psychotherapy. For example, one large-scale study that examined 16 meta-analyses of CBT reported that it was equally effective or more effective than other therapies in treating PTSD, generalized anxiety disorder, depression, and social phobia (Butlera, Chapmanb, Formanc, & Becka, 2006). Another study found that CBT was as effective at treating depression (43% success rate) as prescription medication (50% success rate) compared to the placebo rate of 25% (DeRubeis et al., 2005). Another meta-analysis found that psychodynamic therapy was also as effective at treating these types of psychological issues as CBT (Shedler, 2010). However, no studies have found one psychotherapeutic approach more effective than another (Abbass, Kisely, & Kroenke, 2006; Chorpita et al., 2011), nor have they shown any relationship between a client's treatment outcome and the level of the clinician's training or experience (Wampold, 2007). Regardless of which type of psychotherapy an individual chooses, one critical factor that determines the success of treatment is the person's relationship with the psychologist or therapist.

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 16.2 shows the commonly prescribed types of medications, how they are used, and *some* of the potential side effects that may occur.

Some Commonly Prescribed Psychotropic Medications

Type of Medication	Used to Treat	Brand Names of Commonly Prescribed Medications	How They Work	Side Effec
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	Long-term can lead t tardive dyskinesia involuntar movemen the arms, tongue an facial mus resulting i Parkinson tremors
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	Can increa the risk of obesity an diabetes a as elevate cholesterol levels; constipati dry mouth blurred vi drowsines dizziness
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	SSRIs: headache, nausea, w gain, drowsines reduced s drive Tricyclics mouth, constipati blurred vi drowsines reduced s drive, incr risk of sui

Some Commonly Prescribed Psychotropic Medications				
Type of Medication	**Used to Treat**	**Brand Names of Commonly Prescribed Medications**	**How They Work**	**Side Effec**
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	Drowsines dizziness, headache fatigue, lighthead
Mood Stabilizers	Bipolar disorder	Lithium, Depakote, Lamictal, Tegretol	Treat episodes of mania as well as depression	Excessive irregular heartbeat itching/ra swelling (f mouth, an extremitie nausea, lo appetite
Stimulants	ADHD	Adderall, Ritalin	Improve ability to focus on a task and maintain attention	Decreased appetite, difficulty sleeping, stomacha headache

Table16.2

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).

DIG DEEPER: Evidence-based Practice

A buzzword in therapy today is evidence-based practice. However, it's not a novel concept but one that has been used in medicine for at least two decades. Evidence-based practice is used to reduce errors in treatment selection by making clinical decisions based on research (Sackett & Rosenberg, 1995). In any case, evidence-based treatment is on the rise in the field of psychology. So what is it, and why does it matter? In an effort to determine which treatment methodologies are evidenced-based, professional organizations such as the American Psychological Association (APA) have recommended that specific psychological treatments be used to treat certain psychological disorders (Chambless & Ollendick, 2001). According to the APA (2005), "Evidence-based practice in psychology (EBPP) is the integration of the best available research with clinical expertise in the context of patient characteristics, culture, and preferences" (p. 1).

The foundational idea behind evidence based treatment is that best practices are determined by research evidence that has been compiled by comparing various forms of treatment (Charman & Barkham, 2005). These treatments are then operationalized and placed in

treatment manuals–trained therapists follow these manuals. The benefits are that evidence-based treatment can reduce variability between therapists to ensure that a specific approach is delivered with integrity (Charman & Barkham, 2005). Therefore, clients have a higher chance of receiving therapeutic interventions that are effective at treating their specific disorder. While EBPP is based on randomized control trials, critics of EBPP reject it stating that the results of trials cannot be applied to individuals and instead determinations regarding treatment should be based on a therapist's judgment (Mullen & Streiner, 2004).

Learning Objectives

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

- Distinguish between the various modalities of treatment
- Discuss the benefits of group therapy

Once a person seeks treatment, whether voluntarily or involuntarily, he has an intake done to assess his clinical needs. An intake is the therapist's first meeting with the client. 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 treatment. Confidentiality means the therapist cannot disclose confidential communications to any third party unless mandated or permitted by law to do so. During the intake, the therapist and client will work together to discuss treatment goals. Then a treatment plan will be formulated, usually with specific measurable objectives. Also, the therapist and client will discuss how treatment success will be measured and the estimated length of treatment. There are several different modalities of treatment (Figure 16.14): Individual therapy, family therapy, couples therapy, and group therapy are the most common.

(a)

(b)

Figure 16.14 Therapy may occur (a) one-on-one between a therapist and client, or (b) in a group setting. (credit a: modification of work by Connor Ashleigh, AusAID/Department of Foreign Affairs and Trade)

Individual Therapy

In individual therapy, also known as individual psychotherapy or individual counseling, the client and clinician meet one-on-one (usually from 45 minutes to 1 hour). These meetings typically occur weekly or every other week, and sessions are conducted in a confidential and caring environment (Figure 16.15). The clinician will work with clients to help them explore their feelings, work through

life challenges, identify aspects of themselves and their lives that they wish to change, and set goals to help them work towards these changes. A client might see a clinician for only a few sessions, or the client may attend individual therapy sessions for a year or longer. The amount of time spent in therapy depends on the needs of the client as well as her personal goals.

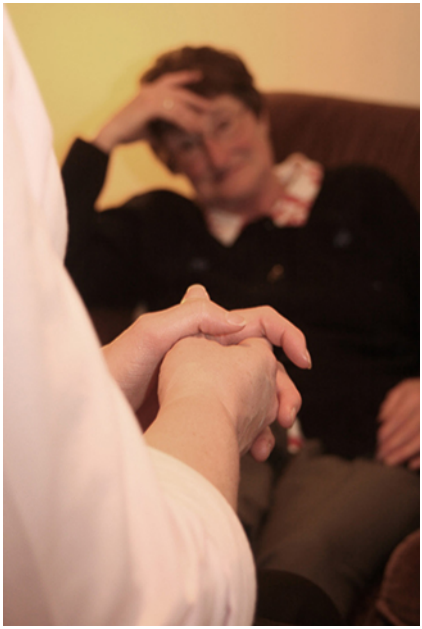


Figure 16.15 In an individual therapy session, a client works one-on-one with a trained therapist. (credit: Alan Cleaver)

Group Therapy

In group therapy, a clinician meets together with several clients with similar problems (Figure 16.16). When children are placed in group therapy, it is particularly important to match clients for age and problems. One benefit of group therapy is that it can help decrease a client's shame and isolation about a problem while

offering needed support, both from the therapist and other members of the group (American Psychological Association, 2014). A nine-year-old sexual abuse victim, for example, may feel very embarrassed and ashamed. If he is placed in a group with other sexually abused boys, he will realize that he is not alone. A child struggling with poor social skills would likely benefit from a group with a specific curriculum to foster special skills. A woman suffering from post-partum depression could feel less guilty and more supported by being in a group with similar women.

Group therapy also has some specific limitations. Members of the group may be afraid to speak in front of other people because sharing secrets and problems with complete strangers can be stressful and overwhelming. There may be personality clashes and arguments among group members. There could also be concerns about confidentiality: Someone from the group might share what another participant said to people outside of the group.

Figure 16.16 In group therapy, usually 5–10 people meet with a trained therapist to discuss a common issue such as divorce, grief, an eating disorder, substance abuse, or anger management. (credit: Cory Zanker)

Another benefit of group therapy is that members can confront each other about their patterns. For those with some types of problems, such as sexual abusers, group therapy is the

recommended treatment. Group treatment for this population is considered to have several benefits:

> Group treatment is more economical than individual, couples, or family therapy. Sexual abusers often feel more comfortable admitting and discussing their offenses in a treatment group where others are modeling openness. Clients often accept feedback about their behavior more willingly from other group members than from therapists. Finally, clients can practice social skills in group treatment settings. (McGrath, Cumming, Burchard, Zeoli, & Ellerby, 2009)

Groups that have a strong educational component are called psycho-educational groups. For example, a group for children whose parents have cancer might discuss in depth what cancer is, types of treatment for cancer, and the side effects of treatments, such as hair loss. Often, group therapy sessions with children take place in school. They are led by a school counselor, a school psychologist, or a school social worker. Groups might focus on test anxiety, social isolation, self-esteem, bullying, or school failure (Shechtman, 2002). Whether the group is held in school or in a clinician's office, group therapy has been found to be effective with children facing numerous kinds of challenges (Shechtman, 2002).

During a group session, the entire group could reflect on an individual's problem or difficulties, and others might disclose what they have done in that situation. When a clinician is facilitating a group, the focus is always on making sure that everyone benefits and participates in the group and that no one person is the focus of the entire session. Groups can be organized in various ways: some have an overarching theme or purpose, some are time-limited, some have open membership that allows people to come and go, and some are closed. Some groups are structured with planned activities and goals, while others are unstructured: There is no specific plan, and group members themselves decide how the group will spend its time and on what goals it will focus. This can become a complex

and emotionally charged process, but it is also an opportunity for personal growth (Page & Berkow, 1994).

Couples Therapy

Couples therapy involves two people in an intimate relationship who are having difficulties and are trying to resolve them (Figure 16.17). The couple may be dating, partnered, engaged, or married. The primary therapeutic orientation used in couples counseling is cognitive-behavioral therapy (Rathus & Sanderson, 1999). Couples meet with a therapist to discuss conflicts and/or aspects of their relationship that they want to change. The therapist helps them see how their individual backgrounds, beliefs, and actions are affecting their relationship. Often, a therapist tries to help the couple resolve these problems, as well as implement strategies that will lead to a healthier and happier relationship, such as how to listen, how to argue, and how to express feelings. However, sometimes, after working with a therapist, a couple will realize that they are too incompatible and will decide to separate. Some couples seek therapy to work out their problems, while others attend therapy to determine whether staying together is the best solution. Counseling couples in a high-conflict and volatile relationship can be difficult. In fact, psychologists Peter Pearson and Ellyn Bader, who founded the Couples Institute in Palo Alto, California, have compared the experience of the clinician in couples' therapy to be like "piloting a helicopter in a hurricane" (Weil, 2012, para. 7).

Figure 16.17 In couples counseling, a therapist helps people work on their relationship. (credit: Cory Zanker)

Family Therapy

Family therapy is a special form of group therapy, consisting of one or more families. Although there are many theoretical orientations in family therapy, one of the most predominant is the systems approach. The family is viewed as an organized system, and each individual within the family is a contributing member who creates and maintains processes within the system that shape behavior (Minuchin, 1985). Each member of the family influences and is influenced by the others. The goal of this approach is to enhance the growth of each family member as well as that of the family as a whole.

Often, dysfunctional patterns of communication that develop between family members can lead to conflict. A family with this dynamic might wish to attend therapy together rather than individually. In many cases, one member of the family has problems

that detrimentally affect everyone. For example, a mother's depression, teen daughter's eating disorder, or father's alcohol dependence could affect all members of the family. The therapist would work with all members of the family to help them cope with the issue and to encourage resolution and growth in the case of the individual family member with the problem.

With family therapy, the nuclear family (i.e., parents and children) or the nuclear family plus whoever lives in the household (e.g., grandparent) come into treatment. Family therapists work with the whole family unit to heal the family. There are several different types of family therapy. In structural family therapy, the therapist examines and discusses 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. In some families, the parents do not work together to make rules, or one parent may undermine the other, leading the children to act out. The therapist helps them resolve these issues and learn to communicate more effectively.

In strategic family therapy, the goal is to address specific problems within the family that can be dealt with in a relatively short amount of time. Typically, the therapist would guide what happens in the therapy session and design a detailed approach to resolving each member's problem (Madanes, 1991).

Learning Objectives

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

- Recognize the goal of substance-related and addictive disorders treatment
- Discuss what makes for effective treatment

- Describe how comorbid disorders are treated

Addiction is often viewed as a chronic disease (Figure 16.18). The choice to use a substance is initially voluntary; however, because chronic substance use can permanently alter the neural structure in the prefrontal cortex, an area of the brain associated with decision-making and judgment, a person becomes driven to use drugs and/or alcohol (Muñoz-Cuevas, Athilingam, Piscopo, & Wilbrecht, 2013). This helps explain why relapse rates tend to be high. About 40%–60% of individuals relapse, which means they return to abusing drugs and/or alcohol after a period of improvement (National Institute on Drug Abuse [NIDA], 2008).

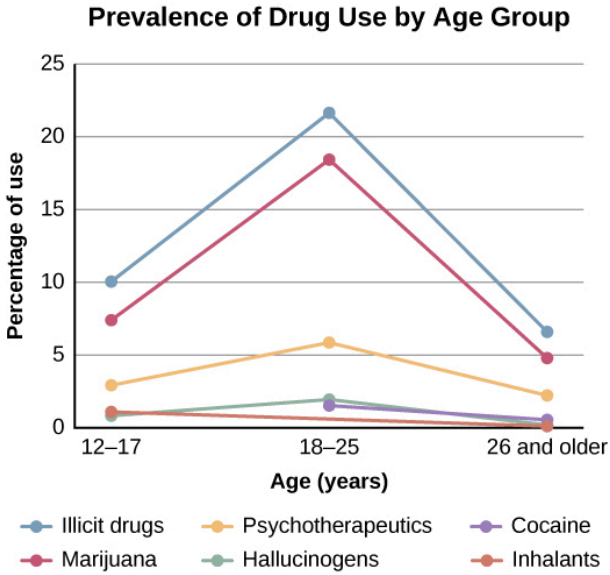


Figure 16.18 The National Survey on Drug Use and Health shows trends in the prevalence of various drugs for ages 12–17, 18–25, and 26 or older.

The goal of substance-related treatment is to help a person with an addiction to stop compulsive drug-seeking behaviors (NIDA, 2012). This means a person with addiction will need long-term treatment, similar to a person battling a chronic physical disease such as hypertension or diabetes. Treatment usually includes behavioral therapy and/or medication, depending on the individual (NIDA, 2012). Specialized therapies have also been developed for specific types of substance-related disorders, including alcohol, cocaine, and opioids (McGovern & Carroll, 2003). Substance-related treatment is considered much more cost-effective than incarceration or not treating those with addictions (NIDA, 2012) (Figure 16.19).

Figure 16.19 Substance use and abuse costs the United States over $600 billion a year (NIDA, 2012). This person with addiction is using heroin. (credit: "jellymc – urbansnaps"/Flickr)

What Makes Treatment Effective?

Specific factors make substance-related treatment much more effective. One factor is the duration of treatment. Generally, a

person with addiction needs to be in treatment for at least three months to achieve a positive outcome (Simpson, 1981; Simpson, Joe, & Bracy, 1982; NIDA, 2012). This is due to the psychological, physiological, behavioral, and social aspects of abuse (Simpson, 1981; Simpson et al., 1982; NIDA, 2012). While in treatment, a person with addiction might receive behavior therapy, which can help motivate the person with addiction to participate in the treatment program and teach strategies for dealing with cravings and how to prevent relapse. Also, treatment needs to be holistic and address multiple needs, not just the drug addiction. This means that treatment will address factors such as communication, stress management, relationship issues, parenting, vocational concerns, and legal concerns (McGovern & Carroll, 2003; NIDA, 2012).

While individual therapy is used in the treatment of substance-related disorders, group therapy is the most widespread treatment modality (Weiss, Jaffee, de Menil, & Cogley, 2004). The rationale behind using group therapy for addiction treatment is that people with addiction are much more likely to maintain sobriety in a group format. It has been suggested that this is due to the rewarding and therapeutic benefits of the group, such as support, affiliation, identification, and even confrontation (Center for Substance Abuse Treatment, 2005). For teenagers, the whole family often needs to participate in treatment to address issues such as family dynamics, communication, and relapse prevention. Family involvement in teen drug addiction is vital. Research suggests that greater parental involvement is correlated with a greater reduction in use by teen substance abusers. Also, mothers who participated in treatment displayed better mental health and greater warmth toward their children (Bertrand et al., 2013). However, neither individual nor group therapy has been found to be more effective (Weiss et al., 2004). Regardless of the type of treatment service, the primary focus is on abstinence or at the very least a significant reduction in use (McGovern & Carroll, 2003).

Treatment also usually involves medications to detox a person with addiction safely after an overdose, to prevent seizures and

agitation that often occur in detox, to prevent reuse of the drug, and to manage withdrawal symptoms. Getting off drugs often involves the use of drugs—some of which can be just as addictive. Detox can be difficult and dangerous.

Comorbid Disorders

Frequently, a person with an addiction to drugs and/or alcohol has an additional psychological disorder. Saying a person has comorbid disorders means the individual has two or more diagnoses. This can often be a substance-related diagnosis and another psychiatric diagnosis, such as depression, bipolar disorder, or schizophrenia. These individuals fall into the category of mentally ill and chemically addicted (MICA)—their problems are often chronic and expensive to treat, with limited success. Compared with the overall population, substance abusers are twice as likely to have a mood or anxiety disorder. Drug abuse can cause symptoms of mood and anxiety disorders and the reverse is also true—people with debilitating symptoms of a psychiatric disorder may self-medicate and abuse substances.

In cases of comorbidity, the best treatment is thought to address both (or multiple) disorders simultaneously (NIDA, 2012). Behavior therapies are used to treat comorbid conditions, and in many cases, psychotropic medications are used along with psychotherapy. For example, evidence suggests that bupropion (trade names: Wellbutrin and Zyban), approved for treating depression and nicotine dependence, might also help reduce craving and use of the drug methamphetamine (NIDA, 2011). However, more research is needed to better understand how these medications work—particularly when combined in patients with comorbidities.

Learning Objectives

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

- Explain how the sociocultural model is used in therapy
- Discuss barriers to mental health services among ethnic minorities

The sociocultural perspective looks at you, your behaviors, and your symptoms in the context of your culture and background. For example, José is an 18-year-old Hispanic male from a traditional family. José comes to treatment because of depression. During the intake session, he reveals that he is gay and is nervous about telling his family. He also discloses that he is concerned because his religious background has taught him that being gay is wrong. How does his religious and cultural background affect him? How might his cultural background affect how his family reacts if José were to tell them he is gay?

As our society becomes increasingly multiethnic and multiracial, mental health professionals must develop cultural competence (Figure 16.20), which means they must understand and address issues of race, culture, and ethnicity. They must also develop strategies to effectively address the needs of various populations for which Eurocentric therapies have limited application (Sue, 2004). For example, a counselor whose treatment focuses on individual decision making may be ineffective at helping a Chinese client with a collectivist approach to problem solving (Sue, 2004).

Multicultural counseling and therapy aims to offer both a helping

role and process that uses modalities and defines goals consistent with the life experiences and cultural values of clients. It strives to recognize client identities to include individual, group, and universal dimensions, advocate the use of universal and culture-specific strategies and roles in the healing process and balances the importance of individualism and collectivism in the assessment, diagnosis, and treatment of client and client systems (Sue, 2001).

This therapeutic perspective integrates the impact of cultural and social norms, starting at the beginning of treatment. Therapists who use this perspective work with clients to obtain and integrate information about their cultural patterns into a unique treatment approach based on their particular situation (Stewart, Simmons, & Habibpour, 2012). Sociocultural therapy can include individual, group, family, and couples treatment modalities.

Figure 16.20 How do your cultural and religious beliefs affect your attitude toward mental health treatment? (credit "top-left": modification of work by Staffan Scherz; credit "top-left-middle": modification of work by Alejandra Quintero Sinisterra; credit "top-right-middle": modification of work by Pedro Ribeiro Simões; credit "top-right": modification of work by Agustin Ruiz; credit "bottom-left": modification of work by Czech Provincial Reconstruction Team; credit "bottom-left-middle": modification of work by Arian Zwegers; credit "bottom-right-middle": modification of work by "Wonderlane"/Flickr; credit "bottom-right": modification of work by Shiraz Chanawala)

LINK TO LEARNING: Watch this short video about cultural competence and sociocultural treatments to learn more.

Barriers to Treatment

Statistically, ethnic minorities tend to utilize mental health services less frequently than White, middle-class Americans (Alegría et al., 2008; Richman, Kohn-Wood, & Williams, 2007). Why is this so? Perhaps the reason has to do with access and availability of mental health services. Ethnic minorities and individuals of low socioeconomic status (SES) report that barriers to services include lack of insurance, transportation, and time (Thomas & Snowden, 2002). However, researchers have found that even when income levels and insurance variables are taken into account, ethnic minorities are far less likely to seek out and utilize mental health services. And when access to mental health services is comparable across ethnic and racial groups, differences in service utilization remain (Richman et al., 2007).

In a study involving thousands of women, it was found that the prevalence rate of anorexia was similar across different races, but that bulimia nervosa was more prevalent among Hispanic and African American women when compared with non-Hispanic whites (Marques et al., 2011). Although they have similar or higher rates of eating disorders, Hispanic and African American women with these disorders tend to seek and engage in treatment far less than Caucasian women. These findings suggest ethnic disparities in access to care, as well as clinical and referral practices that may prevent Hispanic and African American women from receiving care, which could include lack of bilingual treatment, stigma, fear of not

being understood, family privacy, and lack of education about eating disorders.

Perceptions and attitudes toward mental health services may also contribute to this imbalance. A recent study at King's College, London, found many complex reasons why people do not seek treatment: self-sufficiency and not seeing the need for help, not seeing therapy as effective, concerns about confidentiality, and the many effects of stigma and shame (Clement et al., 2014). And in another study, African Americans exhibiting depression were less willing to seek treatment due to fear of possible psychiatric hospitalization as well as fear of the treatment itself (Sussman, Robins, & Earls, 1987). Instead of mental health treatment, many African Americans prefer to be self-reliant or use spiritual practices (Snowden, 2001; Belgrave & Allison, 2010). For example, it has been found that the Black church plays a significant role as an alternative to mental health services by providing prevention and treatment-type programs designed to enhance the psychological and physical well-being of its members (Blank, Mahmood, Fox, & Guterbock, 2002).

Additionally, people belonging to ethnic groups that already report concerns about prejudice and discrimination are less likely to seek services for a mental illness because they view it as an additional stigma (Gary, 2005; Townes, Cunningham, & Chavez-Korell, 2009; Scott, McCoy, Munson, Snowden, & McMillen, 2011). For example, in one recent study of 462 older Korean Americans (over the age of 60) many participants reported suffering from depressive symptoms. However, 71% indicated they thought depression was a sign of personal weakness, and 14% reported that having a mentally ill family member would bring shame to the family (Jang, Chiriboga, & Okazaki, 2009).

Language differences are a further barrier to treatment. In the previous study on Korean Americans' attitudes toward mental health services, it was found that there were no Korean-speaking mental health professionals where the study was conducted (Orlando and Tampa, Florida) (Jang et al., 2009). Because of the

growing number of people from ethnically diverse backgrounds, there is a need for therapists and psychologists to develop knowledge and skills to become culturally competent (Ahmed, Wilson, Henriksen, & Jones, 2011). Those providing therapy must approach the process from the context of the unique culture of each client (Sue & Sue, 2007).

DIG DEEPER: Treatment Perceptions

By the time a child is a senior in high school, 20% of his classmates—that is 1 in 5—will have experienced a mental health problem (U.S. Department of Health and Human Services, 1999), and 8%—about 1 in 12—will have attempted suicide (Centers for Disease Control and Prevention, 2014). Of those classmates experiencing mental disorders, only 20% will receive professional help (U.S. Public Health Service, 2000). Why?

It seems that the public has a negative perception of children and teens with mental health disorders. According to researchers from Indiana University, the University of Virginia, and Columbia University, interviews with over 1,300 U.S. adults show that they believe children with depression are prone to violence and that if a child receives treatment for a psychological disorder, then that child is more likely to be rejected by peers at school.

Bernice Pescosolido, the author of the study, asserts that this is a misconception. However, stigmatization of psychological disorders is one of the main reasons why

young people do not get the help they need when they are having difficulties. Pescosolido and her colleagues caution that this stigma surrounding mental illness, based on misconceptions rather than facts, can be devastating to the emotional and social well-being of our nation's children.

Learning Objectives

- Discuss the relationship between mood disorders and suicidal ideation, as well as factors associated with suicide

Suicide

For some people with mood disorders, the extreme emotional pain they experience becomes unendurable. Overwhelmed by hopelessness, devastated by incapacitating feelings of worthlessness, and burdened with the inability to adequately cope with such feelings, they may consider suicide to be a reasonable way out. Suicide, defined by the CDC as "death caused by self-directed injurious behavior with any intent to die as the result of the behavior" (CDC, 2013a), in a sense represents an outcome of several things going wrong all at the same time (Crosby, Ortega, & Melanson, 2011). Not only must the person be biologically or

psychologically vulnerable, but he must also have the means to perform the suicidal act, and he must lack the necessary protective factors (e.g., social support from friends and family, religion, coping skills, and problem-solving skills) that provide comfort and enable one to cope during times of crisis or great psychological pain (Berman, 2009).

Suicide is not listed as a disorder in the DSM-5; however, suffering from a mental disorder—especially a mood disorder—poses the greatest risk for suicide. Around 90% of those who complete suicides have a diagnosis of at least one mental disorder, with mood disorders being the most frequent (Fleischman, Bertolote, Belfer, & Beautrais, 2005). In fact, the association between major depressive disorder and suicide is so strong that one of the criteria for the disorder is thoughts of suicide, as discussed above (APA, 2013).

Suicide rates can be difficult to interpret because some deaths that appear to be accidental may in fact be acts of suicide (e.g., automobile crash). Nevertheless, investigations into U.S. suicide rates have uncovered these facts:

- Suicide was the 10th leading cause of death for all ages in 2010 (Centers for Disease Control and Prevention [CDC], 2012).
- There were 38,364 suicides in 2010 in the United States—an average of 105 each day (CDC, 2012).
- Suicide among males is 4 times higher than among females and accounts for 79% of all suicides; firearms are the most commonly used method of suicide for males, whereas poisoning is the most commonly used method for females (CDC, 2012).
- From 1991 to 2003, suicide rates were consistently higher among those 65 years and older. Since 2001, however, suicide rates among those ages 25–64 have risen consistently, and, since 2006, suicide rates have been greater for those ages 65 and older (CDC, 2013b). This increase in suicide rates among middle-aged Americans has prompted concern in some quarters that baby boomers (individuals born between

1946–1964) who face economic worry and easy access to prescription medication may be particularly vulnerable to suicide (Parker-Pope, 2013).
- The highest rates of suicide within the United States are among American Indians/Alaskan natives and Non-Hispanic Whites (CDC, 2013b).
- Suicide rates vary across the United States, with the highest rates consistently found in the mountain states of the west (Alaska, Montana, Nevada, Wyoming, Colorado, and Idaho) (Berman, 2009).

Contrary to popular belief, suicide rates peak during the springtime (April and May), not during the holiday season or winter. In fact, suicide rates are generally lowest during the winter months (Postolache et al., 2010).

Risk Factors For Suicide

Suicidal risk is especially high among people with substance abuse problems. Individuals with alcohol dependence are at 10 times greater risk for suicide than the general population (Wilcox, Conner, & Caine, 2004). The risk of suicidal behavior is especially high among those who have made a prior suicide attempt. Among those who attempt suicide, 16% make another attempt within a year and over 21% make another attempt within four years (Owens, Horrocks, & House, 2002). Suicidal individuals may be at high risk for terminating their life if they have a lethal means in which to act, such as a firearm in the home (Brent & Bridge, 2003). Withdrawal from social relationships, feeling as though one is a burden to others, and engaging in reckless and risk-taking behaviors may be precursors to suicidal behavior (Berman, 2009). A sense of entrapment or feeling unable to escape one's miserable feelings or external circumstances (e.g., an abusive relationship with no

perceived way out) predicts suicidal behavior (O'Connor, Smyth, Ferguson, Ryan, & Williams, 2013). Tragically, reports of suicides among adolescents following instances of cyberbullying have emerged in recent years. In one widely-publicized case a few years ago, Phoebe Prince, a 15-year-old Massachusetts high school student, committed suicide following incessant harassment and taunting from her classmates via texting and Facebook (McCabe, 2010).

Suicides can have a contagious effect on people. For example, another's suicide, especially that of a family member heightens one's risk of suicide (Agerbo, Nordentoft, & Mortensen, 2002). Additionally, widely-publicized suicides tend to trigger copycat suicides in some individuals. One study examining suicide statistics in the United States from 1947–1967 found that the rates of suicide skyrocketed for the first month after a suicide story was printed on the front page of the *New York Times* (Phillips, 1974). Austrian researchers found a significant increase in the number of suicides by firearms in the three weeks following extensive reports in Austria's largest newspaper of a celebrity suicide by gun (Etzersdorfer, Voracek, & Sonneck, 2004). A review of 42 studies concluded that media coverage of celebrity suicides is more than 14 times more likely to trigger copycat suicides than is coverage of non-celebrity suicides (Stack, 2000). This review also demonstrated that the medium of coverage is important: televised stories are considerably less likely to prompt a surge in suicides than are newspaper stories. Research suggests that a trend appears to be emerging whereby people use online social media to leave suicide notes, although it is not clear to what extent suicide notes on such media might induce copycat suicides (Ruder, Hatch, Ampanozi, Thali, & Fischer, 2011). Nevertheless, it is reasonable to conjecture that suicide notes left by individuals on social media may influence the decisions of other vulnerable people who encounter them (Luxton, June, & Fairall, 2012).

One possible contributing factor in suicide is brain chemistry. Contemporary neurological research shows that disturbances in the

functioning of serotonin are linked to suicidal behavior (Pompili et al., 2010). Low levels of serotonin predict future suicide attempts and suicide completions, and low levels have been observed post-mortem among suicide victims (Mann, 2003). Serotonin dysfunction, as noted earlier, is also known to play an important role in depression; low levels of serotonin have also been linked to aggression and impulsivity (Stanley et al., 2000). The combination of these three characteristics constitutes a potential formula for suicide—especially violent suicide. A classic study conducted during the 1970s found that patients with major depressive disorder who had very low levels of serotonin attempted suicide more frequently and more violently than did patients with higher levels (Asberg, Thorén, Träskman, Bertilsson, & Ringberger, 1976; Mann, 2003).

Suicidal thoughts, plans, and even off-hand remarks ("I might kill myself this afternoon") should always be taken extremely seriously. People who contemplate terminating their life need immediate help. Below are links to two excellent websites that contain resources (including hotlines) for people who are struggling with suicidal ideation, have loved ones who may be suicidal, or who have lost loved ones to suicide: http://www.afsp.org and http://suicidology.org.

Conclusion

Everyone feels down or euphoric from time to time. For some people, these feelings can last for long periods of time and can also co-occur with other symptoms that, in combination, interfere with their everyday lives. When people experience an episode, they see the world differently, often feel hopeless about the future, and may even experience suicidal thoughts. If you or someone you know is suffering from a mental illness, it is important to seek help. Effective treatments are available and continually improving. You are not alone.

Additional Supplemental Resources

Websites

- APA Topics: Overview of Psychotherapy
  - This APA website provides information on therapy.
- APA Topics: Different Approaches to Psychotherapy
  - The APA website gives information on different approaches to psychotherapy.

Videos

- Ted-Ed: The world needs all kinds of minds
  - In this Ted-Ed video, you'll hear Temple Grandin highlight the benefits of thinking differently, and how we can and should embrace all kinds of thinkers. She explains how Autism allows her to see the world differently. A variety of discussion and assessment questions are included with the video (free registration is required to access the questions). Closed captioning available.
- Crash Course Video #35 – Getting Help – Psychotherapy
  - This video on psychotherapy includes information on topics such as psychodynamic theory, humanistic theory, behavioral therapy, cognitive therapy and group therapy. Closed captioning available.
- Crash Course Video #36 – Biomedical Treatments
  - This video on biomedical treatments includes information on topics such as effectiveness, medication, and electroshock therapy. Closed captioning available.

Access for free at https://openstax.org/books/psychology-2e/pages/1-introduction

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