Learning Objectives

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

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

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

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

Correlational research can find a relationship between two variables, but the only way a researcher can claim that the relationship between the variables is cause and effect is to perform an experiment. In experimental research, which will be discussed later in this chapter, there is a tremendous amount of control over variables of interest. While this is a powerful approach, experiments are often conducted in artificial settings. This calls into question the validity of experimental findings with regard to how they would apply in real-world settings. In addition, many of the questions that psychologists would like to answer cannot be pursued through experimental research because of ethical concerns.

Clinical or Case Studies

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 invaluable insight for 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 precious 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.

Naturalistic Observation

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

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

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

It is critical that the observer be as unobtrusive and as inconspicuous as possible: when people know they are being watched, they are less likely to behave naturally. If you have any doubt about this, ask yourself how your driving behavior might differ in two situations: In the first situation, you are driving down a deserted highway during the middle of the day; in the second situation, you are being followed by a police car down the same deserted highway (Figure 2.7).

Figure 2.7 Seeing a police car behind you would probably affect your driving behavior. (credit: Michael Gil)

It should be pointed out that naturalistic observation is not limited to research involving humans. Indeed, some of the best-known examples of naturalistic observation involve researchers going into the field to observe various kinds of animals in their own environments. As with human studies, the researchers maintain their distance and avoid interfering with the animal subjects so as not to influence their natural behaviors. Scientists have used this technique to study social hierarchies and interactions among animals ranging from ground squirrels to gorillas. The information provided by these studies is invaluable in understanding how those animals organize socially and communicate with one another. The anthropologist Jane Goodall, for example, spent nearly five decades observing the behavior of chimpanzees in Africa (Figure 2.8). As an illustration of the types of concerns that a researcher might encounter in naturalistic observation, some scientists criticized Goodall for giving the chimps names instead of referring to them by numbers—using names was thought to undermine the emotional detachment required for the objectivity of the study (McKie, 2010).

(a)

(b)

Figure 2.8 (a) Jane Goodall made a career of conducting naturalistic observations of (b) chimpanzee behavior. (credit “Jane Goodall”: modification of work by Erik Hersman; “chimpanzee”: modification of work by “Afrika Force”/Flickr.com)

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

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

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

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

Surveys

Often, psychologists develop surveys as a means of gathering data. **Surveys** are lists of questions to be answered by research participants, and can be delivered as paper-and-pencil questionnaires, administered electronically, or conducted verbally (Figure 2.9). Generally, the survey itself can be completed in a short time, and the ease of administering a survey makes it easy to collect data from a large number of people.

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

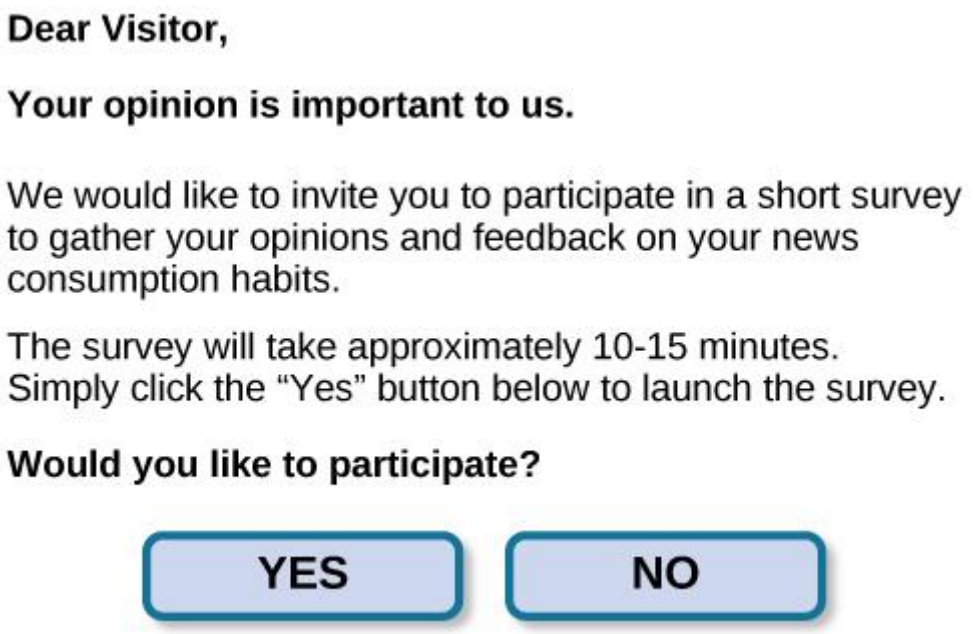


Figure 2.9 Surveys can be administered in a number of ways, including electronically administered research, like the survey shown here. (credit: Robert Nyman)

There is both strength and weakness of the survey in comparison to case studies. By using surveys, we can collect information from a larger sample of people. A larger sample is better able to reflect the actual diversity of the population, thus allowing

better generalizability. Therefore, if our sample is sufficiently large and diverse, we can assume that the data we collect from the survey can be generalized to the larger population with more certainty than the information collected through a case study. However, given the greater number of people involved, we are not able to collect the same depth of information on each person that would be collected in a case study.

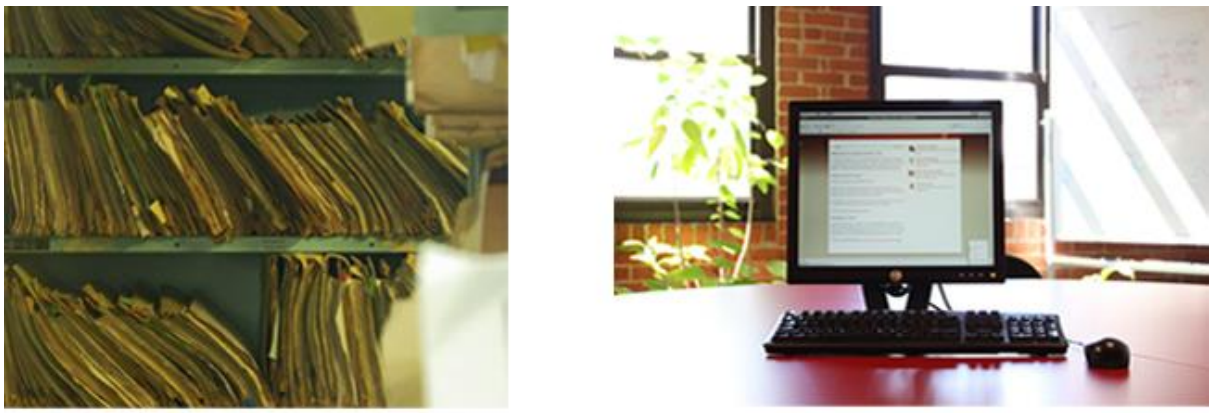
Another potential weakness of surveys is something we touched on earlier in this chapter: People don't always give accurate responses. They may lie, misremember, or answer questions in a way that they think makes them look good. For example, people may report drinking less alcohol than is actually the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

Any number of research questions can be answered through the use of surveys. One real-world example is the research conducted by Jenkins, Ruppel, Kizer, Yehl, and Griffin (2012) about the backlash against the US Arab-American community following the terrorist attacks of September 11, 2001. Jenkins and colleagues wanted to determine to what extent these negative attitudes toward Arab-Americans still existed nearly a decade after the attacks occurred. In one study, 140 research participants filled out a survey with 10 questions, including questions asking directly about the participant's overt prejudicial attitudes toward people of various ethnicities. The survey also asked indirect questions about how likely the participant would be to interact with a person of a given ethnicity in a variety of settings (such as, "How likely do you think it is that you would introduce yourself to a person of Arab-American descent?"). The results of the research suggested that participants were unwilling to report prejudicial attitudes toward any ethnic group. However, there were significant differences between their pattern of responses to questions about social interaction with Arab-Americans compared to other ethnic groups: they indicated less willingness for social interaction with Arab-Americans compared to the other ethnic groups. This suggested that the participants harbored subtle forms of prejudice against Arab-Americans, despite their assertions that this was not the case (Jenkins et al., 2012).

Archival Research

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

For example, a researcher might access the academic records of all individuals who enrolled in college within the past ten years and calculate how long it took them to complete their degrees, as well as course loads, grades, and extracurricular involvement. Archival research could provide important information about who is most likely to complete their education, and it could help identify important risk factors for struggling students (Figure 2.10).



(a) (b)

Figure 2.10 A researcher doing archival research examines records, whether archived as a (a) hardcopy or (b) electronically. (credit “paper files”: modification of work by “Newtown graffiti”/Flickr; “computer”: modification of work by INPIVIC Family/Flickr)

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

Longitudinal and Cross-Sectional Research

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

Another approach is cross-sectional research. In **cross-sectional research**, a researcher compares multiple segments of the population at the same time. Using the dietary habits example above, the researcher might directly compare different groups of people by age. Instead of studying a group of people for 20 years to see how their dietary habits changed from decade to decade, the researcher would study a group of 20-year-old individuals and compare them to a group of 30-year-old individuals and a group of 40-year-old individuals. While cross-sectional research requires a shorter-term investment, it is also limited by differences that exist between

the different generations (or cohorts) that have nothing to do with age per se, but rather reflect the social and cultural experiences of different generations of individuals that make them different from one another.

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

Often longitudinal studies are employed when researching various diseases in an effort to understand particular risk factors. Such studies often involve tens of thousands of individuals who are followed for several decades. Given the enormous number of people involved in these studies, researchers can feel confident that their findings can be generalized to the larger population. The Cancer Prevention Study-3 (CPS-3) is one of a series of longitudinal studies sponsored by the American Cancer Society aimed at determining predictive risk factors associated with cancer. When participants enter the study, they complete a survey about their lives and family histories, providing information on factors that might cause or prevent the development of cancer. Then every few years the participants receive additional surveys to complete. In the end, hundreds of thousands of participants will be tracked over 20 years to determine which of them develop cancer and which do not.

Clearly, this type of research is important and potentially very informative. For instance, earlier longitudinal studies sponsored by the American Cancer Society provided some of the first scientific demonstrations of the now well-established links between increased rates of cancer and smoking (American Cancer Society, n.d.) (Figure 2.11).

Figure 2.11 Longitudinal research like the CPS-3 help us to better understand how smoking is associated with cancer and other diseases. (credit: CDC/Debora Cartagena)

As with any research strategy, longitudinal research is not without limitations. For one, these studies require an incredible time investment by the researcher and research participants. Given that some longitudinal studies take years, if not decades, to complete, the results will not be known for a considerable period of time. In addition to the time demands, these studies also require a substantial financial investment. Many researchers are unable to commit the resources necessary to see a longitudinal project through to the end.

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

Learning Objectives

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

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

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

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

Correlational Research

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

The number portion of the correlation coefficient indicates the strength of the relationship. The closer the number is to 1 (be it negative or positive), the more strongly related the variables are, and the more predictable changes in one variable will be as the other variable changes. The closer the number is to zero, the weaker

the relationship, and the less predictable the relationship between the variables becomes. For instance, a correlation coefficient of 0.9 indicates a far stronger relationship than a correlation coefficient of 0.3. If the variables are not related to one another at all, the correlation coefficient is 0. The example above about ice cream and crime is an example of two variables that we might expect to have no relationship to each other.

The sign—positive or negative—of the correlation coefficient indicates the direction of the relationship (Figure 2.12). A **positive correlation** means that the variables move in the same direction. Put another way, it means that as one variable increases so does the other, and conversely, when one variable decreases so does the other. A **negative correlation** means that the variables move in opposite directions. If two variables are negatively correlated, a decrease in one variable is associated with an increase in the other and vice versa.

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

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

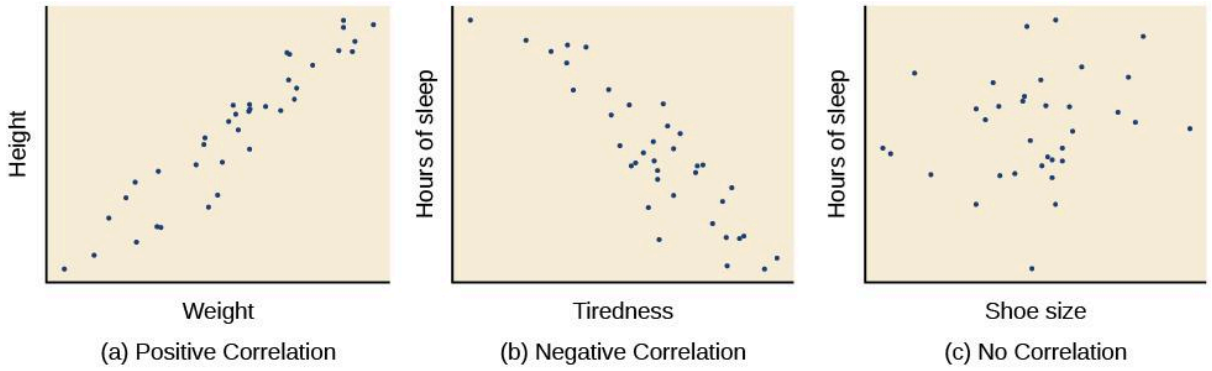


Figure 2.12 Scatterplots are a graphical view of the strength and direction of correlations. The stronger the correlation, the closer the data points are to a straight line. In these examples, we see that there is (a) a positive correlation between weight and height, (b) a negative correlation between tiredness and hours of sleep, and (c) no correlation between shoe size and hours of sleep.

LINK TO LEARNING

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

Correlation Does Not Indicate Causation

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

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

Unfortunately, people mistakenly make claims of causation as a function of correlations all the time. Such claims are especially common in advertisements and news stories. For example, research found that people who eat certain breakfast cereal may have a reduced risk of heart disease (Anderson, Hanna, Peng, & Kryscio, 2000). Cereal companies are likely to share this information in a way that

maximizes and perhaps overstates the positive aspects of eating cereal. But does cereal really cause better health, or are there other possible explanations for the health of those who eat cereal? While correlational research is invaluable in identifying relationships among variables, a major limitation is the inability to establish causality. Psychologists want to make statements about cause and effect, but the only way to do that is to conduct an experiment to answer a research question. The next section describes how scientific experiments incorporate methods that eliminate, or control for, alternative explanations, which allow researchers to explore how changes in one variable cause changes in another variable.

Figure 2.13 Does eating cereal really cause someone to be healthier? (credit: Tim Skillern)

Illusory Correlations

The temptation to make erroneous cause-and-effect statements based on correlational research is not the only way we tend to misinterpret data. We also tend to make the mistake of illusory correlations, especially with unsystematic observations. **Illusory correlations**, or false correlations, occur when people believe that relationships exist between two things when no such relationship exists. One well-known illusory correlation is the supposed effect that the moon's phases have on human behavior. Many people passionately assert that human behavior is affected by the phase of the moon, and specifically, that people act strangely when the moon is full (Figure 2.14).

Figure 2.14 Many people believe that a full moon makes people behave oddly. (credit: Cory Zanker)

There is no denying that the moon exerts a powerful influence on our planet. The ebb and flow of the ocean's tides are tightly tied to the gravitational forces of the moon. Many people believe, therefore, that it is logical that we are affected by the moon as well. After all, our bodies are largely made up of water. A meta-analysis of nearly 40 studies consistently demonstrated, however, that the relationship between the moon and our behavior does not exist (Rotton & Kelly, 1985). While we may pay more attention to odd behavior during the full phase of the moon, the rates of odd behavior remain constant throughout the lunar cycle.

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

Causality: Conducting Experiments and Using the Data

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

The Experimental Hypothesis

In order to conduct an experiment, a researcher must have a specific hypothesis to be tested. As you've learned, hypotheses can be formulated either through direct observation of the real world or after careful review of previous research. For example, if you think that the use of technology in the classroom has negative impacts on learning, then you have basically formulated a hypothesis—namely, that the use of technology in the classroom should be limited because it decreases learning. How might you have arrived at this particular hypothesis? You may have noticed that your classmates who take notes on their laptops perform at lower levels on class exams than those who take notes by hand, or those who receive a lesson via a computer program versus via an in-person teacher have different levels of performance when tested (Figure 2.15).

Figure 2.15 How might the use of technology in the classroom impact learning? (credit: modification of work by Nikolay Georgiev/Pixabay)

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

Designing an Experiment

The most basic experimental design involves two groups: the experimental group and the control group. The two groups are designed to be the same except for one difference— experimental manipulation. The **experimental group** gets the experimental manipulation—that is, the treatment or variable being tested (in this case, the use of technology)—and the **control group** does not. Since experimental manipulation is the only difference between the experimental and control groups, we can be sure that any differences between the two are due to experimental manipulation rather than chance.

In our example of how the use of technology should be limited in the classroom, we have the experimental group learn algebra using a computer program and then test their learning. We measure the learning in our control group after they are taught algebra by a teacher in a traditional classroom. It is important for the control group to be treated similarly to the experimental group, with the exception that the control group does not receive the experimental manipulation.

We also need to precisely define, or operationalize, how we measure learning of algebra. An **operational definition** is a precise description of our variables, and it is important in allowing others to understand exactly how and what a researcher measures in a particular experiment. In operationalizing learning, we might choose to look at performance on a test covering the material on which the individuals were taught by the teacher or the computer program. We might also ask our participants to summarize the information that was just presented in some way. Whatever we determine, it is important that we operationalize learning in such a way that anyone who hears about our study for the first time knows exactly what we mean by learning. This aids peoples' ability to interpret our data as well as their capacity to repeat our experiment should they choose to do so.

Once we have operationalized what is considered use of technology and what is considered learning in our experiment participants, we need to establish how we will run our experiment. In this case, we might have participants spend 45 minutes learning algebra (either through a computer program or with an in-person math teacher) and then give them a test on the material covered during the 45 minutes.

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

(experiment or control group) while the researcher who developed the experiment knows which participants are in each group.

In a **double-blind study**, both the researchers and the participants are blind to group assignments. Why would a researcher want to run a study where no one knows who is in which group? Because by doing so, we can control for both experimenter and participant expectations. If you are familiar with the phrase **placebo effect**, you already have some idea as to why this is an important consideration. The placebo effect occurs when people's expectations or beliefs influence or determine their experience in a given situation. In other words, simply expecting something to happen can actually make it happen.

The placebo effect is commonly described in terms of testing the effectiveness of a new medication. Imagine that you work in a pharmaceutical company, and you think you have a new drug that is effective in treating depression. To demonstrate that your medication is effective, you run an experiment with two groups: The experimental group receives the medication, and the control group does not. But you don’t want participants to know whether they received the drug or not.

Why is that? Imagine that you are a participant in this study, and you have just taken a pill that you think will improve your mood. Because you expect the pill to have an effect, you might feel better simply because you took the pill and not because of any drug actually contained in the pill—this is the placebo effect.

To make sure that any effects on mood are due to the drug and not due to expectations, the control group receives a placebo (in this case a sugar pill). Now everyone gets a pill, and once again neither the researcher nor the experimental participants know who got the drug and who got the sugar pill. Any differences in mood between the experimental and control groups can now be attributed to the drug itself rather than to experimenter bias or participant expectations (Figure 2.16).

Figure 2.16 Providing the control group with a placebo treatment protects against bias caused by expectancy. (credit: Elaine and Arthur Shapiro)

Independent and Dependent Variables

In a research experiment, we strive to study whether changes in one thing cause changes in another. To achieve this, we must pay attention to two important variables, or things that can be changed, in any experimental study: the independent variable and the dependent variable. An **independent variable** is manipulated or controlled by the experimenter. In a well-designed experimental study, the independent variable is the only important difference between the experimental and control groups. In our example of how technology use in the classroom affects learning, the independent variable is the type of learning by participants in the study (Figure 2.17). A **dependent variable** is what the researcher measures to see how much effect the independent variable had. In our example, the dependent variable is the learning exhibited by our participants.

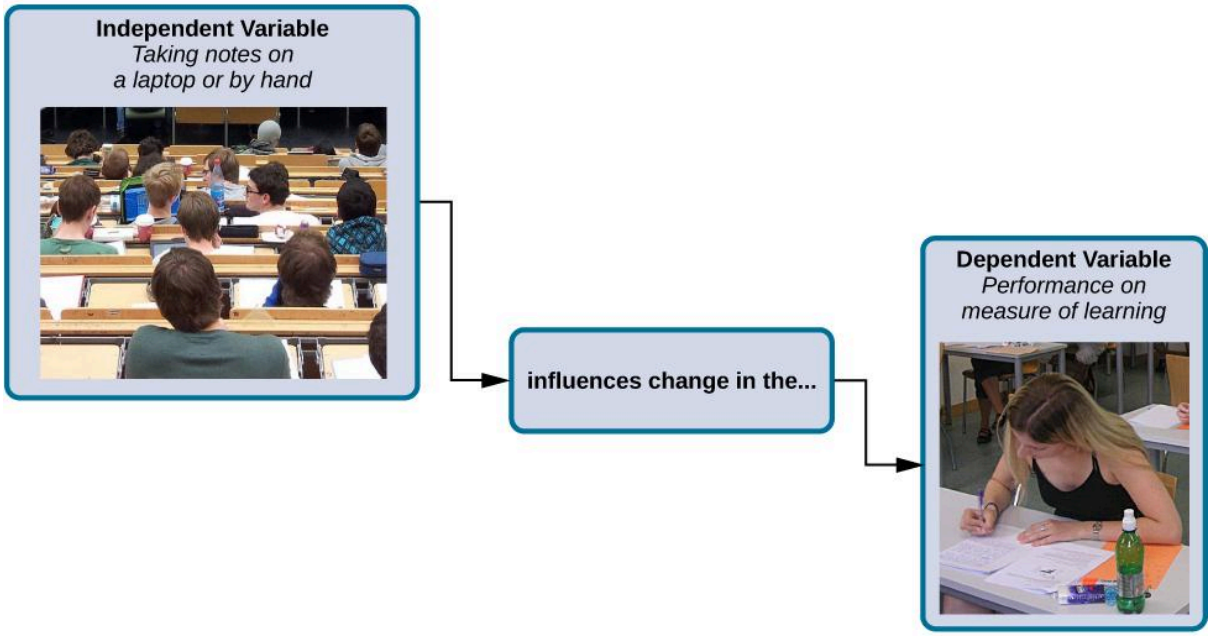


Figure 2.17 In an experiment, manipulations of the independent variable are expected to result in changes in the dependent variable. (credit: “classroom” modification of work by Nikolay Georgiev/Pixabay; credit “note taking”: modification of work by KF/Wikimedia)

We expect that the dependent variable will change as a function of the independent variable. In other words, the dependent variable *depends* on the independent variable. A good way to think about the relationship between the independent and dependent variables is with this question: What effect does the independent variable have on the dependent variable? Returning to our example, what is the effect of being taught a lesson through a computer program versus through an in-person instructor?

Selecting and Assigning Experimental Participants

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

Our hypothetical experiment involves high school students, and we must first generate a sample of students. Samples are used because populations are usually too large to reasonably involve every member in our particular experiment (Figure 2.18). If possible, we should use a random sample (there are other types of samples, but for the purposes of this chapter, we will focus on random samples). A **random sample** is a subset of a larger population in which every member of the population has an equal chance of being selected. Random samples are preferred because if the sample is large enough we can be reasonably sure that the participating individuals are representative of the larger population. This means that the percentages of characteristics in the sample—sex, ethnicity, socioeconomic level, and any other characteristics that might affect the results—are close to those percentages in the larger population.

In our example, let's say we decide our population of interest is algebra students. But all algebra students is a very large population, so we need to be more specific; instead we might say our population of interest is all algebra students in a particular city. We should include students from various income brackets, family situations, races, ethnicities, religions, and geographic areas of town. With this more manageable population, we can work with the local schools in selecting a random sample of around 200 algebra students who we want to participate in our experiment.

In summary, because we cannot test all of the algebra students in a city, we want to find a group of about 200 that reflects the composition of that city. With a representative group, we can generalize our findings to the larger population without fear of our sample being biased in some way.

(a) (b)

Figure 2.18 Researchers may work with (a) a large population or (b) a sample group that is a subset of the larger population. (credit "crowd": modification of work by James Cridland; credit "students": modification of work by Laurie Sullivan)

Now that we have a sample, the next step of the experimental process is to split the participants into experimental and control groups through random assignment. With **random assignment**, all participants have an equal chance of being assigned to

either group. There is statistical software that will randomly assign each of the algebra students in the sample to either the experimental or the control group.

Random assignment is critical for sound experimental design. With sufficiently large samples, random assignment makes it unlikely that there are systematic differences between the groups. So, for instance, it would be very unlikely that we would get one group composed entirely of males, a given ethnic identity, or a given religious ideology. This is important because if the groups were systematically different before the experiment began, we would not know the origin of any differences we find between the groups: Were the differences preexisting, or were they caused by manipulation of the independent variable? Random assignment allows us to assume that any differences observed between experimental and control groups result from the manipulation of the independent variable.

LINK TO LEARNING

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

Issues to Consider

While experiments allow scientists to make cause-and-effect claims, they are not without problems. True experiments require the experimenter to manipulate an independent variable, and that can complicate many questions that psychologists might want to address. For instance, imagine that you want to know what effect sex (the independent variable) has on spatial memory (the dependent variable). Although you can certainly look for differences between males and females on a task that taps into spatial memory, you cannot directly control a person's sex. We categorize this type of research approach as quasi-experimental and recognize that we cannot make cause-and-effect claims in these circumstances.

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

Interpreting Experimental Findings

Once data is collected from both the experimental and the control groups, a **statistical analysis** is conducted to find out if there are meaningful differences between the two groups. A statistical analysis determines how likely it is that any difference found is due to chance (and thus not meaningful). For example, if an experiment is done on the effectiveness of a nutritional supplement, and those taking a placebo pill (and not the supplement) have the same result as those taking the supplement, then the experiment has shown that the nutritional supplement is not

effective. Generally, psychologists consider differences to be statistically significant if there is less than a five percent chance of observing them if the groups did not actually differ from one another. Stated another way, psychologists want to limit the chances of making “false positive” claims to five percent or less.

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

Reporting Research

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

LINK TO LEARNING

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

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

Peer review provides some degree of quality control for psychological research. Poorly conceived or executed studies can be weeded out, and even well-designed research can be improved by the revisions suggested. Peer review also ensures that the research is described clearly enough to allow other scientists to **replicate** it, meaning they can repeat the experiment using different samples to determine reliability. Sometimes replications involve additional measures that expand on the original finding. In any case, each replication serves to provide more evidence to support the original research findings. Successful replications of published research make scientists more apt to adopt those findings, while repeated failures tend to cast doubt on the legitimacy of the original article and lead scientists to look elsewhere. For example, it would be a major advancement in the medical field if a published study indicated that taking a new drug helped individuals achieve better health without changing their behavior. But if other scientists could not replicate the results, the original study's claims would be questioned.

In recent years, there has been increasing concern about a "replication crisis" that has affected a number of scientific fields, including psychology. Some of the most well-known studies and scientists have produced research that has failed to be replicated by others (as discussed in Shrout & Rodgers, 2018). In fact, even a famous Nobel Prize-winning scientist has recently retracted a published paper because she had difficulty replicating her results (Nobel Prize-winning scientist Frances Arnold retracts paper, 2020 January 3). These kinds of outcomes have prompted some scientists to begin to work together and more openly, and some would argue that the current "crisis" is actually improving the ways in which science is conducted and in how its results are shared with others (Aschwanden, 2018).

DIG DEEPER

The Vaccine-Autism Myth and Retraction of Published Studies

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

A published piece of work can be rescinded when data is called into question because of falsification, fabrication, or serious research design problems. Once rescinded, the scientific community is informed that there are serious problems with the original publication. Retractions can be initiated by the researcher who led the study, by research collaborators, by the institution that employed the researcher, or by the editorial board of the journal in which the article was originally published. In the vaccine-autism case, the retraction was made because of a significant conflict of interest in which the leading researcher had a financial interest in establishing a link

between childhood vaccines and autism (Offit, 2008). Unfortunately, the initial studies received so much media attention that many parents around the world became hesitant to have their children vaccinated (Figure 2.19). Continued reliance on such debunked studies has significant consequences. For instance, between January and October of 2019, there were 22 measles outbreaks across the United States and more than a thousand cases of individuals contracting measles (Patel et al., 2019). This is likely due to the anti-vaccination movements that have risen from the debunked research. For more information about how the vaccine/autism story unfolded, as well as the repercussions of this story, take a look at Paul Offit's book, *Autism's False Prophets: Bad Science, Risky Medicine, and the Search for a Cure*.

Figure 2.19 Some people still think vaccinations cause autism. (credit: modification of work by UNICEF Sverige)

Reliability and Validity

Reliability and validity are two important considerations that must be made with any type of data collection. **Reliability** refers to the ability to consistently produce a given result. In the context of psychological research, this would mean that any instruments or tools used to collect data do so in consistent, reproducible ways. There are a number of different types of reliability. Some of these include inter-rater

reliability (the degree to which two or more different observers agree on what has been observed), internal consistency (the degree to which different items on a survey that measure the same thing correlate with one another), and test-retest reliability (the degree to which the outcomes of a particular measure remain consistent over multiple administrations).

Unfortunately, being consistent in measurement does not necessarily mean that you have measured something correctly. To illustrate this concept, consider a kitchen scale that would be used to measure the weight of cereal that you eat in the morning. If the scale is not properly calibrated, it may consistently under- or overestimate the amount of cereal that's being measured. While the scale is highly reliable in producing consistent results (e.g., the same amount of cereal poured onto the scale produces the same reading each time), those results are incorrect. This is where validity comes into play. **Validity** refers to the extent to which a given instrument or tool accurately measures what it's supposed to measure, and once again, there are a number of ways in which validity can be expressed. Ecological validity (the degree to which research results generalize to real-world applications), construct validity (the degree to which a given variable actually captures or measures what it is intended to measure), and face validity (the degree to which a given variable seems valid on the surface) are just a few types that researchers consider. While any valid measure is by necessity reliable, the reverse is not necessarily true. Researchers strive to use instruments that are both highly reliable and valid.

EVERYDAY CONNECTION

How Valid Are the SAT and ACT?

Standardized tests like the SAT and ACT are supposed to measure an individual's aptitude for a college education, but how reliable and valid are such tests? Research conducted by the College Board suggests that scores on the SAT have high predictive validity for first-year college students' GPA (Kobrin, Patterson, Shaw, Mattern, & Barbuti, 2008). In this context, predictive validity refers to the test's ability to effectively predict the GPA of college freshmen. Given that many institutions of higher education require the SAT or ACT for admission, this high degree of predictive validity might be comforting.

However, the emphasis placed on SAT or ACT scores in college admissions is changing based on a number of factors. For one, some researchers assert that these tests are biased, and students from historically marginalized populations are at a disadvantage that unfairly reduces the likelihood of being admitted into a college (Santelices & Wilson, 2010). Additionally, some research has suggested that the predictive validity of these tests is grossly exaggerated in how well they are able to predict the GPA of first-year college students. In fact, it has been suggested that the SAT's predictive validity may be overestimated by as much as 150% (Rothstein,

2004). Many institutions of higher education are beginning to consider de-emphasizing the significance of SAT scores in making admission decisions (Rimer, 2008).

Recent examples of high profile cheating scandals both domestically and abroad have only increased the scrutiny being placed on these types of tests, and as of March 2019, more than 1000 institutions of higher education have either relaxed or eliminated the requirements for SAT or ACT testing for admissions (Strauss, 2019, March 19).

Learning Objectives

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

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

Today, scientists agree that good research is ethical in nature and is guided by a basic respect for human dignity and safety. However, as you will read in the feature box, this has not always been the case. Modern researchers must demonstrate that the research they perform is ethically sound. This section presents how ethical considerations affect the design and implementation of research conducted today.

Research Involving Human Participants

Any experiment involving the participation of human subjects is governed by extensive, strict guidelines designed to ensure that the experiment does not result in harm. Any research institution that receives federal support for research involving human participants must have access to an **institutional review board (IRB)**. The IRB is a committee of individuals often made up of members of the institution's administration, scientists, and community members (Figure 2.20). The purpose of the IRB is to review proposals for research that involves human participants. The IRB reviews these proposals with the principles mentioned above in mind, and generally, approval from the IRB is required in order for the experiment to proceed.

Figure 2.20 An institution's IRB meets regularly to review experimental proposals that involve human participants. (credit: International Hydropower Association/Flickr)

An institution's IRB requires several components in any experiment it approves. For one, each participant must sign an informed consent form before they can participate in the experiment. An **informed consent** form provides a written description of what participants can expect during the experiment, including potential risks and implications of the research. It also lets participants know that their involvement is completely voluntary and can be discontinued without penalty at any time. Furthermore, the informed consent guarantees that any data collected in the experiment will remain completely confidential. In cases where research participants are under the age of 18, the parents or legal guardians are required to sign the informed consent form.

LINK TO LEARNING

View this example of a consent form to learn more.

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

DIG DEEPER

Ethics and the Tuskegee Syphilis Study

Unfortunately, the ethical guidelines that exist for research today were not always applied in the past. In 1932, rural, Black men from Tuskegee, Alabama, were recruited to participate in an experiment conducted by the U.S. Public Health Service, with the aim of studying syphilis in Black men (Figure 2.21). In exchange for free medical care, meals, and burial insurance, 600 men agreed to participate in the study. A little more than half of the men tested positive for syphilis, and they served as the experimental group (given that the researchers could not randomly assign participants to groups, this represents a quasi-experiment). The remaining syphilis-free individuals served as the control group. However, those individuals that tested positive for syphilis were never informed that they had the disease.

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

Figure 2.21 A participant in the Tuskegee Syphilis Study receives an injection.

LINK TO LEARNING

Visit this website about the Tuskegee Syphilis Study to learn more.

Research Involving Animal Subjects

Many psychologists conduct research involving animal subjects. Often, these researchers use rodents (Figure 2.22) or birds as the subjects of their experiments—the APA estimates that 90% of all animal research in psychology uses these species (American Psychological Association, n.d.). Because many basic processes in animals are sufficiently similar to those in humans, these animals are acceptable substitutes for research that would be considered unethical in human participants.

Figure 2.22 Rats, like the one shown here, often serve as the subjects of animal research.

This does not mean that animal researchers are immune to ethical concerns. Indeed, the humane and ethical treatment of animal research subjects is a critical aspect of this type of research. Researchers must design their experiments to minimize any pain or distress experienced by animals serving as research subjects.

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

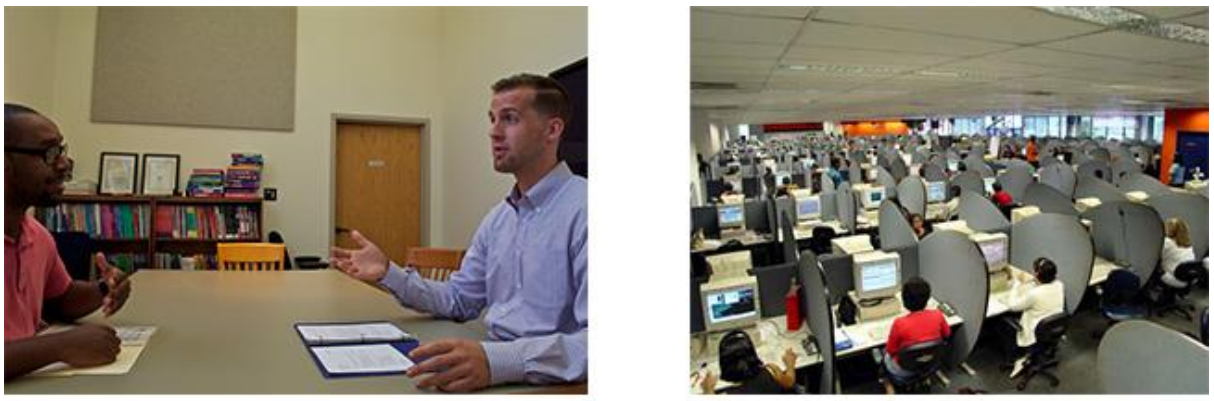
Learning Objectives

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

- Understand the scope of study in the field of industrial and organizational psychology
- Describe the history of industrial and organizational psychology

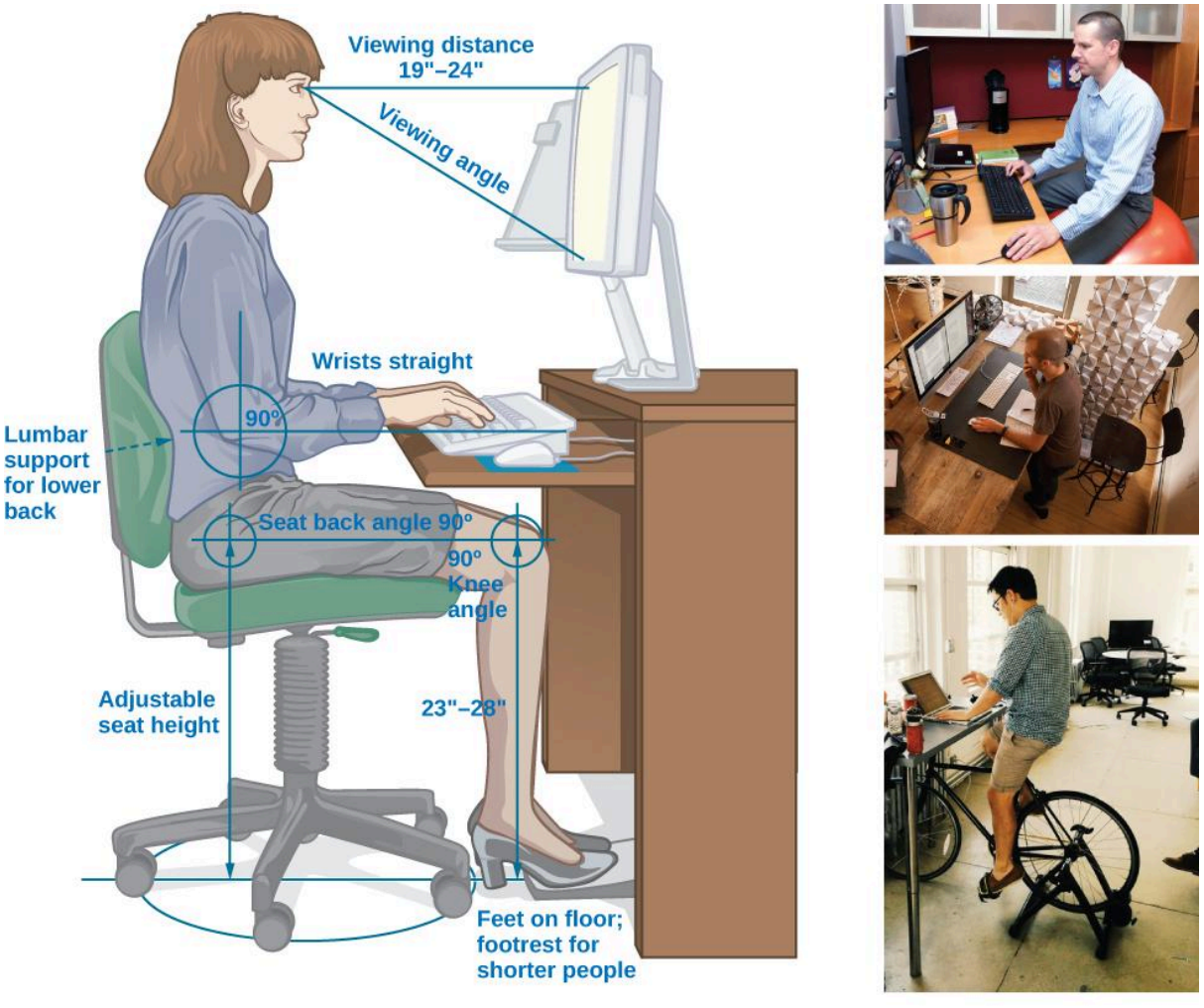
In 2019, people who worked in the United States spent an average of about 42–54 hours per week working (Bureau of Labor Statistics—U.S. Department of Labor, 2019). Sleeping was the only other activity they spent more time on with an average of about 43–62 hours per week. The workday is a significant portion of workers' time and energy. It impacts their lives and their family's lives in positive and negative physical and psychological ways. **Industrial and organizational (I-O) psychology** is a branch of psychology that studies how human behavior and psychology affect work and how they are affected by work.

Industrial and organizational psychologists work in four main contexts: academia, government, consulting firms, and business. Most I-O psychologists have a master's or doctorate degree. The field of I-O psychology can be divided into three broad areas (Figure 13.2 and Figure 13.3): industrial, organizational, and human factors. **Industrial psychology** is concerned with describing job requirements and assessing individuals for their ability to meet those requirements. In addition, once employees are hired, industrial psychology studies and develops ways to train, evaluate, and respond to those evaluations. As a consequence of its concern for candidate characteristics, industrial psychology must also consider issues of legality regarding discrimination in hiring. **Organizational psychology** is a discipline interested in how the relationships among employees affect those employees and the performance of a business. This includes studying worker satisfaction, motivation, and commitment. This field also studies management, leadership, and organizational culture, as well as how an organization's structures, management and leadership styles, social norms, and role expectations affect individual behavior. As a result of its interest in worker wellbeing and relationships, organizational psychology also considers the subjects of harassment, including sexual harassment, and workplace violence. **Human factors psychology** is the study of how workers interact with the tools of work and how to design those tools to optimize workers' productivity, safety, and health. These studies can involve interactions as straightforward as the fit of a desk, chair, and computer to a human having to sit on the chair at the desk using the computer for several hours each day. They can also include the examination of how humans interact with complex displays and their ability to interpret them accurately and quickly. In Europe, this field is referred to as ergonomics.



(a) (b)

Figure 13.2 (a) Industrial psychology focuses on hiring and maintaining employees. (b) Organizational psychology is interested in employee relationships and organizational culture. (credit a: modification of work by Cory Zanker; credit b: modification of work by Vitor Lima)



(a) (b)

Figure 13.3 Human factors psychology is the study of interactions between humans, tools, and work systems. (a) At a traditional desk, certain positioning is ideal for ergonomics and health. (b) Recent developments in workspaces include desks

where people might sit on a ball, stand, or even cycle while working. (credit "ball chair": modification of work by Chris Rosario; credit "standing desk": modification of work by "juhansonin_Flickr"/Flickr; credit "cycle desk": modification of work by "Benny Wong_Flickr"/Flickr)

Occupational health psychology (OHP) deals with the stress, diseases, and disorders that can affect employees as a result of the workplace. As such, the field is informed by research from the medical, biological, psychological, organizational, human factors, human resources, and industrial fields. Individuals in this field seek to examine the ways in which the organization affects the quality of work life for an employee and the responses that employees have towards their organization or as a result of their organization's influence on them. The responses for employees are not limited to the workplace as there may be some spillover into their personal lives outside of work, especially if there is not good work-life balance. The ultimate goal of an occupational health psychologist is to improve the overall health and well-being of an individual, and, as a result, increase the overall health of the organization (Society for Occupational Health Psychology, 2020).

In 2009, the field of humanitarian work psychology (HWP) was developed as the brainchild of a small group of I-O psychologists who met at a conference. Realizing they had a shared set of goals involving helping those who are underserved and underprivileged, the I-O psychologists formally formed the group in 2012 and have approximately 300 members worldwide. Although this is a small number, the group continues to expand. The group seeks to help marginalized members of society, such as people with low income, find work. In addition, they help to determine ways to deliver humanitarian aid during major catastrophes. The Humanitarian Work Psychology group can also reach out to those in the local community who do not have the knowledge, skills, and abilities (KSAs) to be able to find gainful employment that would enable them to not need to receive aid. In both cases, humanitarian work psychologists try to help the underserved individuals develop KSAs that they can use to improve their lives and their current situations. When ensuring these underserved individuals receive training or education, the focus is on skills that, once learned, will never be forgotten and can serve individuals throughout their lifetimes as they seek employment (APA, 2016). Table 13.1 summarizes the main fields in I-O psychology, their focuses, and jobs within each field.

Fields of Industrial Organizational Psychology

Field of I-O Psychology	Description	Types of Jobs

Industrial Psychology	Specializes and focuses on the retention of employees and hiring practices to ensure the least number of firings and the greatest number of hirings relative to the organization's size.	Personnel Analyst Instructional Designer Professor Research Analyst
Organizational Psychology	Works with the relationships that employees develop with their organizations and conversely that their organization develops with them. In addition, studies the relationships that develop between co-workers and how that is influenced by organizational norms.	HR Research Specialist Professor Project Consultant Personnel Psychologist Test Developer Training Developer Leadership Developer

		Talent Developer
Human Factors and Engineering	Researches advances and changes in technology in an effort to improve the way technology is used by consumers, whether with consumer products, technologies, transportation, work environments, or communications. Seeks to be better able to predict the ways in which people can and will utilize technology and products in an effort to provide improved safety and reliability.	Professor Ergonomist Safety Scientist Project Consultant Inspector Research Scientist Marketer Product Development

Humanitarian Work Psychology	Works to improve the conditions of individuals who have faced serious disaster or who are part of an underserved population. Focuses on labor relations, enhancing public health services, effects on populations due to climate change, recession, and diseases.	Professor Instructional Designer Research Scientist Counselor Consultant Program Manager Senior Response Officer
Occupational Health Psychology	Concerned with the overall well-being of both employees and organizations.	Occupational Therapist Research Scientist Consultant Human Resources (HR) Specialist

		Professor

Table 13.1

LINK TO LEARNING

Find out what I-O psychologists do on the Society for Industrial and Organizational Psychology (SIOP) website—a professional organization for people working in the discipline. This site also offers several I-O psychologist profiles.

The Historical Development of Industrial and Organizational Psychology

Industrial and organizational psychology had its origins in the early 20th century. Several influential early psychologists studied issues that today would be categorized as industrial psychology: James Cattell (1860–1944), Hugo Münsterberg (1863–1916), Walter Dill Scott (1869–1955), Robert Yerkes (1876–1956), Walter Bingham (1880–1952), and Lillian Gilbreth (1878–1972). Cattell, Münsterberg, and Scott had been students of Wilhelm Wundt, the father of experimental psychology. Some of these researchers had been involved in work in the area of industrial psychology before World War I. Cattell's contribution to industrial psychology is largely reflected in his founding of a psychological consulting company, which is still operating today, called the Psychological Corporation, and in the accomplishments of students at Columbia in the area of industrial psychology. In 1913, Münsterberg published *Psychology and Industrial Efficiency*, which covered topics such as employee selection, employee training, and effective advertising.

Scott was one of the first psychologists to apply psychology to advertising, management, and personnel selection. In 1903, Scott published two books: *The Theory of Advertising* and *Psychology of Advertising*. They are the first books to describe the use of psychology in the business world. By 1911 he published two more books, *Influencing Men in Business* and *Increasing Human Efficiency in Business*. In 1916 a newly formed division in the Carnegie Institute of Technology hired Scott to conduct applied research on employee selection (Katzell & Austin, 1992).

The focus of all this research was in what we now know as industrial psychology; it was only later in the century that the field of organizational psychology developed as an experimental science (Katzell & Austin, 1992). In addition to their academic positions, these researchers also worked directly for businesses as consultants.

When the United States entered World War I in April 1917, the work of psychologists working in this discipline expanded to include their contributions to military efforts. At that time Yerkes was the president of the 25-year-old American Psychological Association (APA). The APA is a professional association in the United States for clinical and research psychologists. Today the APA performs a number of functions including holding conferences, accrediting university degree programs, and publishing scientific journals. Yerkes organized a group under the Surgeon General's Office (SGO) that developed methods for screening and selecting enlisted men. They developed the Army Alpha test to measure mental abilities. The Army Beta test was a non-verbal form of the test that was administered to illiterate and non-English-speaking draftees. Scott and Bingham organized a group under the Adjutant General's Office (AGO) with the goal of developing selection methods for officers. They created a catalogue of occupational needs for the Army, essentially a job-description system and a system of performance ratings and occupational skill tests for officers (Katzell & Austin, 1992). After the war, work on personnel selection continued. For example, Millicent Pond researched the selection of factory workers, comparing the results of pre-employment tests with various indicators of job performance (Vinchur & Koppes, 2014).

From 1929 to 1932 Elton Mayo (1880–1949) and his colleagues began a series of studies at a plant near Chicago, Western Electric's Hawthorne Works (Figure 13.4). This long-term project took industrial psychology beyond just employee selection and placement to a study of more complex problems of interpersonal relations, motivation, and organizational dynamics. These studies mark the origin of organizational psychology. They began as research into the effects of the physical work environment (e.g., level of lighting in a factory), but the researchers found that the psychological and social factors in the factory were of more interest than the physical factors. These studies also examined how human interaction factors, such as supervisorial style, increased or decreased productivity.

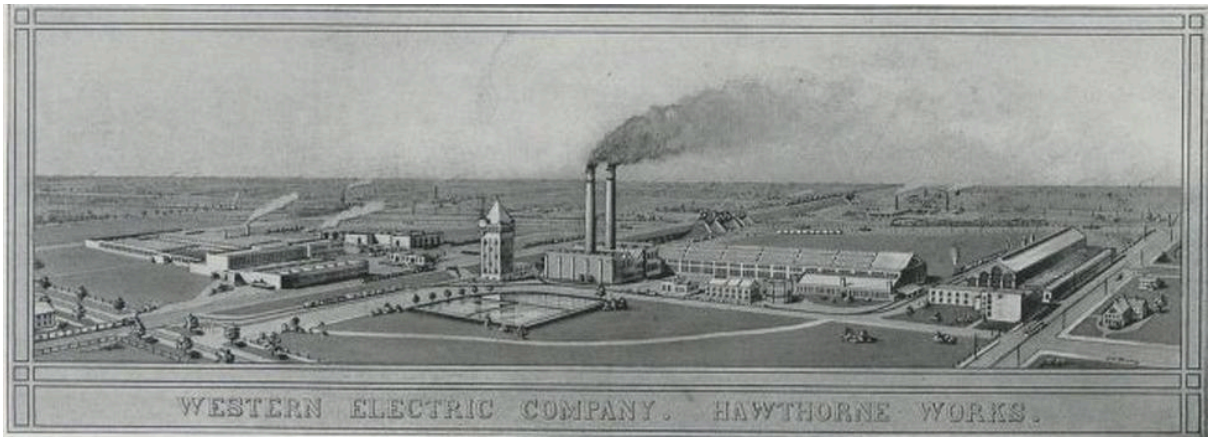


Figure 13.4 Hawthorne Works provided the setting for several early I-O studies.

Analysis of the findings by later researchers led to the term the **Hawthorne effect**, which describes the increase in performance of individuals who are aware they are being observed by researchers or supervisors (Figure 13.5). What the original

researchers found was that any change in a variable, such as lighting levels, led to an improvement in productivity; this was true even when the change was negative, such as a return to poor lighting. The effect faded when the attention faded (Roethlisberg & Dickson, 1939). The Hawthorne-effect concept endures today as an important experimental consideration in many fields and a factor that has to be controlled for in an experiment. In other words, an experimental treatment of some kind may produce an effect simply because it involves greater attention of the researchers on the participants (McCarney et al., 2007).

Figure 13.5 Researchers discovered that employees performed better when researchers or supervisors observed and interacted with them, a dynamic termed the Hawthorne effect.

LINK TO LEARNING

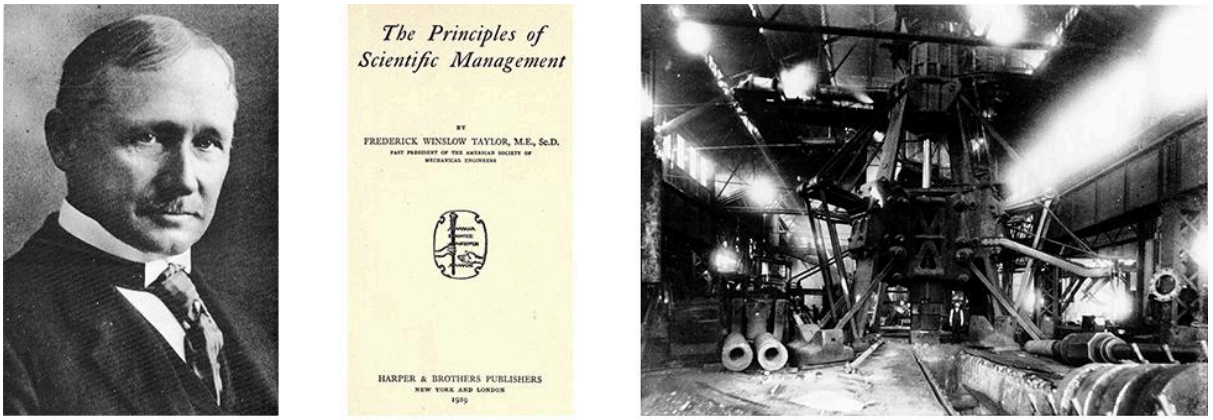
Watch this video of first-hand accounts of the original Hawthorne studies to learn more.

In the 1930s, researchers began to study employees' feelings about their jobs. Kurt Lewin also conducted research on the effects of various leadership styles, team structure, and team dynamics (Katzell & Austin, 1992). Lewin is considered the founder of social psychology and much of his work and that of his students produced results that had important influences in organizational psychology. Lewin and his students' research included an important early study that used children to study the effect of leadership style on aggression, group dynamics, and satisfaction (Lewin,

Lippitt, & White, 1939). Lewin was also responsible for coining the term *group dynamics*, and he was involved in studies of group interactions, cooperation, competition, and communication that bear on organizational psychology.

Parallel to these studies in industrial and organizational psychology, the field of human factors psychology was also developing. Frederick Taylor was an engineer who saw that if one could redesign the workplace there would be an increase in both output for the company and wages for the workers. In 1911 he put forward his theory in a book titled *The Principles of Scientific Management* (Figure 13.6). His book examines management theories, personnel selection and training, as well as the work itself, using time and motion studies. Taylor argued that the principal goal of management should be to make the most money for the employer, along with the best outcome for the employee. He believed that the best outcome for the employee and management would be achieved through training and development so that each employee could provide the best work. He believed that by conducting time and motion studies for both the organization and the employee, the best interests of both were addressed. Time-motion studies were methods that aimed to improve work by dividing different types of operations into sections that could be measured. These analyses were used to standardize work and to check the efficiency of people and equipment.

Personnel selection is a process used by recruiting personnel within the company to recruit and select the best candidates for the job. Training may need to be conducted depending on what skills the hired candidate has. Often companies will hire someone with the personality that fits in with others but who may be lacking in skills. Skills can be taught, but personality cannot be easily changed.



(a) (b) (c)

Figure 13.6 (a) Frederick Taylor (1911) strived to engineer workplaces to increase productivity, based on the ideas he set forth in (b) his book, *The Principles of Scientific Management*. (c) Taylor designed this steam hammer at the Midvale Steel Company. (credit c: modification of work by “Kheel Center, Cornell University”/Flickr)

One of the examples of Taylor’s theory in action involved workers handling heavy iron ingots. Taylor showed that the workers could be more productive by taking work

rests. This method of rest increased worker productivity from 12.5 to 47.0 tons moved per day with less reported fatigue as well as increased wages for the workers who were paid by the ton. At the same time, the company's cost was reduced from 9.2 cents to 3.9 cents per ton. Despite these increases in productivity, Taylor's theory received a great deal of criticism at the time because it was believed that it would exploit workers and reduce the number of workers needed. Also controversial was the underlying concept that only a manager could determine the most efficient method of working, and that while at work, a worker was incapable of this. Taylor's theory was underpinned by the notion that a worker was fundamentally lazy and the goal of Taylor's scientific management approach was to maximize productivity without much concern for worker well-being. His approach was criticized by unions and those sympathetic to workers (Van De Water, 1997).

Gilbreth was another influential I-O psychologist who strove to find ways to increase productivity (Figure 13.7). Using time and motion studies, Gilbreth and her husband, Frank, worked to make workers more efficient by reducing the number of motions required to perform a task. She applied these methods not only to industry but also to the home, office, shops, and other areas. She investigated employee fatigue and time management stress and found many employees were motivated by money and job satisfaction. In 1914, Gilbreth wrote the book, *The Psychology of Management: The Function of the Mind in Determining, Teaching, and Installing Methods of Least Waste*, and she is known as the mother of modern management. Some of Gilbreth's contributions are still in use today: you can thank her for the idea to put shelves inside refrigerator doors, and she also came up with the concept of using a foot pedal to operate the lid of trash can (Gilbreth, 1914, 1998; Koppes, 1997; Lancaster, 2004). Gilbreth was the first woman to join the American Society of Mechanical Engineers in 1926, and in 1966 she was awarded the Hoover Medal of the American Society of Civil Engineers.

Taylor and Gilbreth's work improved productivity, but these innovations also improved the fit between technology and the human using it. The study of machine–human fit is known as ergonomics or human factors psychology.

(a) (b) (c)

Figure 13.7 (a) Lillian Gilbreth studied efficiency improvements that were applicable in the workplace, home, and other areas. She is credited with the idea of (b) putting shelves on the inside of refrigerator doors and (c) foot-pedal-operated garbage cans. (credit b: modification of work by “Goedeker’s”/Flickr; credit c: modification of work by Kerry Ceszyk)

From World War II to Today

World War II also drove the expansion of industrial psychology. Bingham was hired as the chief psychologist for the War Department (now the Department of Defense) and developed new systems for job selection, classification, training, and performance review, plus methods for team development, morale change, and attitude change (Katzell & Austin, 1992). Other countries, such as Canada and the United Kingdom, likewise saw growth in I-O psychology during World War II (McMillan, Stevens, & Kelloway, 2009). In the years after the war, both industrial psychology and organizational psychology became areas of significant research effort. Concerns about the fairness of employment tests arose, and the ethnic and gender biases in various tests were evaluated with mixed results. In addition, a great deal of research went into studying job satisfaction and employee motivation (Katzell & Austin, 1992).

The research and work of I-O psychologists in the areas of employee selection, placement, and performance appraisal became increasingly important in the 1960s. When Congress passed the 1964 Civil Rights Act, Title VII covered what is known as equal employment opportunity. This law protects employees against discrimination based on race, color, religion, sex, or national origin, as well as discrimination against an employee for associating with an individual in one of these categories.

Organizations had to adjust to the social, political, and legal climate of the Civil Rights movement, and these issues needed to be addressed by members of I/O in research and practice.

There are many reasons for organizations to be interested in I/O so that they can better understand the psychology of their workers, which in turn helps them understand how their organizations can become more productive and competitive. For example, most large organizations are now competing on a global level, and they need to understand how to motivate workers in order to achieve high productivity and efficiency. Most companies also have a diverse workforce and need to understand the psychological complexity of the people in these diverse backgrounds.

Today, I-O psychology is a diverse and deep field of research and practice, as you will learn about in the rest of this chapter. The Society for Industrial and Organizational Psychology (SIOP), a division of the APA, lists 8,000 members (SIOP, 2014) and the Bureau of Labor Statistics—U.S. Department of Labor (2013) has projected this profession will have the greatest growth of all job classifications in the 20 years following 2012. On average, a person with a master's degree in industrial-organizational psychology will earn over $80,000 a year, while someone with a doctorate will earn over $110,000 a year (Khanna, Medsker, & Ginter, 2012).

Learning Objectives

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

- Define organizational psychology
- Explain the measurement and determinants of job satisfaction
- Describe key elements of management and leadership
- Explain the significance of organizational culture

Organizational psychology is the second major branch of study and practice within the discipline of industrial and organizational psychology. In organizational psychology, the focus is on social interactions and their effect on the individual and on the functioning of the organization. In this section, you will learn about the work organizational psychologists have done to understand job satisfaction, different styles of management, different styles of leadership, organizational culture, and teamwork.

Job Satisfaction

Some people love their jobs, some people tolerate their jobs, and some people cannot stand their jobs. **Job satisfaction** describes the degree to which individuals enjoy their job. It was described by Edwin Locke (1976) as the state of feeling resulting from appraising one's job experiences. While job satisfaction results from both how we think about our work (our cognition) and how we feel about our work (our affect) (Saari & Judge, 2004), it is described in terms of affect. Job satisfaction is impacted by the work itself, our personality, and the culture we come from and live in (Saari & Judge, 2004).

Job satisfaction is typically measured after a change in an organization, such as a shift in the management model, to assess how the change affects employees. It may also be routinely measured by an organization to assess one of many factors expected to affect the organization's performance. In addition, polling companies like Gallup regularly measure job satisfaction on a national scale to gather broad information on the state of the economy and the workforce (Saad, 2012).

Job satisfaction is measured using questionnaires that employees complete. Sometimes a single question might be asked in a very straightforward way to which employees respond using a rating scale, such as a Likert scale, which was discussed in the chapter on personality. A Likert scale (typically) provides five possible answers to a statement or question that allows respondents to indicate their positive-to-negative strength of agreement or strength of feeling regarding the question or statement. Thus the possible responses to a question such as "How satisfied are you with your job today?" might be "Very satisfied," "Somewhat satisfied," "Neither satisfied, nor dissatisfied," "Somewhat dissatisfied," and "Very dissatisfied." More commonly the survey will ask a number of questions about the

employee's satisfaction to determine more precisely why they are satisfied or dissatisfied. Sometimes these surveys are created for specific jobs; at other times, they are designed to apply to any job. Job satisfaction can be measured at a global level, meaning how satisfied in general the employee is with work, or at the level of specific factors intended to measure which aspects of the job lead to satisfaction (Table 13.2).

Factors Involved in Job Satisfaction and Dissatisfaction

Factor	Description
Autonomy	Individual responsibility, control over decisions
Work content	Variety, challenge, role clarity
Communication	Feedback
Financial rewards	Salary and benefits
Growth and development	Personal growth, training, education
Promotion	Career advancement opportunity
Coworkers	Professional relations or adequacy
Supervision and feedback	Support, recognition, fairness

Workload	Time pressure, tedium
Work demands	Extra work requirements, insecurity of position

Table 13.2

Research has suggested that the work-content factor, which includes variety, difficulty level, and role clarity of the job, is the most strongly predictive factor of overall job satisfaction (Saari & Judge, 2004). In contrast, there is only a weak correlation between pay level and job satisfaction (Judge, Piccolo, Podsakoff, Shaw, & Rich, 2010). Judge et al. (2010) suggest that individuals adjust or adapt to higher pay levels: Higher pay no longer provides the satisfaction the individual may have initially felt when their salary increased.

Why should we care about job satisfaction? Or more specifically, why should an employer care about job satisfaction? Measures of job satisfaction are somewhat correlated with job performance; in particular, they appear to relate to organizational citizenship or discretionary behaviors on the part of an employee that further the goals of the organization (Judge & Kammeyer-Mueller, 2012). Job satisfaction is related to general life satisfaction, although there has been limited research on how the two influence each other or whether personality and cultural factors affect both job and general life satisfaction. One carefully controlled study suggested that the relationship is reciprocal: Job satisfaction affects life satisfaction positively, and vice versa (Judge & Watanabe, 1993). Of course, organizations cannot control life satisfaction's influence on job satisfaction. Job satisfaction, specifically low job satisfaction, is also related to withdrawal behaviors, such as leaving a job or absenteeism (Judge & Kammeyer-Mueller, 2012). The relationship with turnover itself, however, is weak (Judge & Kammeyer-Mueller, 2012). Finally, it appears that job satisfaction is related to organizational performance, which suggests that implementing organizational changes to improve employee job satisfaction will improve organizational performance (Judge & Kammeyer-Mueller, 2012).

There is opportunity for more research in the area of job satisfaction. For example, Weiss (2002) suggests that the concept of job satisfaction measurements have combined both emotional and cognitive concepts, and measurements would be more reliable and show better relationships with outcomes like performance if the measurement of job satisfaction separated these two possible elements of job satisfaction.

DIG DEEPER

Job Satisfaction in Federal Government Agencies

A 2013 study of job satisfaction in the U.S. federal government found indexes of job satisfaction plummeting compared to the private sector. The largest factor in the decline was satisfaction with pay, followed by training and development opportunities. The Partnership for Public Service, a nonprofit, nonpartisan organization, has conducted research on federal employee job satisfaction since 2003. Its primary goal is to improve the federal government's management. However, the results also provide information to those interested in obtaining employment with the federal government.

Among large agencies, the highest job satisfaction ranking went to NASA, followed by the Department of Commerce and the intelligence community. The lowest scores went to the Department of Homeland Security.

The data used to derive the job satisfaction score come from three questions on the Federal Employee Viewpoint Survey. The questions are:

1. I recommend my organization as a good place to work.
2. Considering everything, how satisfied are you with your job?
3. Considering everything, how satisfied are you with your organization?

The questions have a range of six possible answers, spanning a range of strong agreement or satisfaction to strong disagreement or dissatisfaction. How would you answer these questions with regard to your own job? Would these questions adequately assess your job satisfaction?

You can explore the Best Places To Work In The Federal Government study at their Web site: www.bestplacestowork.org. The Office of Personnel Management also produces a report based on their survey: www.fedview.opm.gov.

Job stress affects job satisfaction. Job stress, or job strain, is caused by specific stressors in an occupation. Stress can be an ambiguous term as it is used in common language. Stress is the perception and response of an individual to events judged as overwhelming or threatening to the individual's well-being (Gyllensten & Palmer, 2005). The events themselves are the stressors. Stress is a result of an employee's perception that the demands placed on them exceed their ability to meet them (Gyllensten & Palmer, 2005), such as having to fill multiple roles in a job or life in general, workplace role ambiguity, lack of career progress, lack of job security, lack of control over work outcomes, isolation, work overload, discrimination, harassment, and bullying (Colligan & Higgins, 2005). The stressors are different for women than men and these differences are a significant area of research (Gyllensten & Palmer, 2005). Job stress leads to poor employee health, job performance, and family life (Colligan & Higgins, 2005).

As already mentioned, job insecurity contributes significantly to job stress. Two increasing threats to job security are downsizing events and corporate mergers. Businesses typically involve I-O psychologists in planning for, implementing, and managing these types of organizational change.

Downsizing is an increasingly common response to a business's pronounced failure to achieve profit goals, and it involves laying off a significant percentage of the company's employees. Industrial-organizational psychologists may be involved in all aspects of downsizing: how the news is delivered to employees (both those being let go and those staying), how laid-off employees are supported (e.g., separation packages), and how retained employees are supported. The latter is important for the organization because downsizing events affect the retained employee's intent to quit, organizational commitment, and job insecurity (Ugboro, 2006).

In addition to downsizing as a way of responding to outside strains on a business, corporations often grow larger by combining with other businesses. This can be accomplished through a merger (i.e., the joining of two organizations of equal power and status) or an acquisition (i.e., one organization purchases the other). In an acquisition, the purchasing organization is usually the more powerful or dominant partner. In both cases, there is usually a duplication of services between the two companies, such as two accounting departments and two sales forces. Both departments must be merged, which commonly involves a reduction of staff (Figure 13.14). This leads to organizational processes and stresses similar to those that occur in downsizing events. Mergers require determining how the organizational culture will change, to which employees also must adjust (van Knippenberg, van Knippenberg, Monden, & de Lima, 2002). There can be additional stress on workers as they lose their connection to the old organization and try to make connections with the new combined group (Amiot, Terry, Jimmieson, & Callan, 2006). Research in this area focuses on understanding employee reactions and making practical recommendations for managing these organizational changes.

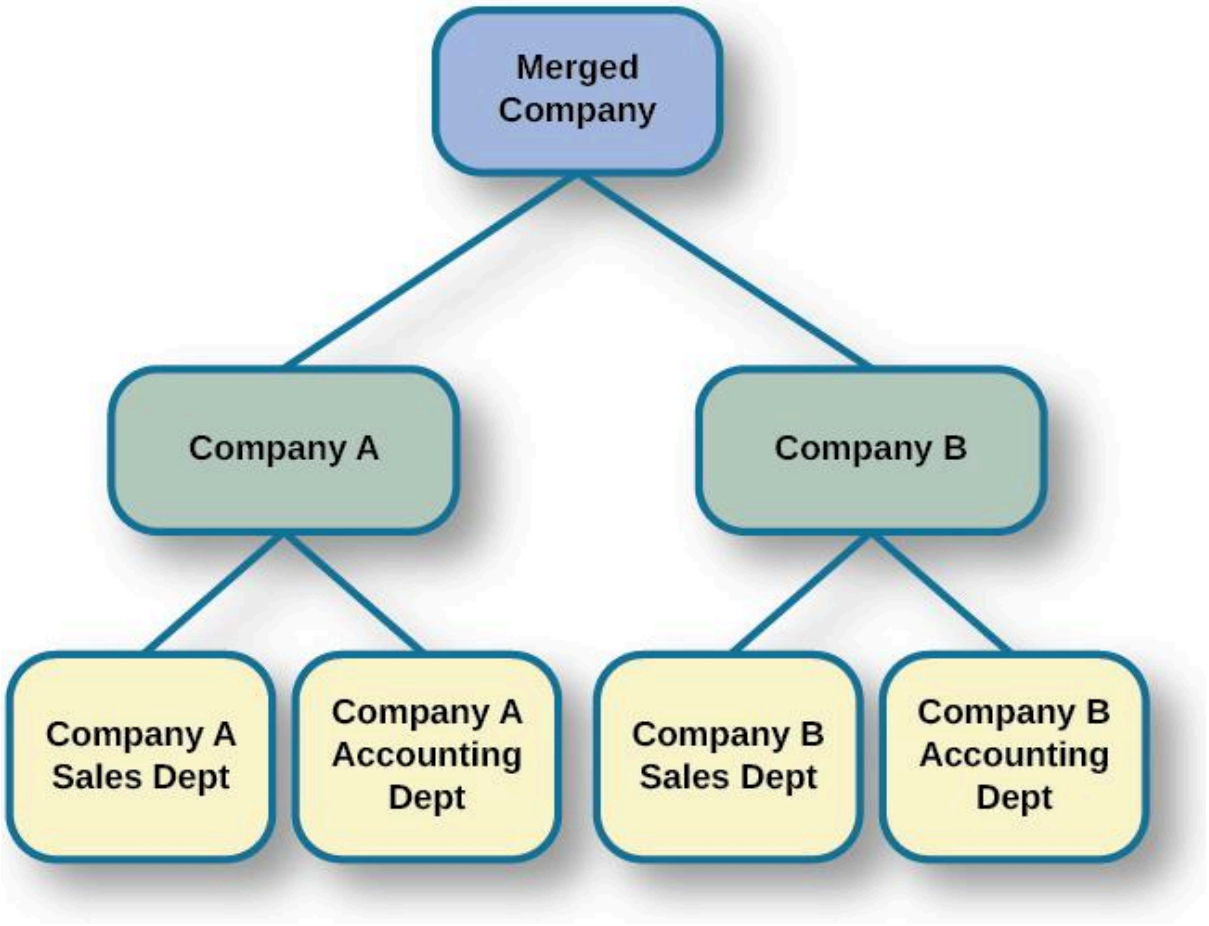


Figure 13.14 When companies are combined through a merger (or acquisition), there are often cuts due to duplication of core functions, like sales and accounting, at each company.

Work–Family Balance

Many people juggle the demands of work life with the demands of their home life, whether it be caring for children or taking care of an elderly parent; this is known as **work-family balance**. We might commonly think about work interfering with family, but it is also the case that family responsibilities may conflict with work obligations (Carlson, Kacmar, & Williams, 2000). Greenhaus and Beutell (1985) first identified three sources of work–family conflicts:

- time devoted to work makes it difficult to fulfill requirements of family, or vice versa,
- strain from participation in work makes it difficult to fulfill requirements of family, or vice versa, and
- specific behaviors required by work make it difficult to fulfill the requirements of family, or vice versa.

Women often have greater responsibility for family demands, including home care, child care, and caring for aging parents, yet men in the United States are

increasingly assuming a greater share of domestic responsibilities. However, research has documented that women report greater levels of stress from work–family conflict (Gyllensten & Palmer, 2005).

There are many ways to decrease work–family conflict and improve people's job satisfaction (Posig & Kickul, 2004). These include support in the home, which can take various forms: emotional (listening), practical (help with chores). Workplace support can include understanding supervisors, flextime, leave with pay, and telecommuting. Flextime usually involves a requirement of core hours spent in the workplace around which the employee may schedule their arrival and departure from work to meet family demands. **Telecommuting** involves employees working at home and setting their own hours, which allows them to work during different parts of the day, and to spend part of the day with their family; this may also be known as ecommuting, working remotely, flexible workspace, or simply working from home. Recall that Yahoo! had a policy of allowing employees to telecommute and then rescinded the policy. There are also organizations that have onsite daycare centers, and some companies even have onsite fitness centers and health clinics. In a study of the effectiveness of different coping methods, Lapierre & Allen (2006) found practical support from home more important than emotional support. They also found that immediate-supervisor support for a worker significantly reduced work–family conflict through such mechanisms as allowing an employee the flexibility needed to fulfill family obligations. In contrast, flextime did not help with coping and telecommuting actually made things worse, perhaps reflecting the fact that being at home intensifies the conflict between work and family because with the employee in the home, the demands of family are more evident.

Posig & Kickul (2004) identify exemplar corporations with policies designed to reduce work–family conflict. Examples include IBM's policy of three years of job-guaranteed leave after the birth of a child, Lucent Technologies offer of one year's childbirth leave at half pay, and SC Johnson's program of concierge services for daytime errands.

LINK TO LEARNING

The Glassdoor website posts job satisfaction reviews for different careers and organizations. Use this site to research possible careers and/or organizations that interest you.

Management and Organizational Structure

A significant portion of I-O research focuses on management and human relations. Douglas McGregor (1960) combined **scientific management** (a theory of management that analyzes and synthesizes workflows with the main objective of improving economic efficiency, especially labor productivity) and human relations into the notion of leadership behavior. His theory lays out two different styles called

Theory X and Theory Y. In the **Theory X** approach to management, managers assume that most people dislike work and are not innately self-directed. Theory X managers perceive employees as people who prefer to be led and told which tasks to perform and when. Their employees have to be watched carefully to be sure that they work hard enough to fulfill the organization's goals. Theory X workplaces will often have employees punch a clock when arriving and leaving the workplace: Tardiness is punished. Supervisors, not employees, determine whether an employee needs to stay late, and even this decision would require someone higher up in the command chain to approve the extra hours. Theory X supervisors will ignore employees' suggestions for improved efficiency and reprimand employees for speaking out of order. These supervisors blame efficiency failures on individual employees rather than the systems or policies in place. Managerial goals are achieved through a system of punishments and threats rather than enticements and rewards. Managers are suspicious of employees' motivations and always suspect selfish motivations for their behavior at work (e.g., being paid is their sole motivation for working).

In the **Theory Y** approach, on the other hand, managers assume that most people seek inner satisfaction and fulfillment from their work. Employees function better under leadership that allows them to participate in, and provide input about, setting their personal and work goals. In Theory Y workplaces, employees participate in decisions about prioritizing tasks; they may belong to teams that, once given a goal, decide themselves how it will be accomplished. In such a workplace, employees are able to provide input on matters of efficiency and safety. One example of Theory Y in action is the policy of Toyota production lines that allows any employee to stop the entire line if a defect or other issue appears, so that the defect can be fixed and its cause remedied (Toyota Motor Manufacturing, 2013). A Theory Y workplace will also meaningfully consult employees on any changes to the work process or management system. In addition, the organization will encourage employees to contribute their own ideas. McGregor (1960) characterized Theory X as the traditional method of management used in the United States. He argued that a Theory Y approach was needed to improve organizational output and the wellbeing of individuals. Table 13.3 summarizes how these two management approaches differ.

Theory X and Theory Y Management Styles

Theory X	Theory Y

People dislike work and avoid it.	People enjoy work and find it natural.
People avoid responsibility.	People are more satisfied when given responsibility.
People want to be told what to do.	People want to take part in setting their own work goals.
Goals are achieved through rules and punishments.	Goals are achieved through enticements and rewards.

Table 13.3

Another management style was described by Donald Clifton, who focused his research on how an organization can best use an individual's strengths, an approach he called strengths-based management. He and his colleagues interviewed 8,000 managers and concluded that it is important to focus on a person's strengths, not their weaknesses. A strength is a particular enduring talent possessed by an individual that allows them to provide consistent, near-perfect performance in tasks involving that talent. Clifton argued that our strengths provide the greatest opportunity for growth (Buckingham & Clifton, 2001). An example of a strength is public speaking or the ability to plan a successful event. The strengths-based approach is very popular although its effect on organization performance is not well-studied. However, Kaiser & Overfield (2011) found that managers often neglected improving their weaknesses and overused their strengths, both of which interfered with performance.

Leadership is an important element of management. Leadership styles have been of major interest within I-O research, and researchers have proposed numerous theories of leadership. Bass (1985) popularized and developed the concepts of transactional leadership versus transformational leadership styles. In **transactional leadership**, the focus is on supervision and organizational goals, which are achieved through a system of rewards and punishments (i.e., transactions). Transactional leaders maintain the status quo: They are managers. This is in contrast to the transformational leader. People who have **transformational leadership** possess four attributes to varying degrees: They are charismatic (highly liked role models),

inspirational (optimistic about goal attainment), intellectually stimulating (encourage critical thinking and problem solving), and considerate (Bass, Avolio, & Atwater, 1996).

As women increasingly take on leadership roles in corporations, questions have arisen as to whether there are differences in leadership styles between men and women (Eagly, Johannesen-Schmidt, & van Engen, 2003). Eagly & Johnson (1990) conducted a meta-analysis to examine gender and leadership style. They found, to a slight but significant degree, that women tend to practice an interpersonal style of leadership (i.e., she focuses on the morale and welfare of the employees) and men practice a task-oriented style (i.e., he focuses on accomplishing tasks). However, the differences were less pronounced when one looked only at organizational studies and excluded laboratory experiments or surveys that did not involve actual organizational leaders. Larger gender-related differences were observed when leadership style was categorized as democratic or autocratic, and these differences were consistent across all types of studies. The authors suggest that similarities between genders in leadership styles are attributable to different genders needing to conform to the organization's culture; additionally, they propose that gender-related differences reflect inherent differences in the strengths each gender brings to bear on leadership practice. In another meta-analysis of leadership style, Eagly, Johannesen-Schmidt, & van Engen (2003) found that women tended to exhibit the characteristics of transformational leaders, while men were more likely to be transactional leaders. However, the differences are not absolute; for example, women were found to use methods of reward for performance more often than men, which is a component of transactional leadership. The differences they found were relatively small. As Eagly, Johannesen-Schmidt, & van Engen (2003) point out, research shows that transformational leadership approaches are more effective than transactional approaches, although individual leaders typically exhibit elements of both approaches.

A new and emerging area of research within psychology focuses on leadership and the relationship with leaders from the perspective of a follower. This "followership" research suggests that studies need to examine the leader-follower relationship in both directions—instead of focusing only on leadership—to better understand the dynamics of the relationship. Put differently, people are individuals, and because they are different, there probably is no single best leadership-follower dynamic between leaders and followers. For instance, think about the differences between yourself and someone you know well. Do you respond the same way to criticism? Maybe one of you likes a lot of structure and other seems to work best with less structure. Perhaps, one of you is ready to try a new restaurant at any time and the other prefers to go to the tried-and-true place that you've visited so many times the servers know your order before you place it.

Some early research has discovered that the characteristics of individual followers will result in different types of relationships with a leader depending on the leadership style. It appears that not all leadership styles work well with all follower types. One characteristic of followers, for example, is their degree of extroversion. Previous research suggests that individuals with a high degree of extroversion would need a larger amount of interaction with their leaders in order to function well; however, other research suggests this may not necessarily be the case and instead other factors may be at work (Phillips & Bedeian; Bauer et al, 2006).

Another characteristic of followers is their individual need for growth. For followers who have a strong desire to learn and grow within their organization, a leader who provides developmental opportunities might be better received than one who does not. In addition, for those followers who are low on growth and need strength, leaders who push them to grow may make them less satisfied followers as they feel forced into further development and training, possibly signaling a lower level of achievement from their supervisor. Training for leaders in both helping employees who have a strong drive for growth and those who do not appears to be helpful in improving the relationship between both types of followers and their leaders (Schyns, Kroon, & Moors, 2008).

Finally, an employee's need for leadership is an important component of the leader-follower relationship. Some individuals are significantly more autonomous than others and as a result do not respond as well to leaders who provide a lot of structure and rigidity of processes, in turn reducing the quality of their relationship with their leader. Other employees who are high in need for leadership have a better relationship with their leader if they are provided with a well-structured environment with clear responsibilities and little ambiguity in their work. These followers work best in situations where they feel they can comfortably perform the work with little requirement to think outside of the guidelines that have been provided. For these individuals, having a leader who is able to set a clear path forward for the employee with little need for deviation promotes a strong positive leader-follower relationship (Felfe & Schyns, 2006).

Goals, Teamwork and Work Teams

The workplace today is rapidly changing due to a variety of factors, such as shifts in technology, economics, foreign competition, globalization, and workplace demographics. Organizations need to respond quickly to changes in these factors. Many companies are responding to these changes by structuring their organizations so that work can be delegated to **work teams**, which bring together diverse skills, experience, and expertise. This is in contrast to organizational structures that have individuals at their base (Naquin & Tynan, 2003). In the team-based approach, teams are brought together and given a specific task or goal to accomplish. Despite their burgeoning popularity, team structures do not always deliver greater

productivity—the work of teams is an active area of research (Naquin & Tynan, 2003).

Why do some teams work well while others do not? There are many contributing factors. For example, teams can mask team members that are not working (i.e., social loafing). Teams can be inefficient due to poor communication; they can have poor decision-making skills due to conformity effects; and, they can have conflict within the group. The popularity of teams may in part result from the team halo effect: Teams are given credit for their successes, but individuals within a team are blamed for team failures (Naquin & Tynan, 2003). One aspect of team diversity is their gender mix. Researchers have explored whether gender mix has an effect on team performance. On the one hand, diversity can introduce communication and interpersonal-relationship problems that hinder performance, but on the other hand diversity can also increase the team's skill set, which may include skills that can actually improve team member interactions. Hoogendoorn, Oosterbeek, & van Praag (2013) studied project teams in a university business school in which the gender mix of the teams was manipulated. They found that gender-balanced teams performed better, as measured by sales and profits, than teams made up mostly by men. The study did not have enough data to determine the relative performance of teams with more women than men. The study was unsuccessful in identifying which mechanism (interpersonal relationships, learning, or skills mixes) accounted for performance improvement.

There are three basic types of teams: problem resolution teams, creative teams, and tactical teams. Problem resolution teams are created for the purpose of solving a particular problem or issue; for example, the diagnostic teams at the Centers for Disease Control. Creative teams are used to develop innovative possibilities or solutions; for example, design teams for car manufacturers create new vehicle models. Tactical teams are used to execute a well-defined plan or objective, such as a police or FBI SWAT team handling a hostage situation (Larson & LaFasto, 1989). One area of active research involves a fourth kind of team—the virtual team; these studies examine how groups of geographically disparate people brought together using digital communications technology function (Powell, Piccoli, & Ives, 2004). Even before the COVID-19 pandemic, virtual teams were more common due to the growing globalization of organizations and the use of consulting and partnerships facilitated by digital communication.

Organizational Culture

Each company and organization has an organizational culture. **Organizational culture** encompasses the values, visions, hierarchies, norms, and interactions among its employees. It is how an organization is run, how it operates, and how it makes decisions—the industry in which the organization participates may have an influence. Different departments within one company can develop their own

subculture within the organization's culture. Ostroff, Kinicki, and Tamkins (2003) identify three layers in organizational culture: observable artifacts, espoused values, and basic assumptions. Observable artifacts are the symbols, language (jargon, slang, and humor), narratives (stories and legends), and practices (rituals) that represent the underlying cultural assumptions. Espoused values are concepts or beliefs that the management or the entire organization endorses. They are the rules that allow employees to know which actions they should take in different situations and which information they should adhere to. These basic assumptions generally are unobservable and unquestioned. Researchers have developed survey instruments to measure organizational culture.

With the workforce being a global marketplace, your company may have a supplier in Korea and another in Honduras and have employees in the United States, China, and South Africa. You may have coworkers of different religious, ethnic, or racial backgrounds than yourself. Your coworkers may be from different places around the globe. Many workplaces offer diversity training to help everyone involved bridge and understand cultural differences. **Diversity training** educates participants about cultural differences with the goal of improving teamwork. There is always the potential for prejudice between members of two groups, but the evidence suggests that simply working together, particularly if the conditions of work are set carefully, allows such prejudice to be reduced or eliminated. Pettigrew and Tropp (2006) conducted a meta-analysis to examine the question of whether contact between groups reduced prejudice between those groups. They found that there was a moderate but significant effect. They also found that, as previously theorized, the effect was enhanced when the two groups met under conditions in which they have equal standing, common goals, cooperation between the groups, and especially support on the part of the institution or authorities for the contact.

DIG DEEPER

Managing Generational Differences

An important consideration in managing employees is age. Workers' expectations and attitudes are developed in part by experience in particular cultural time periods. Generational constructs are somewhat arbitrary, yet they may be helpful in setting broad directions to organizational management as one generation leaves the workforce and another enters it. The baby boomer generation (born between 1946 and 1964) is in the process of leaving the workforce and will continue to depart it for a decade or more. Generation X (born between the early 1960s and the 1980s) are now in the middle of their careers. Millennials (born from 1979 to 1994) began to come of age at the turn of the century, and are early in their careers.

Today, as these three different generations work side by side in the workplace, employers and managers need to be able to identify their unique characteristics. Each generation has distinctive expectations, habits, attitudes, and motivations

(Elmore, 2010). One of the major differences among these generations is knowledge of the use of technology in the workplace. Millennials are technologically sophisticated and believe their use of technology sets them apart from other generations. They have also been characterized as self-centered and overly self-confident. Their attitudinal differences have raised concerns for managers about maintaining their motivation as employees and their ability to integrate into organizational culture created by baby boomers (Myers & Sadaghiani, 2010). For example, millennials may expect to hear that they need to pay their dues in their jobs from baby boomers who believe they paid their dues in their time. Yet millennials may resist doing so because they value life outside of work to a greater degree (Myers & Sadaghiani, 2010). Meister & Willyerd (2010) suggest alternative approaches to training and mentoring that will engage millennials and adapt to their need for feedback from supervisors: reverse mentoring, in which a younger employee educates a senior employee in social media or other digital resources. The senior employee then has the opportunity to provide useful guidance within a less demanding role.

Recruiting and retaining millennials and Generation X employees poses challenges that did not exist in previous generations. The concept of building a career with the company is not relatable to most Generation X employees, who do not expect to stay with one employer for their career. This expectation arises from of a reduced sense of loyalty because they do not expect their employer to be loyal to them (Gibson, Greenwood, & Murphy, 2009). Retaining Generation X workers thus relies on motivating them by making their work meaningful (Gibson, Greenwood, & Murphy, 2009). Since millennials lack an inherent loyalty to the company, retaining them also requires effort in the form of nurturing through frequent rewards, praise, and feedback.

Millennials are also interested in having many choices, including options in work scheduling, choice of job duties, and so on. They also expect more training and education from their employers. Companies that offer the best benefit package and brand attract millennials (Myers & Sadaghiani, 2010).

One well-recognized negative aspect of organizational culture is a culture of harassment, including sexual harassment. Most organizations of any size have developed sexual harassment policies that define sexual harassment (or harassment in general) and the procedures the organization has set in place to prevent and address it when it does occur. Thus, in most jobs you have held, you were probably made aware of the company's sexual harassment policy and procedures, and may have received training related to the policy. The U.S. Equal Employment Opportunity Commission (n.d.) provides the following description of **sexual harassment**:

Unwelcome sexual advances, requests for sexual favors, and other verbal or physical conduct of a sexual nature constitute sexual harassment when this conduct explicitly or implicitly affects an individual's employment, unreasonably interferes with

an individual's work performance, or creates an intimidating, hostile, or offensive work environment. (par. 2)

One form of sexual harassment is called quid pro quo. Quid pro quo means you give something to get something, and it refers to a situation in which organizational rewards are offered in exchange for sexual favors. Quid pro quo harassment is often between an employee and a person with greater power in the organization. For example, a supervisor might request an action, such as a kiss or a touch, in exchange for a promotion, a positive performance review, or a pay raise. Another form of sexual harassment is the threat of withholding a reward if a sexual request is refused. Hostile environment sexual harassment is another type of workplace harassment. In this situation, an employee experiences conditions in the workplace that are considered hostile or intimidating. For example, a work environment that allows offensive language or jokes or displays sexually explicit images. Isolated occurrences of these events do not constitute harassment, but a pattern of repeated occurrences does. In addition to violating organizational policies against sexual harassment, these forms of harassment are illegal.

Harassment does not have to be sexual; it may be related to any of the protected classes in the statutes regulated by the EEOC: race, national origin, religion, or age.

Violence in the Workplace

Workplace violence is any act or threat of physical violence, harassment, intimidation, or other threatening, disruptive behavior that occurs at the workplace. It ranges from threats and verbal abuse to physical assaults and even homicide (Occupational Safety & Health Administration, 2014).

There are different targets of workplace violence: a person could commit violence against coworkers, supervisors, or property. Warning signs often precede such actions: intimidating behavior, threats, sabotaging equipment, or radical changes in a coworker’s behavior. Often there is intimidation and then escalation that leads to even further escalation. It is important for employees to involve their immediate supervisor if they ever feel intimidated or unsafe.

Murder is the second leading cause of death in the workplace. It is also the primary cause of death for women in the workplace. Every year there are nearly two million workers who are physically assaulted or threatened with assault. Many are murdered in domestic violence situations by boyfriends or husbands who chose the woman’s workplace to commit their crimes.

There are many triggers for workplace violence. A significant trigger is the feeling of being treated unfairly, unjustly, or disrespectfully. In a research experiment, Greenberg (1993) examined the reactions of students who were given pay for a task. In one group, the students were given extensive explanations for the pay rate. In the

second group, the students were given a curt uninformative explanation. The students were made to believe the supervisor would not know how much money the student withdrew for payment. The rate of stealing (taking more pay than they were told they deserved) was higher in the group who had been given the limited explanation. This is a demonstration of the importance of procedural justice in organizations. **Procedural justice** refers to the fairness of the processes by which outcomes are determined in conflicts with or among employees.

In another study by Greenberg & Barling (1999), they found a history of aggression and amount of alcohol consumed to be accurate predictors of workplace violence against a coworker. Aggression against a supervisor was predicted if a worker felt unfairly treated or untrusted. Job security and alcohol consumption predicted aggression against a subordinate. To understand and predict workplace violence, Greenberg & Barling (1999) emphasize the importance of considering the employee target of aggression or violence and characteristics of both the workplace and the aggressive or violent person.

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 they appraise as overwhelming or threatening to their 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 they believed the promotion would lead to excessive work demands than if they 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 their ability to complete a task is important (Bandura, 1994). A threat tends to be viewed as less catastrophic if one believes something can be done about it (Lazarus & Folkman, 1984). Imagine that two middle-aged people, Robin and Madhuri, perform breast self-examinations one morning and each notices a lump on the lower region of their left breast. Although

both view the breast lump as a potential threat (primary appraisal), their secondary appraisals differ considerably. In considering the breast lump, some of the thoughts racing through Robin's mind are, "Oh my God, I could have breast cancer! What if the cancer has spread to the rest of my body and I cannot recover? What if I have to go through chemotherapy? I've heard that experience is awful! What if I have to quit my job? My partner and I won't have enough money to pay the mortgage. Oh, this is just horrible…I can't deal with it!" On the other hand, Madhuri thinks, "Hmm, this may not be good. Although most times these things turn out to be benign, I need to have it checked out. If it turns out to be breast cancer, there are doctors who can take care of it because the medical technology today is quite advanced. I'll have a lot of different options, and I'll be just fine." Clearly, Robin and Madhuri have different outlooks on what might turn out to be a very serious situation: Robin seems to think that little could be done about it, whereas Madhuri believes that, worst case scenario, a number of options that are likely to be effective would be available. As such, Robin would clearly experience greater stress than would Madhuri.

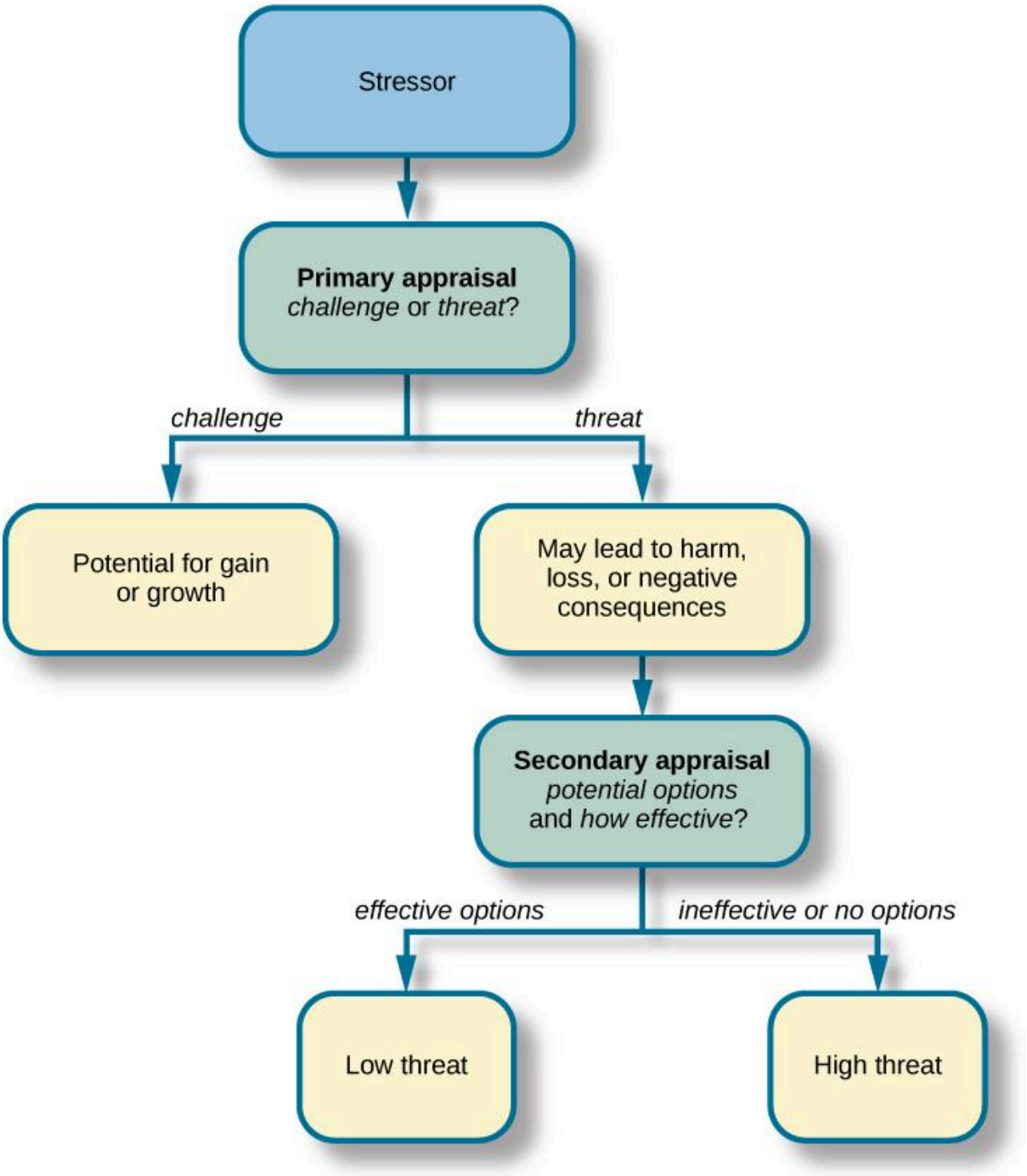


Figure 14.3 When encountering a stressor, a person judges its potential threat (primary appraisal) and then determines if effective options are available to manage the situation. Stress is likely to result if a stressor is perceived as extremely threatening or threatening with few or no effective coping 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. 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 their game, meaning they feel fully energized, focused, and can work with minimal effort and maximum efficiency. But when stress exceeds this optimal level, it is no longer a positive force—it becomes excessive and debilitating, or what Selye termed **distress** (from the Latin *dis* = "bad"). People who reach this level of stress feel burned out; they are fatigued, exhausted, and their performance begins to decline. If the stress remains excessive, health may begin to erode as well (Everly & Lating, 2002). A good example of distress is severe test anxiety. When students are feeling very stressed about a test, negative emotions combined with physical symptoms may make concentration difficult, thereby negatively affecting test scores.

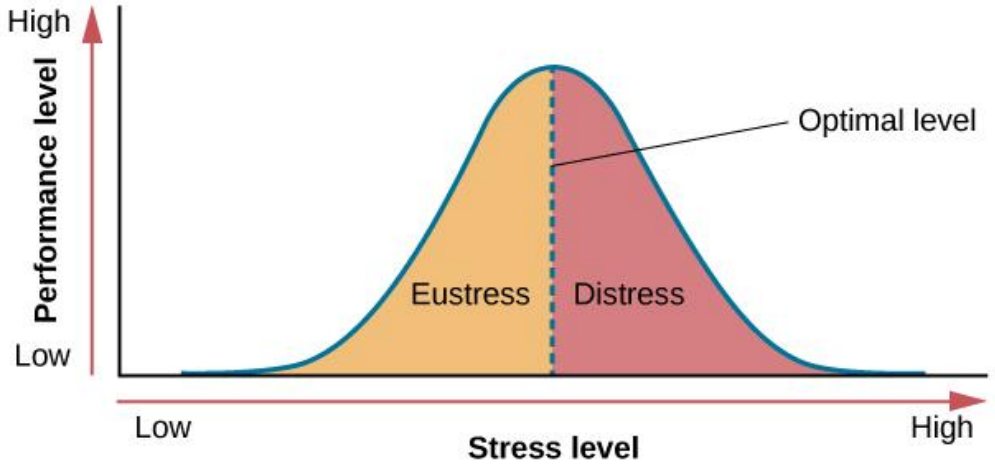


Figure 14.4 As the stress level increases from low to moderate, so does performance (eustress). At the optimal level (the peak of the curve), performance has reached its peak. If stress exceeds the optimal level, it will reach the distress region, where it will become excessive and debilitating, and 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.

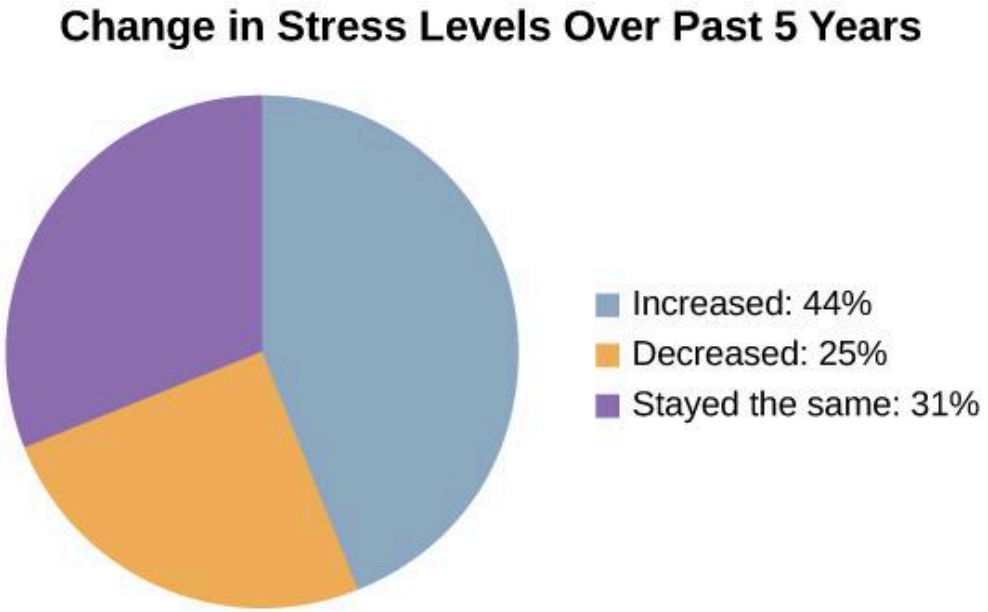


Figure 14.5 Nearly half of U.S. adults indicated that their stress levels have increased over the last five years (Neelakantan, 2013).

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, Hispanic 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.

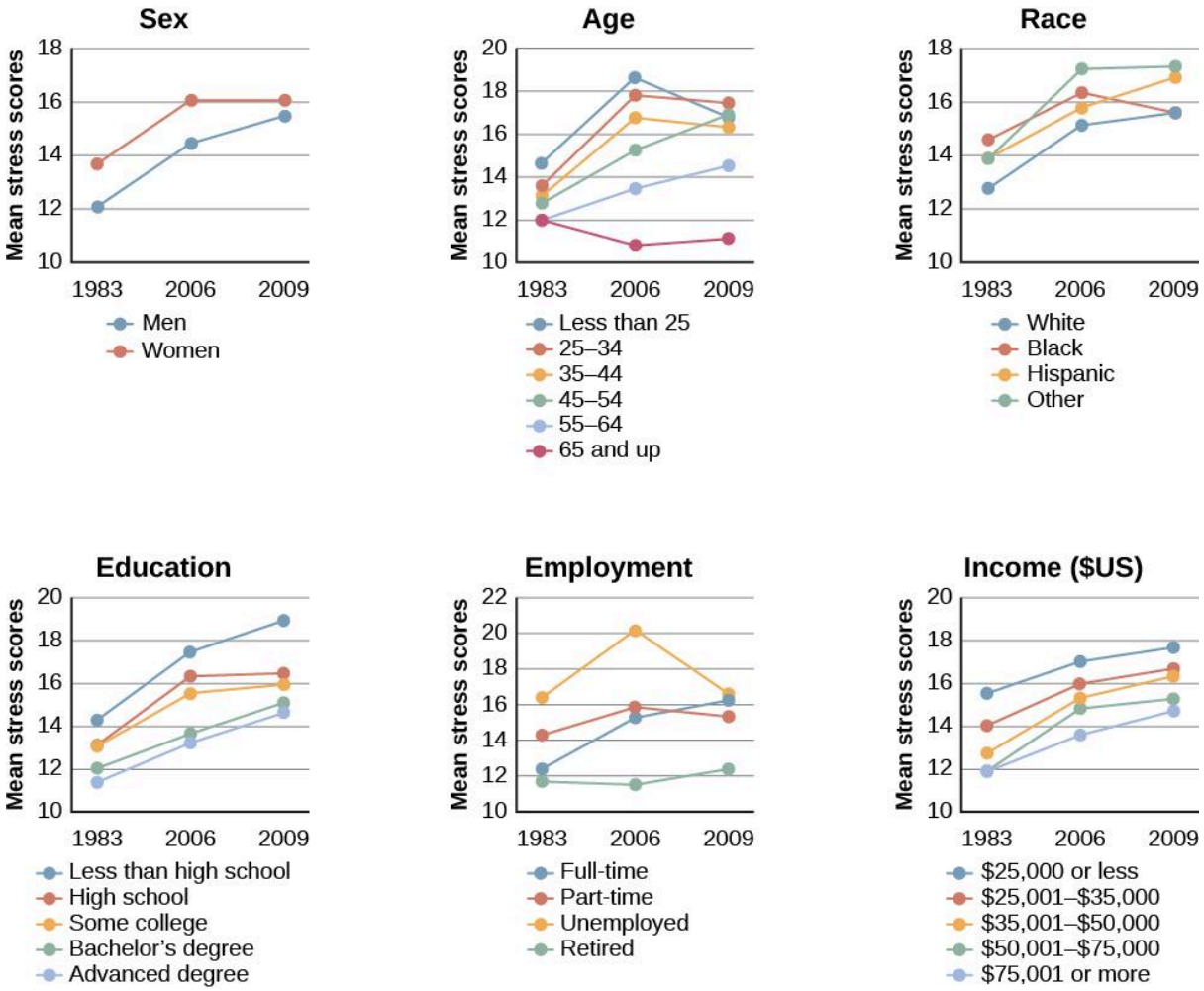


Figure 14.6 The charts above, adapted from Cohen & Janicki-Deverts (2012), depict the mean stress level scores among different demographic groups during the years 1983, 2006, and 2009. Across categories of sex, age, race, education level, employment status, and income, stress levels generally show a marked increase over this quarter-century time span.

Early Contributions to the Study of Stress

As previously stated, scientific interest in stress goes back nearly a century. One of the early pioneers in the study of stress was Walter Cannon, an eminent American physiologist at Harvard Medical School (Figure 14.7). In the early part of the 20th century, Cannon was the first to identify the body's physiological reactions to stress.

Figure 14.7 Harvard physiologist Walter Cannon first articulated and named the fight-or-flight response, the nervous system's sympathetic response to a significant stressor.

Cannon and the Fight-or-Flight Response

Imagine that you are hiking in the beautiful mountains of Colorado on a warm and sunny spring day. At one point during your hike, a large, frightening-looking black bear appears from behind a stand of trees and sits about 50 yards from you. The bear notices you, sits up, and begins to lumber in your direction. In addition to thinking, "This is definitely not good," a constellation of physiological reactions begins to take place inside you. Prompted by a deluge of epinephrine (adrenaline) and norepinephrine (noradrenaline) from your adrenal glands, your pupils begin to dilate. Your heart starts to pound and speeds up, you begin to breathe heavily and perspire, you get butterflies in your stomach, and your muscles become tense, preparing you to take some kind of direct action. Cannon proposed that this reaction, which he called the **fight-or-flight response**, occurs when a person experiences very strong emotions—especially those associated with a perceived threat (Cannon, 1932). During the fight-or-flight response, the body is rapidly aroused by activation of both the sympathetic nervous system and the endocrine system (Figure 14.8). This arousal helps prepare the person to either fight or flee from a perceived threat.

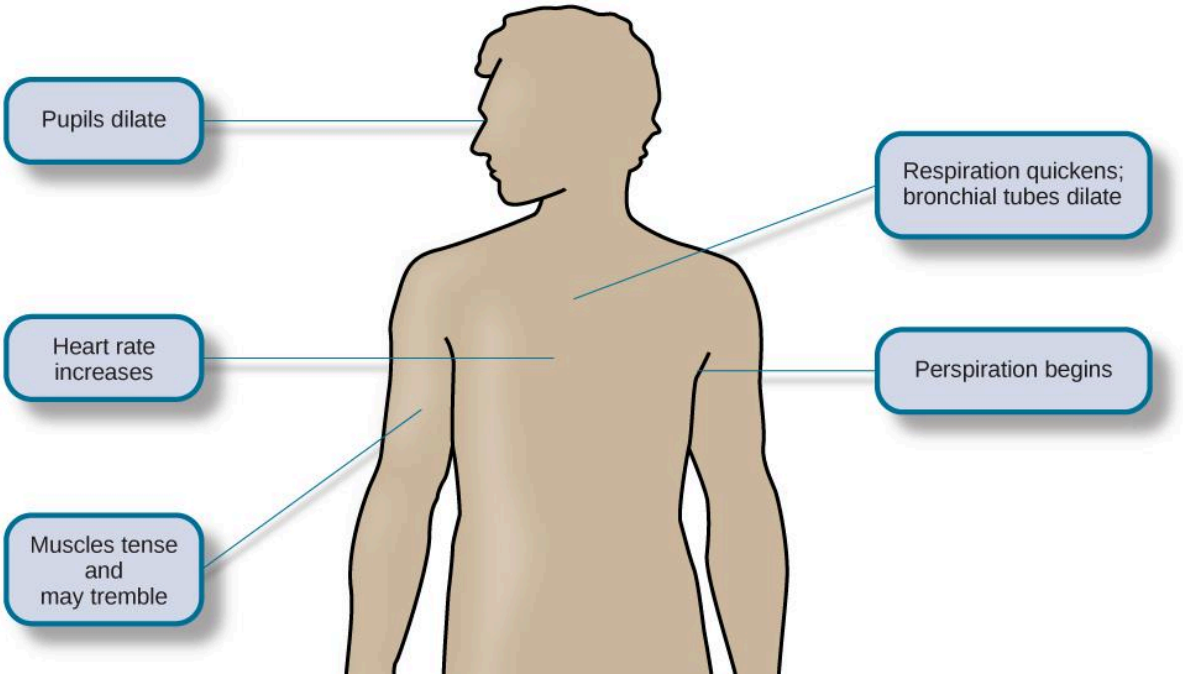


Figure 14.8 Fight or flight is a physiological response to a stressor.

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.

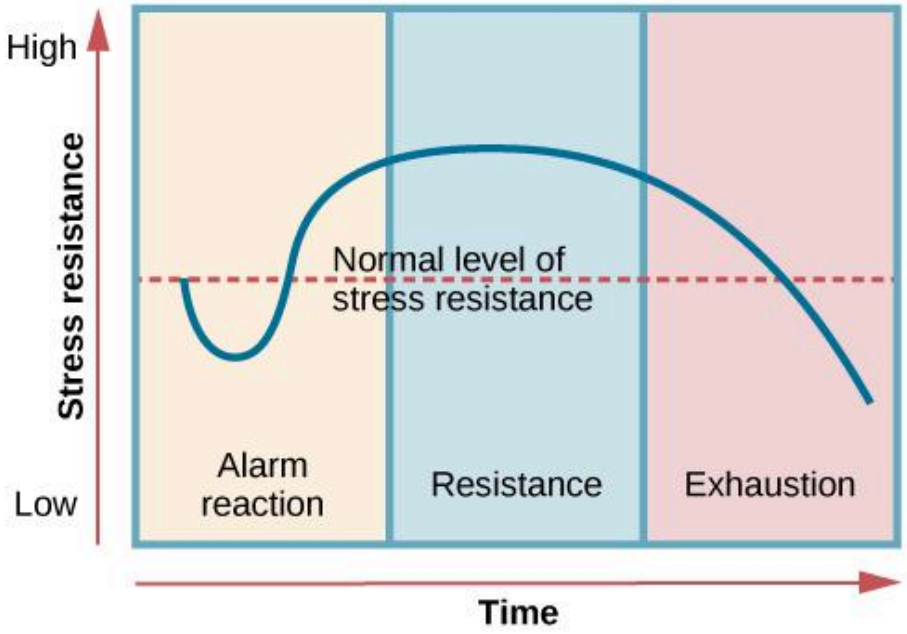


Figure 14.10 The three stages of Selye's general adaptation syndrome are shown in this graph. Prolonged stress ultimately results in exhaustion.

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 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 corticotropin-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.

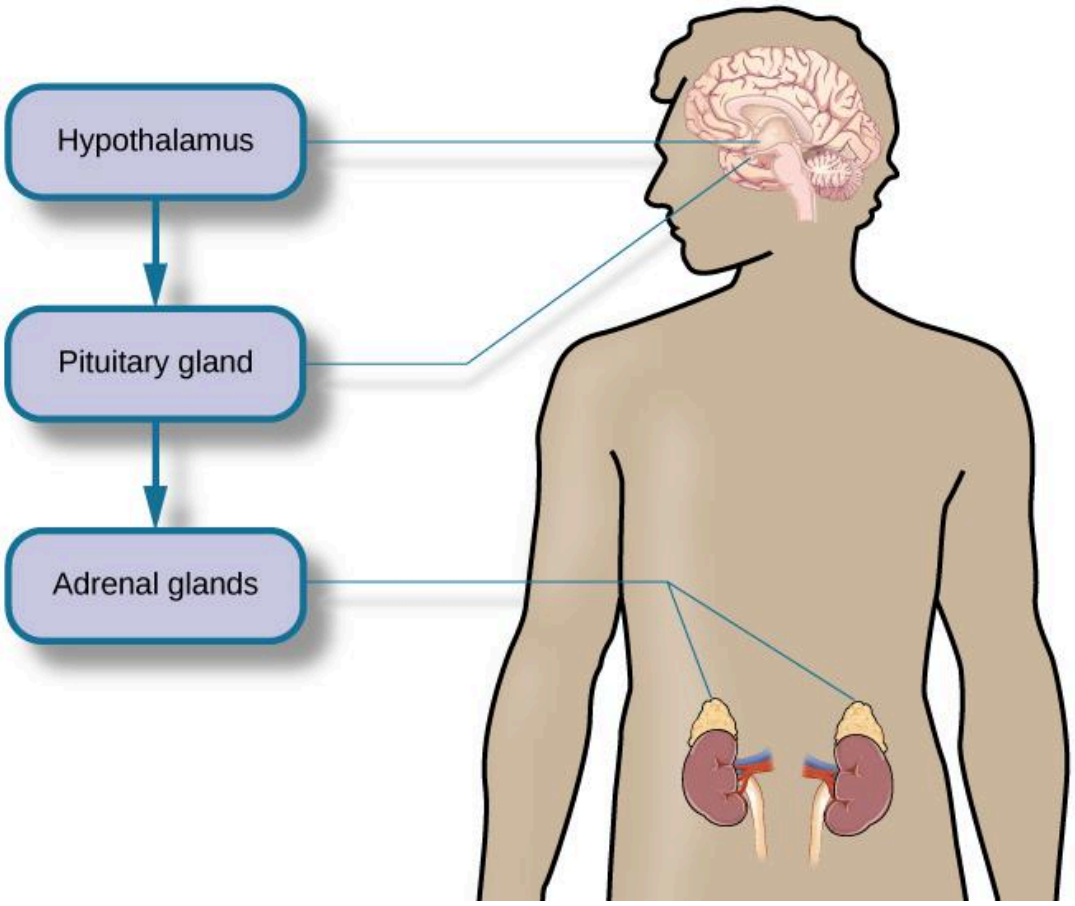


Figure 14.11 This diagram shows the functioning of the hypothalamic-pituitary-adrenal (HPA) axis. The hypothalamus activates the pituitary gland, which in turn activates the adrenal glands, increasing their secretion of cortisol.

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. For example, researchers in one study found that people injured during the September 11, 2001, World Trade Center disaster or who developed post-traumatic stress symptoms afterward later suffered significantly elevated rates of heart disease (Jordan, Miller-Archie, Cone, Morabia, & Stellman, 2011). Another investigation yielded that self-reported stress symptoms among aging and retired Finnish food industry workers were associated with morbidity 11 years later. This study also predicted the onset of musculoskeletal, nervous system, and endocrine and metabolic disorders (Salonen, Arola, Nygård, & Huhtala, 2008). Another study reported that male South Korean manufacturing employees who reported high levels of work-related stress were more likely to catch the common cold over the next several months than were those employees who reported lower work-related stress levels (Park et al., 2011). Later, you will explore the mechanisms through which stress can produce physical illness and disease.

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-White people, and individuals in lower socioeconomic status (SES) groups report experiencing a greater number of traumatic events than do women, White people, 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 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). In an early demonstration, researchers obtained LCU scores for U.S. and Norwegian Navy personnel who were about to embark on a six-month voyage. A later examination of medical records revealed positive (but small) correlations between LCU scores prior to the voyage and subsequent illness symptoms during the ensuing six-month journey (Rahe, 1974). In addition, people tend to experience more physical symptoms, such as backache, upset stomach, diarrhea, and acne, on specific days in which self-reported LCU values are considerably higher than normal, such as the day of a family member's wedding (Holmes & Holmes, 1970).

The Social Readjustment Rating Scale (SRRS) provides researchers a simple, easy-to-administer way of assessing the amount of stress in people's lives, and it

has been used in hundreds of studies (Thoits, 2010). Despite its widespread use, the scale has been subject to criticism. First, many of the items on the SRRS are vague; for example, death of a close friend could involve the death of a long-absent childhood friend that requires little social readjustment (Dohrenwend, 2006). In addition, some have challenged its assumption that undesirable life events are no more stressful than desirable ones (Derogatis & Coons, 1993). However, most of the available evidence suggests that, at least as far as mental health is concerned, undesirable or negative events are more strongly associated with poor outcomes (such as depression) than are desirable, positive events (Hatch & Dohrenwend, 2007). Perhaps the most serious criticism is that the scale does not take into consideration respondents' appraisals of the life events it contains. As you recall, appraisal of a stressor is a key element in the conceptualization and overall experience of stress. Being fired from work may be devastating to some but a welcome opportunity to obtain a better job for others. The SRRS remains one of the most well-known instruments in the study of stress, and it is a useful tool for identifying potential stress-related health outcomes (Scully et al., 2000).

LINK TO LEARNING

Go to this site and complete the SRRS scale to determine the total number of LCUs you have experienced over the last year.

CONNECT THE CONCEPTS

Correlational Research

The Holmes and Rahe Social Readjustment Rating Scale (SRRS) uses the correlational research method to identify the connection between stress and health. That is, respondents' LCU scores are correlated with the number or frequency of self-reported symptoms indicating health problems. These correlations are typically positive—as LCU scores increase, the number of symptoms increase. Consider all the thousands of studies that have used this scale to correlate stress and illness symptoms: If you were to assign an average correlation coefficient to this body of research, what would be your best guess? How strong do you think the correlation coefficient would be? Why can't the SRRS show a causal relationship between stress and illness? If it were possible to show causation, do you think stress causes illness or illness causes stress?

Hassles

Potential stressors do not always involve major life events. **Daily hassles**—the minor irritations and annoyances that are part of our everyday lives (e.g., rush hour traffic, lost keys, obnoxious coworkers, inclement weather, arguments with friends or family)—can build on one another and leave us just as stressed as life change events (Figure 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 distressed mood states (Bolger, DeLongis, Kessler, & Schilling, 1989). Cyber hassles that occur on social media may represent a modern and evolving source of stress. In one investigation, social media stress was tied to loss of sleep in adolescents, presumably because ruminating about social media caused a physiological stress response that increased arousal (van der Schuur, Baumgartner, & Sumter, 2018). Clearly, daily hassles can add up and take a toll on us both emotionally and physically.

OCCUPATION-RELATED Stressors

Stressors can include situations in which one is frequently exposed to challenging and unpleasant events, such as difficult, demanding, or unsafe working conditions. Although most jobs and occupations can at times be demanding, some are clearly more stressful than others (Figure 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, threat

	of physical violence, lack of support from parents and administrators
Nurse	Work overload, heavy physical work, patient concerns (dealing with death and medical concerns), interpersonal problems with other medical staff (especially physicians)
Emergency medical worker	Unpredictable and extreme nature of the job, inexperience
Clerical and secretarial work	Few opportunities for advancement, unsupportive supervisors, work overload, lack of perceived control
Managerial work	Work overload, conflict and ambiguity in defining the managerial role, difficult work relationships

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). A longitudinal study of over 10,000 British civil servants reported that workers under 50 years old who earlier had reported high job strain were 68% more likely to later develop heart disease than

were those workers under 50 years old who reported little job strain (Chandola et al., 2008).

Some people who are exposed to chronically stressful work conditions can experience **job burnout**, which is a general sense of emotional exhaustion and cynicism in relation to one's job (Maslach & Jackson, 1981). Job burnout occurs frequently among those in human service jobs (e.g., social workers, teachers, therapists, 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 their rope and has nothing more to give at a psychological level. Second, job burnout is characterized by depersonalization: a sense of emotional detachment between the worker and the recipients of their services, often resulting in callous, cynical, or indifferent attitudes toward these individuals. Third, job burnout is characterized by diminished personal accomplishment, which is the tendency to evaluate one's work negatively by, for example, experiencing dissatisfaction with one's job-related accomplishments or feeling as though one has categorically failed to influence others' lives through one's work.

Job strain appears to be one of the greatest risk factors leading to job burnout, which is most commonly observed in workers who are older (ages 55–64), unmarried, and whose jobs involve manual labor. Heavy alcohol consumption, physical inactivity, being overweight, and having a physical or lifetime mental disorder are also associated with job burnout (Ahola, et al., 2006). In addition, depression often co-occurs with job burnout. One large-scale study of over 3,000 Finnish employees reported that half of the participants with severe job burnout had some form of depressive disorder (Ahola et al., 2005). Job burnout is often precipitated by feelings of having invested considerable energy, effort, and time into one's work while receiving little in return (e.g., little respect or support from others or low pay) (Tatris, Peeters, Le Blanc, Schreurs, & Schaufeli, 2001).

As an illustration, consider Tyre, a nursing assistant who worked in a nursing home. Tyre worked long hours for little pay in a difficult facility. Tyre's supervisor was domineering, unpleasant, and unsupportive, as well as disrespectful of Tyre's personal time, frequently informing them at the last minute they must work several additional hours after their shift ended or report to work on weekends. Tyre had very little autonomy at work. They had little input in day-to-day duties and how to perform them, and was not permitted to take breaks unless explicitly told by their supervisor. Tyre did not feel as though their hard work was appreciated, either by supervisory staff or by the residents of the home. Tyre was very unhappy over the low pay, and felt that many of the residents treated them disrespectfully.

After several years, Tyre began to hate their job. Tyre dreaded going to work in the morning, and gradually developed a callous, hostile attitude toward many of the residents. Eventually, they began to feel they could no longer help the nursing home residents. Tyre's absenteeism from work increased, and one day they decided that

they had had enough and quit. Tyre now has a job in sales, vowing never to work in nursing again.

LINK TO LEARNING

Watch this clip from the 1999 comedy *Office Space* for a humorous illustration of lack of supervisory support in which a sympathetic character's insufferable boss makes a last-minute demand that he "go ahead and come in" to the office on both Saturday and Sunday.

Finally, our close relationships with friends and family—particularly the negative aspects of these relationships—can be a potent source of stress. Negative aspects of close relationships can include conflicts such as disagreements or arguments, lack of emotional support or confiding, and lack of reciprocity. All of these can be overwhelming, threatening to the relationship, and thus stressful. Such stressors can take a toll both emotionally and physically. A longitudinal investigation of over 9,000 British civil servants found that those who at one point had reported the highest levels of negative interactions in their closest relationship were 34% more likely to experience serious heart problems (fatal or nonfatal heart attacks) over a 13–15 year period, compared to those who experienced the lowest levels of negative interaction (De Vogli, Chandola & Marmot, 2007).

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 their 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

Friedman and Booth-Kewley (1987) statistically reviewed 101 studies to examine the link between personality and illness. They proposed the existence of disease-prone personality characteristics, including depression, anger/hostility, and anxiety. Indeed, a study of over 61,000 Norwegians identified depression as a risk factor for all major disease-related causes of death (Mykletun et al., 2007). In addition, neuroticism—a personality trait that reflects how anxious, moody, and sad one is—has been identified as a risk factor for chronic health problems and mortality (Ploubidis & Grundy, 2009).

Below, we discuss two kinds of psychophysiological disorders about which a great deal is known: cardiovascular disorders and asthma. First, however, it is necessary to turn our attention to a discussion of the immune system—one of the major pathways through which stress and emotional factors can lead to illness and disease.

EVERYDAY CONNECTION

Social Status, Stress, and Health Care

Psychologists have long been aware that social status (e.g., wealth, privilege) is intimately tied to stress, health, and well-being. Some factors that contribute to high stress and poor health among people with lower social status include lack of control and predictability (e.g., greater unemployment) and resource inequality (e.g., less access to health care and other community resources) (Marmot & Sapolsky, 2014).

In the United States, resource inequalities tied to social status often create race and gender differences in health care. For example, African American women have the highest rates of emergency room visits and unmet health care needs compared to any other group, and this disparity increased significantly from 2006 to 2014 (Manuel, 2018). Lesbian, gay, bisexual, and transgender youth often experience poor quality of care as a result of stigma, lack of understanding, and insensitivity among health care professionals (Hafeez, Zeshan, Tahir, Jahan, & Naveed, 2017). One goal of the U.S. government's Healthy People 2020 initiative is to eliminate gender and race disparities in health care. Their interactive dataset provides an updated snapshot of health disparities: https://www.healthypeople.gov/2020/data-search/health-disparities-data.

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).

Immune System Errors

Sometimes, the immune system will function erroneously. For example, sometimes it can go awry by mistaking your body's own healthy cells for invaders and repeatedly attacking them. When this happens, the person is said to have an autoimmune disease, which can affect almost any part of the body. How an autoimmune disease affects a person depends on what part of the body is targeted. For instance, rheumatoid arthritis, an autoimmune disease that affects the joints, results in joint pain, stiffness, and loss of function. Systemic lupus erythematosus (lupus), an

autoimmune disease, causes a person's body to attack its own tissues and can inflict permanent damage on multiple organs, including the heart, lungs, and kidneys. Hashimoto's hypothyroiditis, an autoimmune disease that affects the thyroid gland, can result in fatigue, weight gain, and muscle aches (National Institute of Arthritis and Musculoskeletal and Skin Diseases [NIAMS], 2012).

In addition, the immune system may sometimes break down and be unable to do its job. This situation is referred to as **immunosuppression**, the decreased effectiveness of the immune system. When people experience immunosuppression, they become susceptible to any number of infections, illness, and diseases. For example, acquired immune deficiency syndrome (AIDS) is a serious and lethal disease that is caused by human immunodeficiency virus (HIV), which greatly weakens the immune system by infecting and destroying antibody-producing cells, thus rendering an untreated person vulnerable to any of a number of opportunistic infections (Powell, 1996).

Stressors and Immune Function

The question of whether stress and negative emotional states can influence immune function has captivated researchers for over three decades, and discoveries made over that time have dramatically changed the face of health psychology (Kiecolt-Glaser, 2009). **Psychoneuroimmunology** is the field that studies how psychological factors such as stress influence the immune system and immune functioning. The term psychoneuroimmunology was first coined in 1981, when it appeared as the title of a book that reviewed available evidence for associations between the brain, endocrine system, and immune system (Zacharie, 2009). To a large extent, this field evolved from the discovery that there is a connection between the central nervous system and the immune system.

Some of the most compelling evidence for a connection between the brain and the immune system comes from studies in which researchers demonstrated that immune responses in animals could be classically conditioned (Everly & Lating, 2002). For example, Ader and Cohen (1975) paired 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).

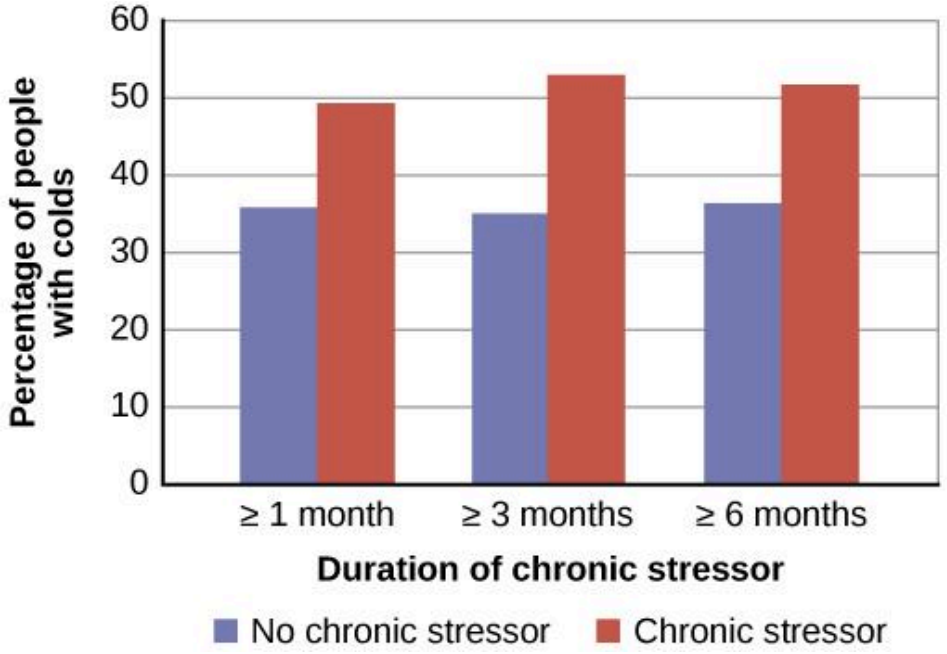


Figure 14.15 This graph shows the percentages of participants who developed colds (after receiving the cold virus) after reporting having experienced chronic stressors lasting at least one month, three months, and six months (adapted from Cohen et al., 1998).

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.

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 because 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 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 since 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).

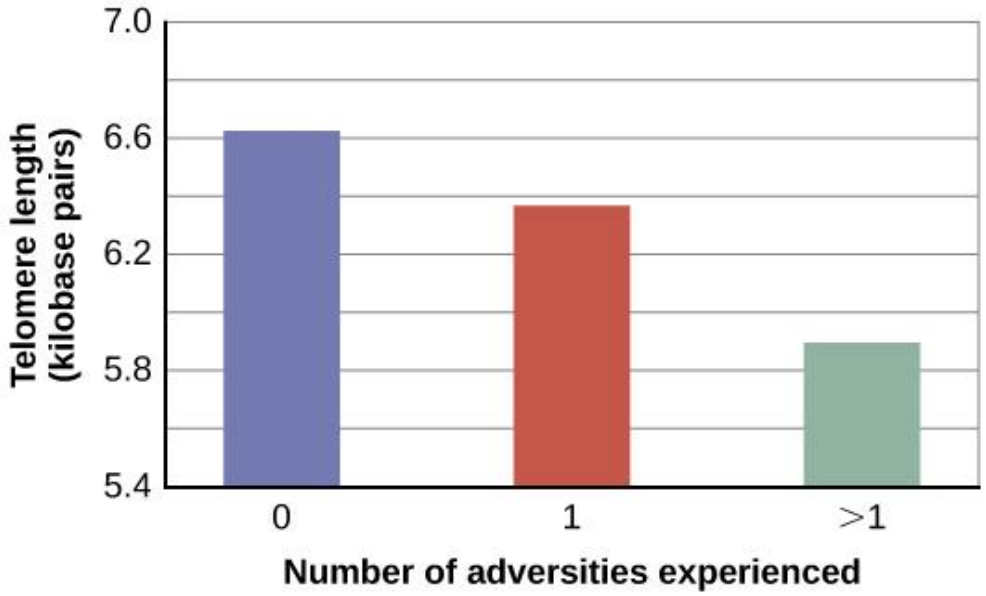


Figure 14.16 Telomeres are shorter in adults who experienced more trauma as children (adapted from Blackburn & Epel, 2012).

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).

Cardiovascular Disorders

The cardiovascular system is composed of the heart and blood circulation system. For many years, disorders that involve the cardiovascular system—known as **cardiovascular disorders**—have been a major focal point in the study of psychophysiological disorders because of the cardiovascular system's centrality in the stress response (Everly & Lating, 2002). **Heart disease** is one such condition. Each year, heart disease causes approximately one in three deaths in the United States, and it is the leading cause of death in the developed world (Centers for Disease Control and Prevention [CDC], 2011; Shapiro, 2005).

The symptoms of heart disease vary somewhat depending on the specific kind of heart disease one has, but they generally involve angina—chest pains or discomfort that occur when the heart does not receive enough blood (Office on Women's Health, 2009). The pain often feels like the chest is being pressed or squeezed; burning sensations in the chest and shortness of breath are also commonly reported. Such pain and discomfort can spread to the arms, neck, jaws, stomach (as nausea), and back (American Heart Association [AHA], 2012a) (Figure 14.17).

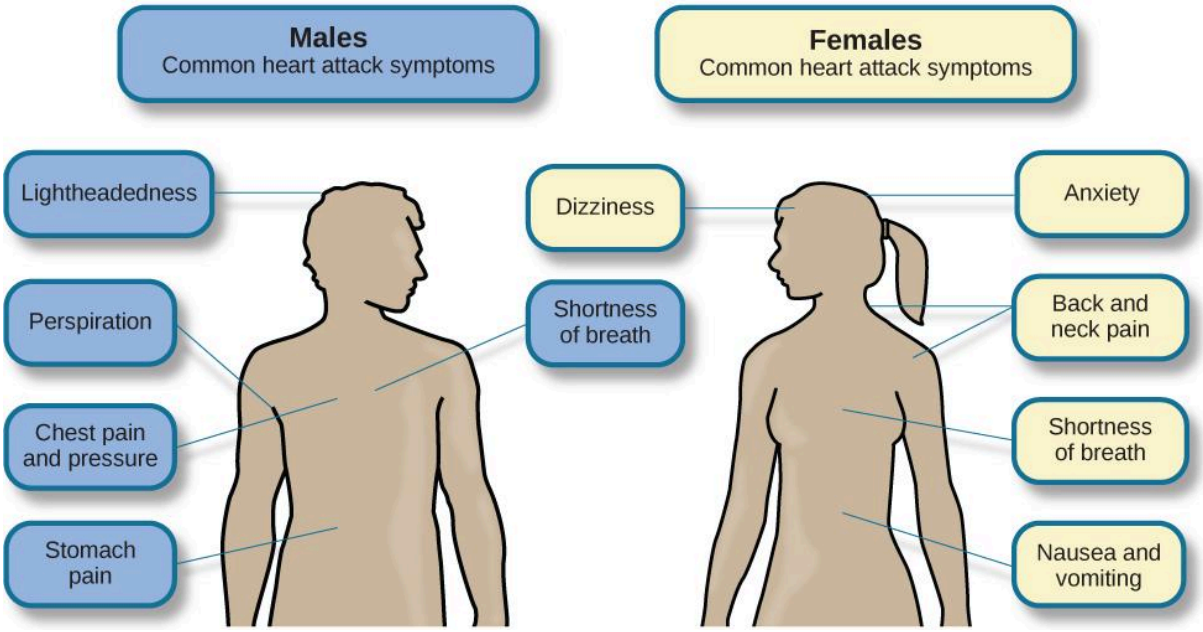


Figure 14.17 Males and females often experience different symptoms of a heart attack.

A major risk factor for heart disease is **hypertension**, which is high blood pressure. Hypertension forces a person's heart to pump harder, thus putting more physical strain on the heart. If left unchecked, hypertension can lead to a heart attack, stroke, or heart failure; it can also lead to kidney failure and blindness. Hypertension is a

serious cardiovascular disorder, and it is sometimes called the silent killer because it has no symptoms—one who has high blood pressure may not even be aware of it (AHA, 2012b).

Many risk factors contributing to cardiovascular disorders have been identified. These risk factors include social determinants such as aging, income, education, and employment status, as well as 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).

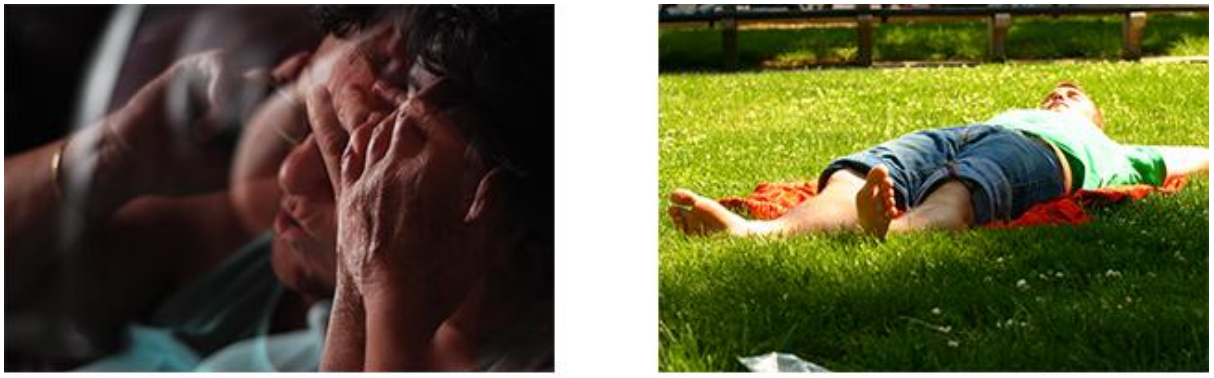
Over the past few decades, there has been much greater recognition and awareness of the importance of stress and other psychological factors in cardiovascular health (Nusair, Al-dadah, & Kumar, 2012). Indeed, exposure to stressors of many kinds has also been linked to cardiovascular problems; in the 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 (known as the cold pressor test), mirror tracing, and public speaking have all been shown to elevate blood pressure (Phillips, 2011).

Are You Type A or Type B?

Sometimes research ideas and theories emerge from seemingly trivial observations. In the 1950s, cardiologist Meyer Friedman was looking over his waiting room furniture, which consisted of upholstered chairs with armrests. Friedman decided to have these chairs reupholstered. When the man doing the reupholstering came to the office to do the work, he commented on how the chairs were worn in a unique manner—the front edges of the cushions were worn down, as were the front tips of the arm rests. It seemed like the cardiology patients were tapping or squeezing the front of the armrests, as well as literally sitting on the edge of their seats (Friedman & Rosenman, 1974). Were cardiology patients somehow different than other types of patients? If so, how?

After researching this matter, Friedman and his colleague, Ray Rosenman, came to understand that people who are prone to heart disease tend to think, feel, and act differently than those who are not. These individuals tend to be intensively driven workaholics who are preoccupied with deadlines and always seem to be in a rush. According to Friedman and Rosenman, these individuals exhibit **Type A** 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).

An example of a person who exhibits Type A behavior pattern is Jeffrey. Even as a child, Jeffrey was intense and driven. He excelled at school, was captain of the swim team, and graduated with honors from an Ivy League college. Jeffrey never seems able to relax; he is always working on something, even on the weekends. However, Jeffrey always seems to feel as though there are not enough hours in the day to accomplish all he feels he should. He volunteers to take on extra tasks at work and often brings his work home with him; he often goes to bed frustrated late at night because he feels that he has not done enough. Jeffrey is quick tempered with his coworkers; he often becomes noticeably agitated when dealing with those coworkers he feels work too slowly or whose work does not meet his standards. He typically reacts with hostility when interrupted at work. He has experienced problems in his marriage over his lack of time spent with family. When caught in traffic during his commute to and from work, Jeffrey incessantly pounds on his horn and swears loudly at other drivers. When Jeffrey was 52, he suffered his first heart attack.

By the 1970s, a majority of practicing cardiologists believed that Type A behavior pattern was a significant risk factor for heart disease (Friedman, 1977). Indeed, a number of early longitudinal investigations demonstrated a link between Type A behavior pattern and later development of heart disease (Rosenman et al., 1975; Haynes, Feinleib, & Kannel, 1980).

Subsequent research examining the association between Type A and heart disease, however, failed to replicate these earlier findings (Glassman, 2007; Myrtek, 2001). Because Type A theory did not pan out as well as they had hoped, researchers shifted their attention toward determining if any of the specific elements of Type A predict heart disease.

Extensive research clearly suggests that the anger/hostility dimension of Type A 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).

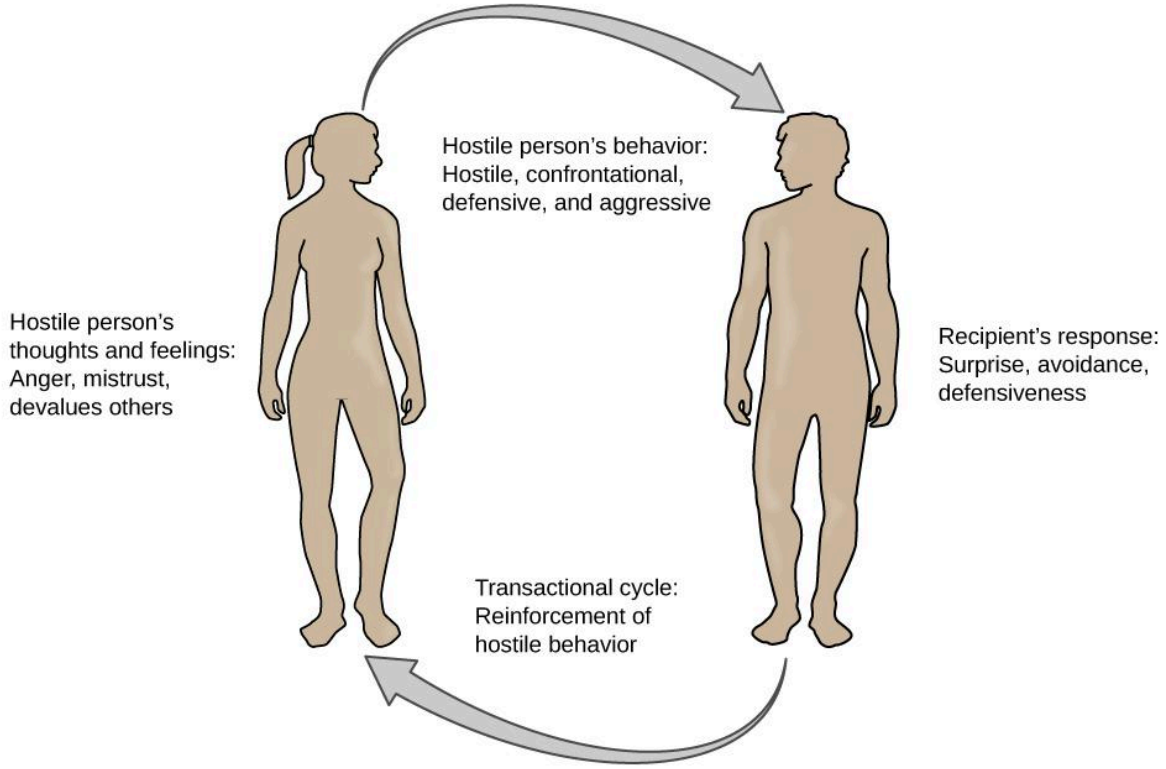


Figure 14.19 According to the transactional model of hostility for predicting social interactions (Vella et al., 2012), the thoughts and feelings of a hostile person promote antagonistic behavior toward others, which in turn reinforces complimentary reactions from others, thereby intensifying ones' hostile disposition and intensifying the cyclical nature of this relationship.

For example, suppose Kaitlin has a hostile disposition; she has a cynical, distrustful attitude toward others and often thinks that other people are out to get her. She is very defensive around people, even those she has known for years, and she is always looking for signs that others are either disrespecting or belittling her. In the shower each morning before work, she often mentally rehearses what she would say to someone who said or did something that angered her, such as making a political statement that was counter to her own ideology. As Kaitlin goes through these mental rehearsals, she often grins and thinks about the retaliation on anyone who will irk her that day.

Socially, she is confrontational and tends to use a harsh tone with people, which often leads to very disagreeable and sometimes argumentative social interactions. As you might imagine, Kaitlin is not especially popular with others, including coworkers, neighbors, and even members of her own family. They either avoid her at all costs or snap back at her, which causes Kaitlin to become even more cynical and distrustful of others, making her disposition even more hostile. Kaitlin's hostility—through her own doing—has created an antagonistic environment that cyclically causes her to become even more hostile and angry, thereby potentially setting the stage for cardiovascular problems.

In addition to anger and hostility, a number of other negative emotional states have been linked with heart disease, including negative affectivity and depression (Suls & Bunde, 2005). **Negative affectivity** is a tendency to experience distressed emotional states involving anger, contempt, disgust, guilt, fear, and nervousness (Watson, Clark, & Tellegen, 1988). It has been linked with the development of both hypertension and heart disease. For example, over 3,000 initially healthy participants in one study were tracked longitudinally, up to 22 years. Those with higher levels of negative affectivity at the time the study began were substantially more likely to develop and be treated for hypertension during the ensuing years than were those with lower levels of negative affectivity (Jonas & Lando, 2000). In addition, a study of over 10,000 middle-aged London-based civil servants who were followed an average of 12.5 years revealed that those who earlier had scored in the upper third on a test of negative affectivity were 32% more likely to have experienced heart disease, heart attack, or angina over a period of years than were those who scored in the lowest third (Nabi, Kivimaki, De Vogli, Marmot, & Singh-Manoux, 2008). Hence, negative affectivity appears to be a potentially vital risk factor for the development of cardiovascular disorders.

Depression and the Heart

For centuries, poets and folklore have asserted that there is a connection between moods and the heart (Glassman & Shapiro, 1998). You are no doubt familiar with the notion of a broken heart following a disappointing or depressing event and have encountered that notion in songs, films, and literature.

Perhaps the first to recognize the link between depression and heart disease was Benjamin Malzberg (1937), who found that the death rate among institutionalized patients with melancholia (an archaic term for depression) was six times higher than that of the population. A classic study in the late 1970s looked at over 8,000 people diagnosed with manic-depressive disorder (now classified as bipolar disorder) in Denmark, finding a nearly 50% increase in deaths from heart disease among these patients compared with the general Danish population (Weeke, 1979). By the early 1990s, evidence began to accumulate showing that depressed individuals who were followed for long periods of time were at increased risk for heart disease and cardiac death (Glassman, 2007). In one investigation of over 700 Denmark residents, those with the highest depression scores were 71% more likely to have experienced a heart attack than were those with lower depression scores (Barefoot & Schroll, 1996). Figure 14.20 illustrates the gradation in risk of heart attacks for both men and women.

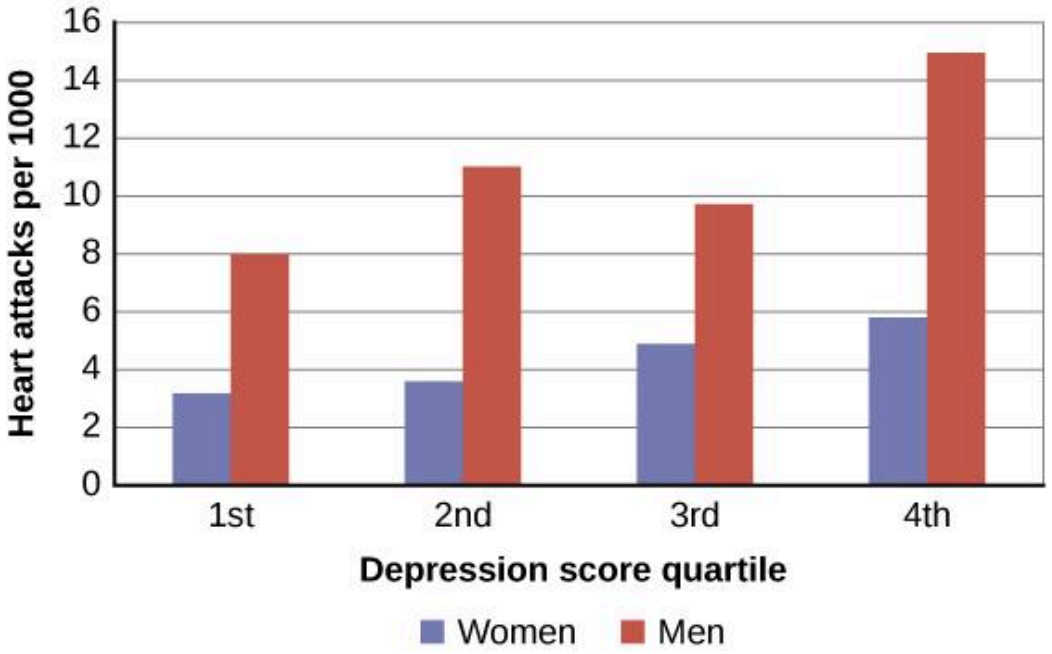


Figure 14.20 This graph shows the incidence of heart attacks among men and women by depression score quartile (adapted from Barefoot & Schroll, 1996).

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). Consider the following:

- In one study, death rates from cardiovascular problems was substantially higher in depressed people; depressed men were 50% more likely to have died from cardiovascular problems, and depressed women were 70% more likely (Ösby, Brandt, Correia, Ekbom, & Sparén, 2001).
- A statistical review of 10 longitudinal studies involving initially healthy individuals revealed that those with elevated depressive symptoms have, on average, a 64% greater risk of developing heart disease than do those with fewer symptoms (Wulsin & Singal, 2003).
- A study of over 63,000 registered nurses found that those with more depressed symptoms when the study began were 49% more likely to experience fatal heart disease over a 12-year period (Whang et al., 2009).

The American Heart Association, fully aware of the established importance of depression in cardiovascular diseases, several years ago recommended routine depression screening for all heart disease patients (Lichtman et al., 2008). Recently, they have recommended including depression as a risk factor for heart disease patients (AHA, 2014).

Although the exact mechanisms through which depression might produce heart problems have not been fully clarified, a recent investigation examining this connection in early life has shed some light. In an ongoing study of childhood depression, adolescents who had been diagnosed with depression as children were more likely to be obese, smoke, and be physically inactive than were those who had not received this diagnosis (Rottenberg et al., 2014). One implication of this study is that depression, especially if it occurs early in life, may increase the likelihood of living an unhealthy lifestyle, thereby predisposing people to an 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. A longitudinal investigation of Vietnam War veterans found that depression, anxiety, hostility, and trait anger each independently predicted the onset of heart disease (Boyle, Michalek, & Suarez, 2006). However, when each of these negative psychological attributes was combined into a single variable, this new variable (which researchers called psychological risk factor) predicted heart disease more strongly than any of the individual variables. Thus, rather than examining the predictive power of isolated psychological risk factors, it seems crucial for future researchers to examine the effects of combined and more general negative emotional and psychological traits in the development of cardiovascular illnesses.

Asthma

Asthma is a chronic and serious disease in which the airways of the respiratory system become obstructed, leading to great difficulty expelling air from the lungs. The airway obstruction is caused by inflammation of the airways (leading to thickening of the airway walls) and a tightening of the muscles around them, resulting in a narrowing of the airways (Figure 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).

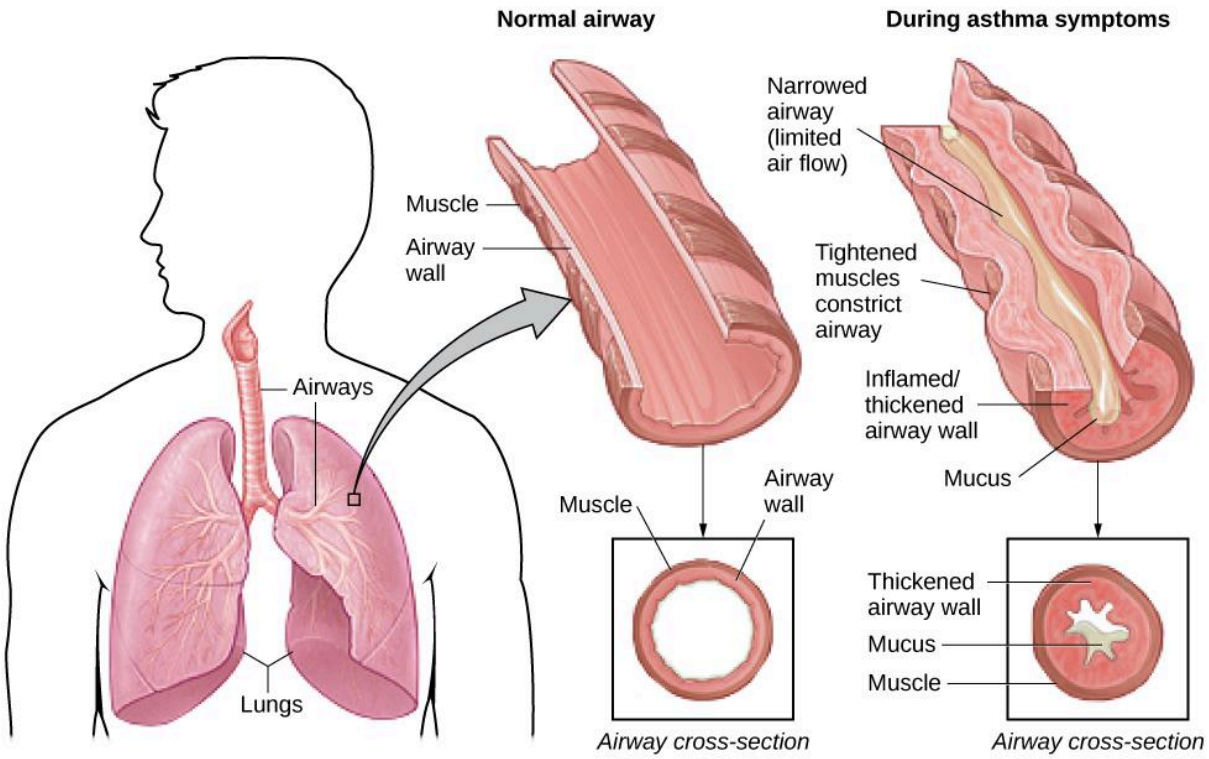


Figure 14.21 In asthma, the airways become inflamed and narrowed.

According to the Centers for Disease Control and Prevention (CDC), around 4,000 people die each year from asthma-related causes, and asthma is a contributing factor to another 7,000 deaths each year (CDC, 2013a). The CDC has revealed that asthma affects 18.7 million U.S. adults and is more common among people with lower income levels (CDC, 2013b). Especially concerning is that asthma is on the rise, with rates of asthma increasing 157% between 2000 and 2010 (CDC, 2013b).

Asthma attacks are acute episodes in which an asthma sufferer experiences the full range of symptoms. Asthma exacerbation is often triggered by environmental factors, such as air pollution, allergens (e.g., pollen, mold, and pet hairs), cigarette smoke, airway infections, cold air or a sudden change in temperature, and exercise (CDC, 2013b). Certain regions and neighborhoods are known for having notably high rates of asthma and related diseases due to high rates of concentrated pollution and low air quality. For example, Long Beach, California and Bronx, New York contain "asthma alleys" due to the density of trucking, power plants, factories, sewage works, or other agents of air pollution.

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). In addition, D'Amato, Liccardi, Cecchi, Pellegrino, & D'Amato (2010) described a case study of an 18-year-old man with asthma whose girlfriend had broken up with him, leaving him in a depressed state. She had also unfriended him on Facebook, while friending other young males. Eventually, the young man was able to "friend" her once again and could monitor her activity through Facebook. Subsequently, he would experience asthma symptoms whenever he logged on and accessed her profile. When he later resigned not to use Facebook any longer, the asthma attacks stopped. This case suggests that the use of Facebook and other forms of social media may represent a new source of stress—it may be a triggering factor for asthma attacks, especially in depressed asthmatic individuals.

Exposure to stressful experiences, particularly those that involve parental or interpersonal conflicts, has been linked to the development of asthma throughout the lifespan. A longitudinal study of 145 children found that parenting difficulties during the first year of life increased the chances that the child developed asthma by 107% (Klinnert et al., 2001). In addition, a cross-sectional study of over 10,000 Finnish college students found that high rates of parent or personal conflicts (e.g., parental divorce, separation from spouse, or severe conflicts in other long-term relationships) increased the risk of asthma onset (Kilpeläinen, Koskenvuo, Helenius, & Terho, 2002). Further, a study of over 4,000 middle-aged men who were interviewed in the early 1990s and again a decade later found that breaking off an important life partnership (e.g., divorce or breaking off relationship from parents) increased the risk of developing asthma by 124% over the time of the study (Loerbroks, Apfelbacher, Thayer, Debling, & Stürmer, 2009).

Headaches

A headache is a continuous pain anywhere in the head and neck region. Inflammation of the sinuses caused by an infection or allergic reaction can cause sinus headaches, which are experienced as pain in the cheeks and forehead. Migraine headaches are a type of headache thought to be caused by blood vessel

swelling and increased blood flow (McIntosh, 2013). Migraines are characterized by severe pain on one or both sides of the head, an upset stomach, and disturbed vision. They are more frequently experienced by women than by men (American Academy of Neurology, 2014). Tension headaches are triggered by tightening/tensing of facial and neck muscles; they are the most commonly experienced kind of headache, accounting for about 42% of all headaches worldwide (Stovner et al., 2007). In the United States, well over one-third of the population experiences tension headaches each year, and 2–3% of the population suffers from chronic tension headaches (Schwartz, Stewart, Simon, & Lipton, 1998).

A number of factors can contribute to tension headaches, including sleep deprivation, skipping meals, eye strain, overexertion, muscular tension caused by poor posture, and stress (MedicineNet, 2013). Although there is uncertainty regarding the exact mechanisms through which stress can produce tension headaches, stress has been demonstrated to increase sensitivity to pain (Caceres & Burns, 1997; Logan et al., 2001). In general, tension headache sufferers, compared to non-sufferers, have a lower threshold for and greater sensitivity to pain (Ukestad & Wittrock, 1996), and they report greater levels of subjective stress when faced with a stressor (Myers, Wittrock, & Foreman, 1998). Thus, stress may contribute to tension headaches by increasing pain sensitivity in already-sensitive pain pathways in tension headache sufferers (Cathcart, Petkov, & Pritchard, 2008).

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 is governed largely by perceived control over the demands of one’s life” (p. 262). As cogently described in his statement, our reaction to potential stressors depends to a large extent on how much control we feel we have over such things. **Perceived control** is our beliefs about our personal capacity to exert influence over and shape outcomes, and it has major implications for our health and happiness (Infurna & Gerstorf, 2014). Extensive research has demonstrated that perceptions of personal control are associated with a variety of 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 was similar to that observed in human depression. Therefore, Seligman speculated that learned helplessness might be an important cause of depression in humans: Humans who experience negative life events that they believe they are unable to control may become helpless. As a result, they give up trying to change the situation and some may become depressed and show lack of initiative in future situations in which they can control the outcomes (Seligman, Maier, & Geer, 1968). In an application Seligman never proposed, learned helplessness was later used as a methodology in

the torture of prisoners by U.S. military and intelligence personnel following the 2001 attacks on the World Trade Center. The psychologists who designed the torture program, James E. Mitchell and Bruce Jesson, theorized 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. For example, elephants seem to be able to sense when other elephants are stressed and will often

comfort them with physical contact—such as a trunk touch—or an empathetic vocal response (Krumboltz, 2014).

Scientific interest in the importance of social support first emerged in the 1970s when health researchers developed an interest in the health consequences of being socially integrated (Stroebe & Stroebe, 1996). Interest was further 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).

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 supported have been linked to better survival rates following breast cancer (Falagas et al., 2007) and infectious

diseases, especially HIV infection (Lee & Rotheram-Borus, 2001). In fact, a person with high levels of social support is less likely to contract a common cold. In one study, 334 participants completed questionnaires assessing their sociability; these individuals were subsequently exposed to a virus that causes a common cold and monitored for several weeks to see who became ill. Results showed that increased sociability was linearly associated with a decreased probability of developing a cold (Cohen, Doyle, Turner, Alper, & Skoner, 2003).

For many of us, friends are a vital source of social support. But what if you find yourself in a situation in which you have few friends and companions? Many students who leave home to attend and live at college experience drastic reductions in their social support, which makes them vulnerable to anxiety, depression, and loneliness. Social media can sometimes be useful in navigating these transitions (Raney & Troop Gordon, 2012) but might also cause increases in loneliness (Hunt, Marx, Lipson, & Young, 2018). For this reason, many colleges have designed first-year programs, such as peer mentoring (Raymond & Shepard, 2018), that can help students build new social networks. For some people, our families—especially our parents—are a major source of social support.

Social support appears to work by boosting the immune system, especially among people who are experiencing stress (Uchino, Vaughn, Carlisle, & Birmingham, 2012). In a pioneering study, spouses of cancer patients who reported high levels of social support showed indications of better immune functioning on two out of three immune functioning measures, compared to spouses who were below the median on reported social support (Baron, Cutrona, Hicklin, Russell, & Lubaroff, 1990). Studies of other populations have produced similar results, including those of spousal caregivers of dementia sufferers, medical students, elderly adults, and cancer patients (Cohen & Herbert, 1996; Kiecolt-Glaser, McGuire, Robles, & Glaser, 2002).

In addition, social support has been shown to reduce blood pressure for people performing stressful tasks, such as giving a speech or performing mental arithmetic (Lepore, 1998). In these kinds of studies, participants are usually asked to perform a stressful task either alone, with a stranger present (who may be either supportive or unsupportive), or with a friend present. Those tested with a friend present generally exhibit lower blood pressure than those tested alone or with a stranger (Fontana, Diegnan, Villeneuve, & Lepore, 1999). In one study, 112 female participants who performed stressful mental arithmetic exhibited lower blood pressure when they received support from a friend rather than a stranger, but only if the friend was a male (Phillips, Gallagher, & Carroll, 2009). Although these findings are somewhat difficult to interpret, the authors mention that it is possible that females feel less supported and more evaluated by other females, particularly females whose opinions they value.

Taken together, the findings above suggest one of the reasons social support is connected to 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).

DIG DEEPER

Stress and Discrimination

Being the recipient of prejudice and discrimination is associated with a number of negative outcomes. Many studies have shown how discrimination is a significant stressor for marginalized groups (Pascoe & Smart Richman, 2009). Discrimination negatively impacts both physical and mental health for individuals in stigmatized groups. As you'll learn when you study social psychology, various social identities (such as gender, age, religion, sexuality, ethnicity) often lead people to simultaneously be exposed to multiple forms of discrimination, which can have even stronger negative effects on mental and physical health (Vines, Ward, Cordoba, & Black, 2017). For example, the amplified levels of discrimination faced by Latinx transgender women may have related effects, leading to high stress levels and poor mental and physical health outcomes.

Perceived control and the general adaptation syndrome help explain the process by which discrimination affects mental and physical health. Discrimination can be conceptualized as an uncontrollable, persistent, and unpredictable stressor. When a discriminatory event occurs, the target of the event initially experiences an acute stress response (alarm stage). This acute reaction alone does not typically have a great impact on health. However, discrimination tends to be a chronic stressor. As people in marginalized groups experience repeated discrimination, they develop a heightened reactivity as their bodies prepare to act quickly (resistance stage). This long-term accumulation of stress responses can eventually lead to increases in negative emotion and wear on physical health (exhaustion stage). This explains why a history of perceived discrimination is associated with a host of mental and physical health problems including depression, cardiovascular disease, and cancer (Pascoe & Smart Richman, 2009).

Protecting stigmatized groups from the negative impact of discrimination-induced stress may involve reducing the incidence of discriminatory behaviors in conjunction with protective strategies that reduce the impact of discriminatory events when they occur. Civil rights legislation has protected some stigmatized groups by making discrimination a prosecutable offense in many social contexts. However, some groups (e.g., transgender people) often lack important legal recourse when discrimination occurs. Moreover, most modern discrimination comes in subtle forms that fall below the radar of the law. For example, discrimination may be experienced as selective inhospitality toward people of specific races or ethnicities, but little is done in response since it would be easy to attribute the behavior to other causes.

Although some cultural changes are increasingly helping people to recognize and control subtle discrimination, such shifts may take a long time.

Similar to other stressors, buffers like social support and healthy coping strategies appear to be effective in lowering the impact of perceived discrimination. For example, one study (Ajrouch, Reisine, Lim, Sohn, & Ismail, 2010) showed that discrimination predicted high psychological distress among African American mothers living in Detroit. However, the women who had readily available emotional support from friends and family experienced less distress than those with fewer social resources. While coping strategies and social support may buffer the effects of discrimination, they fail to erase all of the negative impacts. Vigilant antidiscrimination efforts, including the development of legal protections for vulnerable groups, are needed to reduce discrimination, stress, and the resulting physical and mental health effects.

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.

In the 1970s, Herbert Benson, a cardiologist, developed a stress reduction method called the **relaxation response technique** (Greenberg, 2006). The relaxation response technique combines relaxation with transcendental meditation, and consists of four components (Stein, 2001):

1. sitting upright on a comfortable chair with feet on the ground and body in a relaxed position,
2. being in a quiet environment with eyes closed,
3. repeating a word or a phrase—a mantra—to oneself, such as “alert mind, calm body,”
4. passively allowing the mind to focus on pleasant thoughts, such as nature or the warmth of your blood nourishing your body.

The relaxation response approach is conceptualized as a general approach to stress reduction that reduces sympathetic arousal, and it has been used effectively to treat people with high blood pressure (Benson & Proctor, 1994).

Another technique to combat stress, **biofeedback**, was developed by Gary Schwartz at Harvard University in the early 1970s. Biofeedback is a technique that uses electronic equipment to accurately measure a person’s neuromuscular and autonomic activity—feedback is provided in the form of visual or auditory signals. The main assumption of this approach is that providing somebody biofeedback will enable the individual to develop strategies that help gain some level of voluntary control over what are normally involuntary bodily processes (Schwartz & Schwartz, 1995). A number of different bodily measures have been used in biofeedback research, including facial muscle movement, brain activity, and skin temperature, and it has been applied successfully with individuals experiencing tension headaches, high blood pressure, asthma, and phobias (Stein, 2001).