CHAPTER 6

CHAPTER OUTLINE

1 Types of Learning
2 Classical Conditioning
3 Operant Conditioning
4 Observational Learning
5 Cognitive Factors in Learning
6 Biological, Cultural, and Psychological Factors in Learning
7 Learning and Health and Wellness

Learning

Sniffer Dogs on Call: Putting Learning to Work in Haiti

On January 12, 2010, a magnitude 7.0 earthquake rocked Haiti. One million people were left homeless, and the estimated deaths topped 200,000. In the quake's aftermath, humanitarian aid poured in. In addition to the throngs of people who rushed to help the island nation, battalions of rescue dogs were dispatched from around the world. Elite teams of humans and dogs from England, China, the United States, Peru, Mexico, Taiwan, and many other nations reported for duty.

The "sniffer" dogs in these teams rely not only on their amazing canine olfactory abilities but also on the months and years of laborious training they receive, geared toward locating survivors trapped under rubble. Indeed, rescue dogs (some of which are themselves "rescued dogs"—that is, adopted from shelters) are rigorously trained animals that have passed a set of strict criteria to earn a place on the special teams. In the United States, the Federal Emergency Management Administration (FEMA) has established strict guidelines for the training of rescue dogs (FEMA, 2003). The dogs must demonstrate mastery of a set of difficult skills, including walking off-leash with a trainer on a crowded city street, without getting distracted, and performing search-and-rescue tasks without immediate practice and without their regular trainer. They must demonstrate their abilities without food rewards (although a toy reward placed on rubble is allowed). Further, these hardworking canines must be recertified every two years to ensure that their skills remain at peak level. In the invaluable work they performed in Haiti, the dogs not only helped with rescue efforts but also raised everyone's spirits with their tirelessness and persistence.

Truly, rescue dogs are nothing less than highly skilled professionals. You might well wonder *how* the dogs are trained to perform these complex acts. It's simple—through the principles that psychologists have uncovered in studying learning, our focus in this chapter.

PREVIEW

We begin by defining learning and sketching out its main types: associative learning and observational learning. We then turn attention to two types of associative learning—classical conditioning and operant conditioning—followed by a close look at observational learning. We next consider the role of cognitive processes in learning before finally examining biological, cultural, and psychological constraints on learning. We close out the chapter by looking at the role of learning in human health and wellness.

1. TYPES OF LEARNING

Learning anything new involves change. Once you learned the alphabet, it did not leave you; it became part of a "new you" who had been changed through the process of learning. Similarly, once you learn how to drive a car, you do not have to go through the process again at a later time. If you ever try out for the X-Games, you may break a few bones along the way, but at some point you probably will learn a trick or two through the experience, changing from a novice to an enthusiast who can at least stay on top of a skateboard.

By way of experience, too, you may have learned that you have to study to do well on a test, that there usually is an opening act at a rock concert, and that a field goal in U.S. football adds 3 points to the score. Putting these pieces together, we arrive at a definition of **learning:** a systematic, relatively permanent change in behavior that occurs through experience.

If someone were to ask you what you learned in class today, you might mention new ideas you heard about, lists you memorized, or concepts you mastered. However, how would you define learning if you could not refer to unobservable mental processes? You might follow the lead of behavioral psychologists. **Behaviorism** is a theory of learning that focuses solely on observable behaviors, discounting the importance of such mental activity as thinking, wishing, and hoping. Psychologists who examine learning from a behavioral perspective define learning as relatively stable, observable changes in behavior. The behavioral approach has emphasized general laws that guide behavior change and make sense of some of the puzzling aspects of human life (Olson & Hergenhahn, 2009).

Behaviorism maintains that the principles of learning are the same whether we are talking about animals or humans. Because of the influence of behaviorism, psychologists' understanding of learning started with studies of rats, cats, pigeons, and even raccoons. A century of research on learning in animals and in humans suggests that many of the principles generated initially in research on such animals also apply to humans (Domjan, 2010).

In this chapter we look at two types of learning: associative learning and observational learning. **Associative learning** occurs when we make a connection, or an association, between two events. *Conditioning* is the process of learning these associations (Chance, 2009; Klein, 2009). There are two types of conditioning—classical and operant—both of which have been studied by behaviorists.

In *classical conditioning,* organisms learn the association between two stimuli. As a result of this association, organisms learn to anticipate events. For example, lightning is associated with thunder and regularly precedes it. Thus, when we see lightning, we anticipate that we will hear thunder soon afterward. In *operant conditioning,* organisms learn the association between a behavior and a consequence, such as a reward. As a result of this association, organisms learn to increase behaviors that are followed by rewards and to decrease behaviors that are followed by punishment. For example, children are likely to repeat their good manners if their parents reward them with candy after they have shown good manners. Also, if children's bad

learning A systematic, relatively permanent change in behavior that occurs through experience.

behaviorism A theory of learning that focuses solely on observable behaviors, discounting the importance of such mental activity as thinking, wishing, and hoping.

associative learning Learning that occurs when we make a connection, or an association, between two events.

FIGURE 6.1 **Associative Learning: Comparing Classical and Operant Conditioning** (*Left*) In this example of classical conditioning, a child associates a doctor's office (stimulus 1) with getting a painful injection (stimulus 2). (*Right*) In this example of operant conditioning, performing well in a swimming competition (behavior) becomes associated with getting awards (consequences).

manners are followed by scolding words and harsh glances by parents, the children are less likely to repeat the bad manners. Figure 6.1 compares classical and operant conditioning.

Much of what we learn, however, is not a result of direct consequences but rather of exposure to models performing a behavior or skill (Spiegler & Guevremont, 2010). For instance, as you watch someone shoot baskets, you get a sense of how the shots are made. The learning that takes place when a person observes and imitates another's behavior is called **observational learning.** Observational learning is a common way that people learn in educational and other settings. Observational learning is different from the associative learning described by behaviorism because it relies on mental processes: The learner has to pay attention, remember, and reproduce what the model did. Observational learning is especially important to human beings. In fact, watching other people is another way in which human infants acquire skills.

observational learning Learning that occurs when a person observes and imitates another's behavior.

Human infants differ from baby monkeys in their strong reliance on imitation (MacLeod, 2006). After watching an adult model perform a task, a baby monkey will figure out its own way to do it, but a human infant will do exactly what the model did. Imitation may be the human baby's way to solve the huge problem it faces: to learn the vast amount of cultural knowledge that is part of human life. Many of our behaviors are rather arbitrary. Why do we clap to show approval or wave "hello" or "bye-bye"? The human infant has a lot to learn and may be well served to follow the old adage, "When in Rome, do as the Romans do."

Learning applies to many areas of acquiring new behaviors, skills, and knowledge (Mayer, 2011). Our focus in this chapter is on the two types of associative learning—classical conditioning and operant conditioning—and on observational learning.

test yourself

1. What is associative learning?
2. What is conditioning? What two types of conditioning have behavioral psychologists studied?
3. What is observational learning? Give two examples of it.

2· CLASSICAL CONDITIONING

Early one morning, Bob is in the shower. While he showers, his wife enters the bathroom and flushes the toilet. Scalding hot water suddenly bursts down on Bob, causing him to yell in pain. The next day, Bob is back for his morning shower, and once again his wife enters the bathroom and flushes the toilet. Panicked by the sound of the toilet flushing, Bob yelps in fear and jumps out of the shower stream. Bob's panic at the sound of the toilet illustrates the learning process of **classical conditioning,** in which a neutral stimulus (the sound of a toilet flushing) becomes associated with a meaningful stimulus (the pain of scalding hot water) and acquires the capacity to elicit a similar response (panic).

classical conditioning Learning process in which a neutral stimulus becomes associated with a meaningful stimulus and acquires the capacity to elicit a similar response.

Pavlov's Studies

Even before beginning this course, you might have heard about Pavlov's dogs. The work of the Russian physiologist Ivan Pavlov is well known. Still, it is easy to take its true significance for granted. Importantly, Pavlov demonstrated that neutral aspects of the environment can attain the capacity to evoke responses through pairing with other stimuli and that bodily processes can be influenced by environmental cues.

In the early 1900s, Pavlov was interested in the way the body digests food. In his experiments, he routinely placed meat powder in a dog's mouth, causing the dog to salivate. By accident, Pavlov noticed that the meat powder was not the only stimulus that caused the dog to salivate. The dog salivated in response to a number of stimuli associated with the food, such as the sight of the food dish, the sight of the individual who brought the food into the room, and the sound of the door closing when the food arrived. Pavlov recognized that the dog's association of these sights and sounds with the food was an important type of learning, which came to be called *classical conditioning.*

Pavlov wanted to know *why* the dog salivated in reaction to various sights and sounds before eating the meat powder. He observed that the dog's behavior included both unlearned and learned components. The unlearned part of classical conditioning is based on the fact that some stimuli automatically produce certain responses apart from any prior learning; in other words, they are inborn (innate). *Reflexes* are such automatic stimulus–response connections. They include salivation in response to food, nausea in response to spoiled food, shivering in response to low temperature, coughing in response to throat congestion, pupil constriction in response to light, and withdrawal in response to pain.

unconditioned stimulus (UCS) A stimulus that produces a response without prior learning.

unconditioned response (UCR) An unlearned reaction that is automatically elicited by the unconditioned stimulus.

conditioned stimulus (CS) A previously neutral stimulus that eventually elicits a conditioned response after being paired with the unconditioned stimulus.

conditioned response (CR) The learned response to the conditioned stimulus that occurs after conditioned stimulus–unconditioned stimulus pairing.

An **unconditioned stimulus (UCS)** is a stimulus that produces a response without prior learning; food was the UCS in Pavlov's experiments. An **unconditioned response (UCR)** is an unlearned reaction that is automatically elicited by the UCS. Unconditioned responses are involuntary; they happen in response to a stimulus without conscious effort. In Pavlov's experiment, salivating in response to food was the UCR. In the case of Bob and the flushing toilet, Bob's learning and experience did not cause him to shriek when the hot water hit his body. His cry of pain was unlearned and occurred automatically. The hot water was the UCS, and Bob's panic was the UCR.

In classical conditioning, a **conditioned stimulus (CS)** is a previously neutral stimulus that eventually elicits a conditioned response after being paired with the unconditioned stimulus. The **conditioned response (CR)** is the learned response to the conditioned stimulus that occurs after CS–UCS pairing (Pavlov, 1927). Sometimes

Pavlov (the white-bearded gentleman in the center) is shown demonstrating the nature of classical conditioning to students at the Military Medical Academy in Russia.

conditioned responses are quite similar to unconditioned responses, but typically they are not as strong.

In studying a dog's response to various stimuli associated with meat powder, Pavlov rang a bell before giving meat powder to the dog. Until then, ringing the bell did not have a particular effect on the dog, except perhaps to wake the dog from a nap. The bell was a neutral stimulus. However, the dog began to associate the sound of the bell with the food and salivated when it heard the bell. The bell had become a conditioned (learned) stimulus (CS), and salivation was now a conditioned response (CR). In the case of Bob's interrupted shower, the sound of the toilet flushing was the CS, and panicking was the CR after the scalding water (UCS) and the flushing sound (CS) were paired. Figure 6.2 summarizes how classical conditioning works.

Researchers have shown that salivation can be used as a conditioned response not only in dogs and humans but also in, of all things, cockroaches (Watanabe & Mizunami, 2007). These researchers paired the smell of peppermint (the CS, which was applied to the cockroaches' antennae) with sugary water (the UCS). Cockroaches naturally salivate (the UCR) in response to sugary foods, and after repeated pairings between peppermint smell and sugary water, the cockroaches salivated in response to the smell of peppermint (the CR). When they collected and measured the cockroach saliva, the researchers found that the cockroaches had slobbered over that smell for two minutes.

ACQUISITION

Whether it is human beings, dogs, or cockroaches, the first part of classical conditioning is called acquisition. **Acquisition** is the initial learning of the connection between the UCS and CS when these two stimuli are paired (as with the smell of peppermint and the sugary water). During acquisition, the CS is repeatedly presented followed by the UCS. Eventually, the CS will produce a response. Note that classical conditioning is a type of learning that occurs without awareness or effort, based on the presentation of

● **acquisition** The initial learning of the connection between the unconditioned stimulus and the conditioned stimulus when these two stimuli are paired.

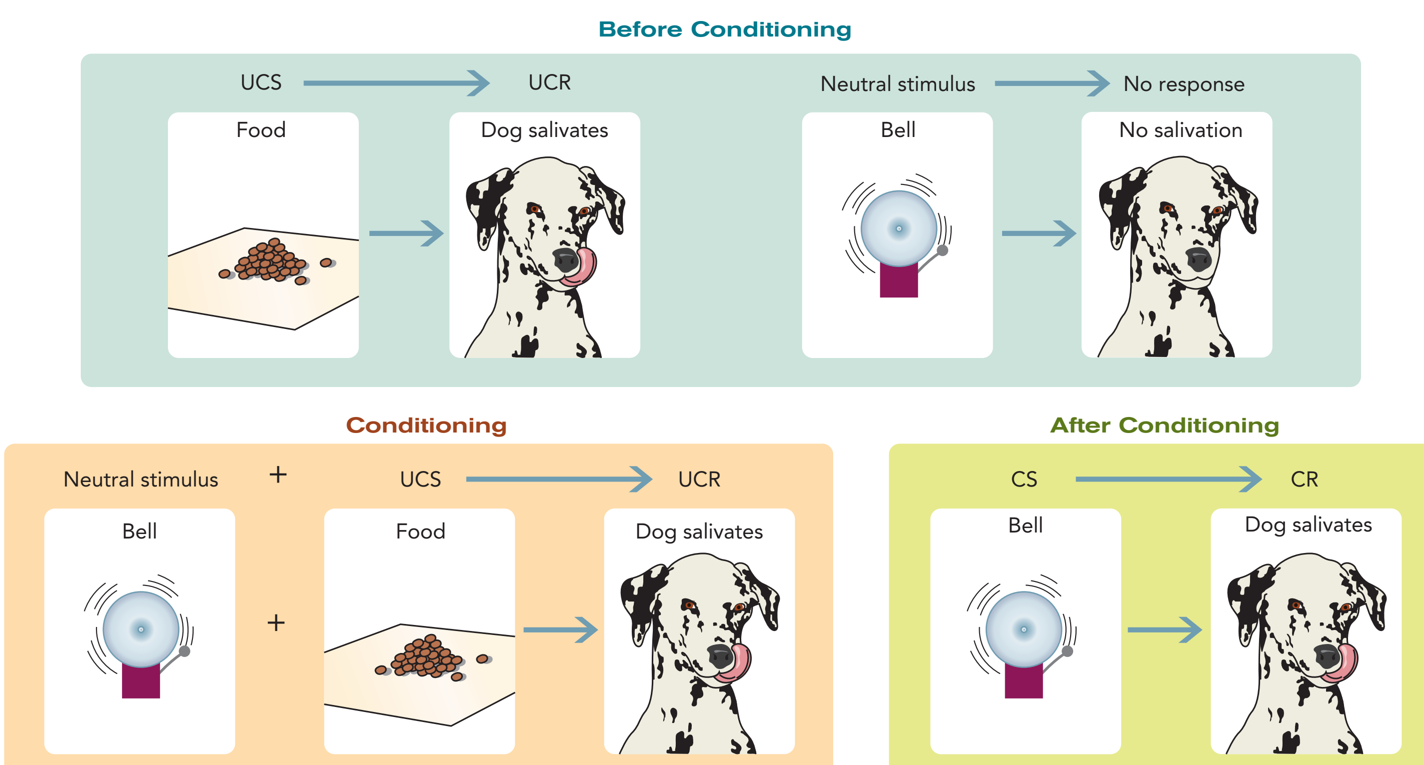

FIGURE 6.2 Pavlov's Classical Conditioning In one experiment, Pavlov presented a neutral stimulus (bell) just before an unconditioned stimulus (food). The neutral stimulus became a conditioned stimulus by being paired with the unconditioned stimulus. Subsequently, the conditioned stimulus (bell) by itself was able to elicit the dog's salivation.

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two stimuli together. For this pairing to work, however, two important factors must be present: contiguity and contingency.

Contiguity simply means that the CS and UCS are presented very close together in time—even a mere fraction of a second (Wheeler & Miller, 2008). In Pavlov's work, if the bell had rung 20 minutes before the presentation of the food, the dog probably would not have associated the bell with the food. However, pairing the CS and UCS close together in time is not all that is needed for conditioning to occur.

Contingency means that the CS must not only precede the UCS closely in time, it must also serve as a reliable indicator that the UCS is on its way (Rescorla, 1966, 1988, 2009). To get a sense of the importance of contingency, imagine that the dog in Pavlov's experiment is exposed to a ringing bell at random times all day long. Whenever the dog receives food, the delivery of the food always immediately follows a bell ring. However, in this situation, the dog will not associate the bell with the food, because the bell is not a reliable signal that food is coming: It rings a lot when no food is on the way. Whereas contiguity refers to the fact that the CS and UCS occur close together in time, contingency refers to the information value of the CS relative to the UCS. When contingency is present, the CS provides a systematic signal that the UCS is on its way.

GENERALIZATION AND DISCRIMINATION

Pavlov found that the dog salivated in response not only to the tone of the bell but also to other sounds, such as a whistle. These sounds had not been paired with the unconditioned stimulus of the food. Pavlov discovered that the more similar the noise was to the original sound of the bell, the stronger the dog's salivary flow.

● **generalization (in classical conditioning)** The tendency of a new stimulus that is similar to the original conditioned stimulus to elicit a response that is similar to the conditioned response.

Generalization in classical conditioning is the tendency of a new stimulus that is similar to the original conditioned stimulus to elicit a response that is similar to the conditioned response (Pearce & Hall, 2009). Generalization has value in preventing learning from being tied to specific stimuli. Once we learn the association between a given CS (say, flashing police lights behind our car) and a particular UCS (the dread associated with being pulled over), we do not have to learn it all over again when a similar stimulus presents itself (a police car with its siren moaning as it cruises directly behind our car).

● **discrimination (in classical conditioning)** The process of learning to respond to certain stimuli and not others.

Stimulus generalization is not always beneficial. For example, the cat that generalizes from a harmless minnow to a dangerous piranha has a major problem; therefore, it is important to also discriminate among stimuli. **Discrimination** in classical conditioning is the process of learning to respond to certain stimuli and not others. To produce discrimination, Pavlov gave food to the dog only after ringing the bell and not after any other sounds. In this way, the dog learned to distinguish between the bell and other sounds.

EXTINCTION AND SPONTANEOUS RECOVERY

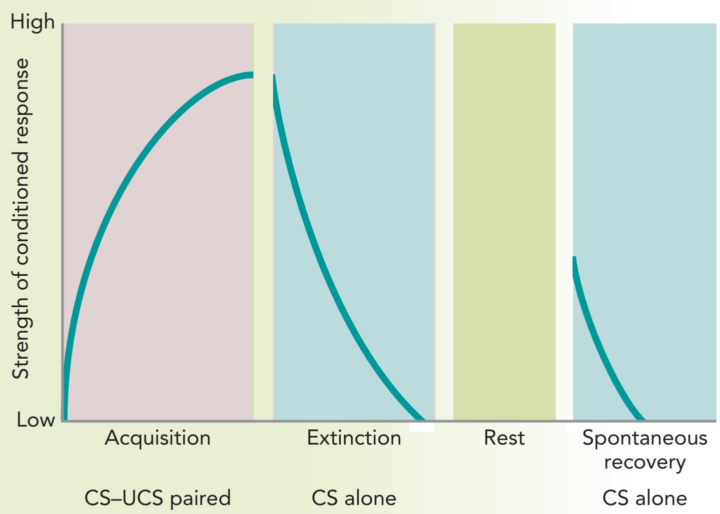
● **extinction (in classical conditioning)** The weakening of the conditioned response when the unconditioned stimulus is absent.

After conditioning the dog to salivate at the sound of a bell, Pavlov rang the bell repeatedly in a single session and did not give the dog any food. Eventually the dog stopped salivating. This result is **extinction,** which in classical conditioning is the weakening of the conditioned response when the unconditioned stimulus is absent (Kim & others, 2010). Without continued association with the unconditioned stimulus (UCS), the conditioned stimulus (CS) loses its power to produce the conditioned response (CR).

● **spontaneous recovery** The process in classical conditioning by which a conditioned response can recur after a time delay, without further conditioning.

Extinction is not always the end of a conditioned response (Urcelay, Wheeler, & Miller, 2009). The day after Pavlov extinguished the conditioned salivation to the sound of a bell, he took the dog to the laboratory and rang the bell but still did not give the dog any meat powder. The dog salivated, indicating that an extinguished response can spontaneously recur. **Spontaneous recovery** is the process in classical conditioning by which a conditioned response can recur after a time delay, without further conditioning (Rescorla, 2005; Gershman, Blei, & Niv, 2010). Consider an example of spontaneous recovery you may have experienced: You thought that you had forgotten about (extinguished) an ex-girlfriend or boyfriend, but then you found yourself in a particular

psychological inquiry



From Acquisition to Extinction (to Spontaneous Recovery)

The figure illustrates the strength of a conditioned response (CR), shown on the Y or vertical axis, across the stages from acquisition, to extinction, to a rest period, and finally to spontaneous recovery. Using the graphs, answer the following questions.

1. What happens to the unconditioned stimulus (UCS) and the conditioned stimulus (CS) during acquisition, and how does this influence the conditioned response (CR)?
2. When is the CR strongest and when is it weakest?
3. What happens to the UCS and CS during extinction, and how does this influence the CR?
4. Notice that spontaneous recovery occurs after a rest period. Why is this rest necessary?
5. In your own life, what are some CS's that are attached to CR's for you? Trace them through these steps.

context (perhaps the restaurant where you used to dine together), and you suddenly got a mental image of your ex, accompanied by an emotional reaction to him or her from the past (spontaneous recovery).

The steps in classical conditioning are reviewed in the Psychological Inquiry above. The figure in the feature shows the sequence of acquisition, extinction, and spontaneous recovery. Spontaneous recovery can occur several times, but as long as the conditioned stimulus is presented alone (that is, without the unconditioned stimulus), spontaneous recovery becomes weaker and eventually ceases.

Extinction is not always the end of a conditioned response. **Renewal** refers to the recovery of the conditioned response when the organism is placed in a novel context (Gershman, Blei, & Niv, 2010). Renewal can be a powerful problem to overcome—as it is when a person leaves a drug treatment facility to return to his or her previous living situation (Stasiewicz, Brandon, & Bardizza, 2007). Indeed, drug addiction is one of the many human issues to which classical conditioning has been applied (Reichel & Bevins, 2010).

renewal The recovery of the conditioned response when the organism is placed in a novel context.

Classical Conditioning in Humans

Classical conditioning has a great deal of survival value for human beings (Powell, Symbaluk, & Honey, 2009). Here we review examples of classical conditioning at work in human life.

EXPLAINING FEARS

Classical conditioning provides an explanation of fears (Lissek & others, 2010). John B. Watson (who coined the term *behaviorism*) and Rosalie Rayner (1920) demonstrated classical conditioning's role in the development of fears with an infant named Albert. They showed Albert a white laboratory rat to see whether he was afraid of it. He was not (so the rat is a neutral stimulus or CS). As Albert played with the rat, the researchers sounded a loud noise behind his head (the bell is then the UCS). The noise caused little Albert to cry (the UCR). After only seven pairings of the loud noise with the

Watson and Rayner conditioned 11-month-old Albert to fear a white rat by pairing the rat with a loud noise. When little Albert was later presented with other stimuli similar to the white rat, such as the rabbit shown here with Albert, he was afraid of them too. This study illustrates stimulus generalization in classical conditioning.

● **counterconditioning** A classical conditioning procedure for changing the relationship between a conditioned stimulus and its conditioned response.

● **aversive conditioning** A form of treatment that consists of repeated pairings of a stimulus with a very unpleasant stimulus.

white rat, Albert began to fear the rat even when the noise was not sounded (the CR). Albert's fear was generalized to a rabbit, a dog, and a sealskin coat.

Today, Watson and Rayner's (1920) study would violate the ethical guidelines of the American Psychological Association (see Chapter 2). Especially problematic is that the researchers did not reverse Albert's fear of furry white objects, so presumably this phobia remained with him into old age. In any case, Watson correctly concluded that we learn many of our fears through classical conditioning. We might develop fear of the dentist because of a painful experience, fear of driving after having been in a car crash, and fear of dogs after having been bitten by one.

If we can learn fears through classical conditioning, we also can possibly unlearn them through that process (Maier & Seligman, 2009; Ohman, 2010; Powell, Symbaluk, & Honey, 2009). In Chapter 16, for example, we will examine the application of classical conditioning to therapies for treating phobias.

BREAKING HABITS

Counterconditioning is a classical conditioning procedure for changing the relationship between a conditioned stimulus and its conditioned response. Therapists have used counterconditioning to break apart the association between certain stimuli and positive feelings (Brunborg & others, 2010). **Aversive conditioning** is a form of treatment that consists of repeated pairings of a stimulus with a very unpleasant stimulus. Electric shocks and nausea-inducing substances are examples of noxious stimuli that are used in aversive conditioning (Sommer & others, 2006).

To reduce drinking, for example, every time a person drinks an alcoholic beverage, he or she also consumes a mixture that induces nausea. In classical conditioning terminology, the alcoholic beverage is the conditioned stimulus and the nausea-inducing agent is the unconditioned stimulus. Through a repeated pairing of alcohol with the nausea-inducing agent, alcohol becomes the conditioned stimulus that elicits nausea, the conditioned response. As a consequence, alcohol no longer is associated with something pleasant but rather something highly unpleasant. Antabuse, a drug treatment for alcoholism since the late 1940s, is based on this association (Ullman, 1952). When someone takes this drug, ingesting even the smallest amount of alcohol will make the person quite ill, even if the exposure to the alcohol is through mouthwash or cologne.

CLASSICAL CONDITIONING AND THE PLACEBO EFFECT

Chapter 2 defined the *placebo effect* as the effect of a substance or procedure (such as taking a pill) that is used as a control to identify the actual effects of a treatment. Placebo effects are observable changes (such as a drop in pain) that cannot be explained by the effects of an actual treatment. The principles of classical conditioning can help to explain some of these effects (Price, Finniss, & Benedetti, 2008). In this case, the pill or syringe serves as a CS and the actual drug is the UCS. After the experience of pain relief following the consumption of a drug, for instance, the pill or syringe might lead to a CR of lowered pain even in the absence of actual painkiller. The strongest evidence for the role of classical conditioning on placebo effects comes from research on the immune system and the endocrine system.

CLASSICAL CONDITIONING AND THE IMMUNE AND ENDOCRINE SYSTEMS

Even the human body's internal organ systems can be classically conditioned. The immune system is the body's natural defense against disease. Robert Ader and Nicholas Cohen have conducted a number of studies that reveal that classical conditioning can produce *immunosuppression,* a decrease in the production of antibodies, which can lower a person's ability to fight disease (Ader, 2000; Ader & Cohen, 1975, 2000).

The initial discovery of this link between classical conditioning and immunosuppression came as a surprise. In studying classical conditioning, Ader (1974) was examining how long a conditioned response would last in some laboratory rats. He paired a conditioned stimulus (saccharin solution) with an unconditioned stimulus, a drug called Cytoxan, which induces nausea. Afterward, while giving the rats saccharin-laced water without the accompanying Cytoxan, Ader watched to see how long it would take the rats to forget the association between the two.

Unexpectedly, in the second month of the study, the rats developed a disease and began to die off. In analyzing this unforeseen result, Ader looked into the properties of the nausea-inducing drug he had used. He discovered that one of its side effects was immunosuppression. It turned out that the rats had been classically conditioned to associate sweet water not only with nausea but also with the shutdown of the immune system. The sweet water apparently had become a conditioned stimulus for immunosuppression.

Researchers have found that conditioned immune responses also occur in humans (Ader, 2000; Goebel & others, 2002; Olness & Ader, 1992). For example, in one study, patients with multiple sclerosis were given a flavored drink prior to receiving a drug that suppressed the immune system. After this pairing, the flavored drink by itself lowered immune functioning, similarly to the drug (Giang & others, 1996).

Similar results have been found for the endocrine system. Recall from Chapter 3 that the endocrine system is a loosely organized set of glands that produce and circulate hormones. Research has shown that placebo pills can influence the secretion of hormones if patients had previous experiences with pills containing actual drugs that affected hormone secretion (Benedetti & others, 2003). Studies have revealed that the sympathetic nervous system (the part of the autonomic nervous systems that responds to stress) plays an important role in the learned associations between conditioned stimuli and immune and endocrine functioning (Saurer & others, 2008).

TASTE AVERSION LEARNING

Consider this scenario. Mike goes out for sushi with some friends and eats tekka maki (tuna roll), his favorite dish. He then proceeds to a jazz concert. Several hours later, he becomes very ill with stomach pains and nausea. A few weeks later, he tries to eat tekka maki again but cannot stand it. Importantly, Mike does not experience an aversion to jazz, even though he attended the jazz concert that night before getting sick. Mike's experience exemplifies *taste aversion*: a special kind of classical conditioning involving the learned association between a particular taste and nausea (Bernstein & Koh, 2007; Davis & Riley, 2010; Garcia & Koelling 1966).

Taste aversion is special because it typically requires only one pairing of a neutral stimulus (a taste) with the unconditioned response of nausea to seal that connection, often for a very long time. As we consider later, it is highly adaptive to learn taste aversion in only one trial. An animal that required multiple pairings of taste with poison would likely not survive the acquisition phase. It is notable, though, that taste aversion can occur even if the "taste" had nothing to do with getting sick—perhaps, in Mike's case, he was simply coming down with a stomach bug. Taste aversion can even occur when a person has been sickened by a completely separate event, such as being spun around in a chair (Klosterhalfen & others, 2000).

Taste aversion learning is particularly important in the context of the traditional treatment of some cancers. Radiation and the chemical treatment of cancer often produce nausea in patients, with the result that cancer patients sometimes develop strong aversions to many foods that they ingest prior to treatment (Holmes, 1993; Jacobsen & others, 1993). Consequently, they may experience a general tendency to be turned off by food, a situation that can lead to nutritional deficits (Hutton, Baracos, & Wismer, 2007).

Researchers have used classical conditioning principles to combat these taste aversions, especially in children, for whom antinausea medication is often ineffective (Skolin & others, 2006) and for whom aversions to protein-rich food is particularly problematic (Ikeda & others, 2006). Early studies demonstrated that giving children a "scapegoat" conditioned stimulus prior to chemotherapy would help contain the taste aversion to only one flavor (Broberg & Bernstein, 1987). For example, children might be given a particular flavor of Lifesaver candy or ice cream before receiving treatment. For these children, the nausea would be more strongly associated with the Lifesaver or ice cream flavor than with the foods they needed to eat for good nutrition. These results show discrimination in classical conditioning—the kids developed aversions only to the specific scapegoat flavors.

CLASSICAL CONDITIONING AND ADVERTISING

Classical conditioning provides the foundation for many of the commercials that we are bombarded with daily. (Appropriately, when John Watson, whom you will recall from the baby Albert study, left the field of psychology, he went on to advertising.) Think about it: Advertising involves creating an association between a product and pleasant feelings (buy that Grande Misto and be happy). TV advertisers cunningly apply classical conditioning principles to consumers by showing ads that pair something positive—such as a beautiful woman (a UCS) producing pleasant feelings (a UCR)—with a product (a CS) in hopes that you, the viewer, will experience those positive feelings toward the product (CR). Have you seen the Hardee's ad showing Padma Lakshmi in a low-cut dress (the UCS) eating a giant, messy hamburger (the CS)?

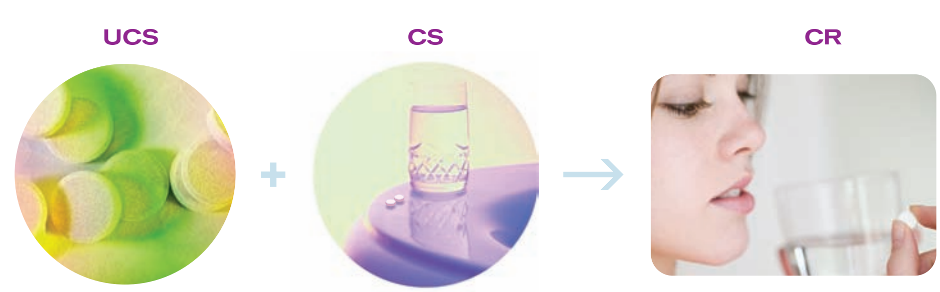
DRUG HABITUATION

● **habituation** Decreased responsiveness to a stimulus after repeated presentations.

Chapter 5 noted how, over time, a person might develop a tolerance for a psychoactive drug and need a higher and higher dose of the substance to get the same effect. Classical conditioning helps to explain **habituation,** which refers to the decreased responsiveness to a stimulus after repeated presentations. A mind-altering drug is an unconditioned stimulus: It naturally produces a response in the person's body. This unconditioned stimulus is often paired systematically with a previously neutral stimulus (CS). For instance, the physical appearance of the drug in a pill or syringe, and the room where the person takes the drugs, are conditioned stimuli that are paired with the UCS of the drug. These repeated pairings should produce a conditioned response, and they do—but it is different from those we have considered so far.

The conditioned response to a drug can be the body's way of *preparing* for the effects of a drug (Rachlin & Green, 2009). In this case, the body braces itself for the effects of the drug with a CR that is the opposite of the UCR. For instance, if the drug (the UCS) leads to an increase in heart rate (the UCR), the CR might be a drop in heart rate. The CS serves as a warning that the drug is coming, and the conditioned response in this case is the body's compensation for the drug's effects (Figure 6.3). In this situation the conditioned response works to decrease the effects of the UCS, making the drug experience less intense. Some drug users try to prevent habituation by varying the physical location of where they take the drug.

This aspect of drug use can play a role in deaths caused by drug overdoses. How might classical conditioning be involved? A user typically takes a drug in a particular setting, such as a bathroom, and acquires a conditioned response to this location (Siegel, 1988). Because of classical conditioning, as soon as the drug user walks into the bathroom, his or her body begins to prepare for and anticipate the drug dose in order to lessen the effect of the drug. However, if the user takes the drug in a location other



The psychoactive drug is an unconditioned stimulus (UCS) because it naturally produces a response in a person's body.

Appearance of the drug tablets and the room where the person takes the drug are conditioned stimuli (CS) that are paired with the drug (UCS).

The body prepares to receive the drug in the room. Repeated pairings of the UCS and CS have produced a conditioned response (CR).

FIGURE 6.3 Drug Habituation The figure illustrates how classical conditioning is involved in drug habituation. As a result of conditioning, the drug user will need to take more of the drug to get the same effect as the person did before the conditioning. Moreover, if the user takes the drug without the usual conditioned stimulus or stimuli—represented in the middle panel by the bathroom and the drug tablets—overdosing is likely.

than the usual one, such as at a rock concert, the drug's effect is greater because no conditioned responses have built up in the new setting, and therefore the body is not prepared for the drug. In cases in which heroin causes death, researchers often have found that the individuals took the drug under unusual circumstances, at a different time, or in a different place relative to the context in which they usually took the drug (Marlow, 1999). In these cases, with no CS signal, the body is unprepared for (and tragically overwhelmed by) the drug's effects.

test yourself

1. What is meant by an unconditioned stimulus (UCS) and an unconditioned response (UCR)? In Pavlov's experiments with dogs, what were the UCS and UCR?
2. What is meant by a conditioned stimulus (CS) and a conditioned response (CR)? In Pavlov's experiments with dogs, what were the CS and the CR?
3. What learning principle does the Watson and Rayner study with baby Albert illustrate?

3. OPERANT CONDITIONING

Recall from early in the chapter that classical conditioning and operant conditioning are forms of associative learning, which involves learning that two events are connected. In classical conditioning, organisms learn the association between two stimuli (UCS and CS). Classical conditioning is a form of *respondent behavior,* behavior that occurs in automatic response to a stimulus such as a nausea-producing drug, and later to a conditioned stimulus such as sweet water that was paired with the drug.

Classical conditioning explains how neutral stimuli become associated with unlearned, *involuntary responses.* Classical conditioning is not as effective, however, in explaining *voluntary behaviors* such as a student's studying hard for a test, a gambler's playing slot machines in Las Vegas, or a dog's searching for and finding his owner's lost cell phone. Operant conditioning is usually much better than classical conditioning at explaining such voluntary behaviors.

Defining Operant Conditioning

Operant conditioning or *instrumental conditioning* is a form of associative learning in which the consequences of a behavior change the probability of the behavior's occurrence. American psychologist B. F. Skinner (1938) chose the term *operant* to describe the behavior of the organism. An operant behavior occurs spontaneously. According to Skinner, the consequences that follow such spontaneous behaviors determine whether the behavior will be repeated.

● **operant conditioning** Also called instrumental conditioning, a form of associative learning in which the consequences of a behavior change the probability of the behavior's occurrence.

Imagine, for example, that you spontaneously decide to take a different route while driving to campus one day. You are more likely to repeat that route on another day if you have a pleasant experience—for instance, arriving at school faster or finding a new coffee place to try—than if you have a lousy experience such as getting stuck in traffic. In either case, the consequences of your spontaneous act influence whether that behavior happens again.

Recall that *contingency* is an important aspect of classical conditioning in which the occurrence of one stimulus can be predicted from the presence of another one. Contingency also plays a key role in operant conditioning. For example, when a rat pushes a lever (behavior) that delivers food, the delivery of food (consequence) is *contingent* on that behavior. This principle of contingency helps explain why passersby should never praise, pet, or feed a service dog while he is working (at least without asking first). Providing rewards during such times might interfere with the dog's training.

Thorndike's Law of Effect

Although Skinner emerged as the primary figure in operant conditioning, the experiments of E. L. Thorndike (1898) established the power of consequences in determining voluntary behavior. At about the same time that Pavlov was conducting classical conditioning experiments with salivating dogs, Thorndike, another American psychologist, was studying cats in puzzle boxes. Thorndike put a hungry cat inside a box and placed a piece of fish outside. To escape from the box and obtain the food, the cat had to learn to open the latch inside the box. At first the cat made a number of ineffective responses. It clawed or

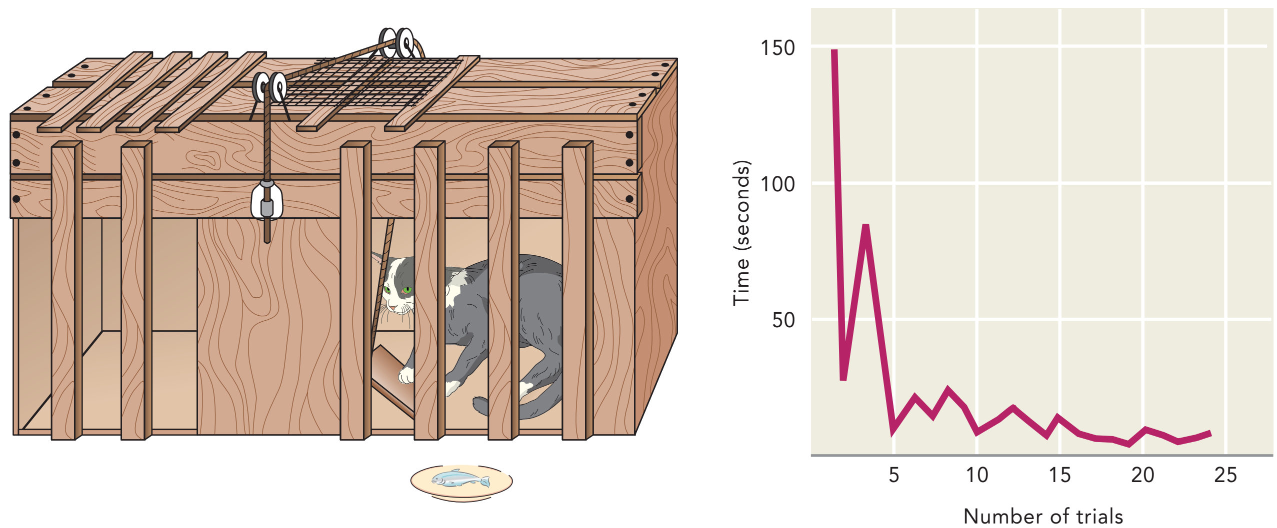


FIGURE 6.4 Thorndike's Puzzle Box and the Law of Effect (*Left*) A box typical of the puzzle boxes Thorndike used in his experiments with cats to study the law of effect. Stepping on the treadle released the door bolt; a weight attached to the door then pulled the door open and allowed the cat to escape. After accidentally pressing the treadle as it tried to get to the food, the cat learned to press the treadle when it wanted to escape the box. (*Right*) One cat's learning curve over 24 separate trials. Notice that the cat escaped much more quickly after about five trials. It had learned the consequences of its behavior.

law of effect Thorndike's law stating that behaviors followed by positive outcomes are strengthened and that behaviors followed by negative outcomes are weakened.

bit at the bars and thrust its paw through the openings. Eventually the cat accidentally stepped on the lever that released the door bolt. When the cat returned to the box, it went through the same random activity until it stepped on the lever once more. On subsequent trials, the cat made fewer and fewer random movements until finally it immediately stepped on the lever to open the door (Figure 6.4). Thorndike's resulting **law of effect** states that behaviors followed by positive outcomes are strengthened and that behaviors followed by negative outcomes are weakened (Brown & Jenkins, 2009).

The law of effect is important because it presents the basic idea that the consequences of a behavior influence the likelihood of that behavior's recurrence. Quite simply, a behavior can be followed by something good or something bad, and the probability of a behavior's being repeated depends on these outcomes. As we now explore, Skinner's operant conditioning model expands on this basic idea.

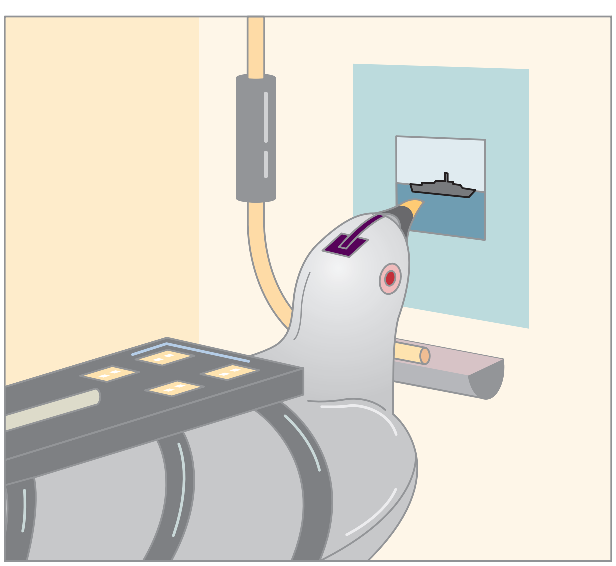


FIGURE 6.5 Skinner's Pigeon-Guided Missile Skinner wanted to help the military during World War II by using pigeons' tracking behavior. He devised a system whereby a lens at the front of the missile would project an image of the target to a screen at the control station. Pigeons, with a gold electrode attached to their beak, were trained through occasional food pellet rewards to peck at the image of the target. As long as the target remained at the center of the screen, the missiles would fly straight, but pecks off-center would cause the screen to tilt. Through the connection to the missile's flight controls, the tilt would cause the missile to change course.

Skinner's Approach to Operant Conditioning

Skinner believed that the mechanisms of learning are the same for all species. This conviction led him to study animals in the hope that he could discover the components of learning with organisms simpler than humans, including pigeons. During World War II, Skinner trained pigeons to pilot missiles. Naval officials would not accept pigeons piloting missiles in wartime, but Skinner congratulated himself on the degree of control he was able to exercise over the pigeons (Figure 6.5).

Skinner and other behaviorists made every effort to study organisms under precisely controlled conditions so that they could examine the connection between the operant behavior and the specific consequences in minute detail (Herrnstein, 2009). One of Skinner's creations in the 1930s to control experimental conditions was the Skinner box (Figure 6.6). A device in the box delivered food pellets into a tray at random. After a rat became accustomed to the box, Skinner installed a lever and observed the rat's behavior. As the hungry rat explored the box, it occasionally pressed the lever, and a food pellet was dispensed. Soon the rat learned that the consequences of pressing the lever were positive: It would be fed. Skinner achieved further control by sound-proofing the box to ensure that the experimenter was the only influence on the organism. In many of the experiments, the responses were mechanically recorded, and the food (the consequence) was dispensed automatically. These precautions aimed to prevent human error.

FIGURE 6.6 The Skinner Box B. F. Skinner conducting an operant conditioning study in his behavioral laboratory. The rat being studied is in a Skinner box.

Shaping

We have all seen service dogs walking faithfully next to their human partners. These highly trained canines provide services to people with various disabilities. They open and close doors, help individuals dress and undress, flush toilets, and even put clothes in a washer and dryer. They have gained these skills through operant conditioning. However, just imagine the challenge of teaching even a really smart dog how to do the laundry. Your task might seem close to impossible, as it is quite unlikely that a dog would spontaneously start putting the clothes in the washing machine. You could wait a very long time for such a feat, and furthermore you could not reinforce a behavior that had not been elicited. It *is* possible, however, to train a dog or another animal to perform highly complex tasks through shaping.

Shaping refers to rewarding approximations of a desired behavior (Krueger & Dayan, 2009). For example, shaping can be used to train a rat to press a bar to obtain food. When a rat is first placed in a Skinner box, it rarely presses the bar. Thus, the experimenter may start off by giving the rat a food pellet if it is in the same half of the cage as the bar. Then the experimenter might reward the rat's behavior only when it is within 2 inches of the bar, then only when it touches the bar, and finally only when it presses the bar.

Returning to the service dog, rather than waiting for the dog spontaneously to put the clothes in the washing machine, we might reward the dog for carrying the clothes to the laundry room and for bringing them closer and closer to the washing machine. Finally, we might reward the dog only when it gets the clothes inside the washer. Indeed, trainers use this type of shaping technique extensively in teaching animals to perform tricks. A dolphin that jumps through a hoop held high above the water has been trained to perform this behavior through shaping.

Through operant conditioning, animals can learn to do amazing things—even ride a wave, like this alpaca shown with its trainer, Peruvian surfer Domingo Pianezzi.

Operant conditioning relies on the notion that a behavior is likely to be repeated if it is followed by a reward. What makes a reinforcer rewarding? Recent research reveals considerable interest in discovering the links between brain activity and operant conditioning (Chester & others, 2006; Fontanini & others, 2009; Rapanelli & others, 2010). To explore this topic, see the Intersection.

Principles of Reinforcement

We noted earlier that a behavior can be followed by something pleasant or something unpleasant. *Reinforcement* refers to those nice things that follow a behavior. **Reinforcement** is the process by which a rewarding stimulus or event (a *reinforcer*) following a particular behavior increases the probability that the behavior will happen again. Pleasant or rewarding consequences of a behavior fall into two types, called *positive reinforcement* and *negative reinforcement.* Both of these types of consequences are experienced as pleasant, and both increase the frequency of a behavior.

POSITIVE AND NEGATIVE REINFORCEMENT

In **positive reinforcement,** the frequency of a behavior increases because it is followed by the presentation of something that is good. For example, if someone you meet smiles at you after you say, "Hello, how are you?" and you keep talking, the smile has reinforced your talking. The same principle of positive reinforcement is at work when you teach a dog to "shake hands" by giving it a piece of food when it lifts its paw.

In contrast, in **negative reinforcement,** the frequency of a behavior increases because it is followed by the removal of something unpleasant. For example, if your father

● **shaping** Rewarding approximations of a desired behavior.

● **reinforcement** The process by which a rewarding stimulus or event (a reinforcer) following a particular behavior increases the probability that the behavior will happen again.

● **positive reinforcement** An increase in the frequency of a behavior in response to the subsequent presentation of something that is good.

● **negative reinforcement** An increase in the frequency of a behavior in response to the subsequent removal of something that is unpleasant.

Behaviorism and Cognitive Neuroscience: If It Feels Good, Is It Rewarding?

When behaviorists talk about behaviors, they rarely focus on what is going on inside the head of the organism they are studying. With remarkable innovations in the technology of brain imaging, however, researchers—even those interested in associative learning—can examine the neural underpinnings of behavior (Knight & others, 2010; Koob, 2006). In effect, researchers can look inside the "black box" of the human brain and observe how learning takes place.

A central idea behind operant conditioning is that an organism is likely to repeat a behavior when that behavior is followed by a reward. However, what is rewarding about a reward? Food is an obvious reward. Hungry rats will work hard for food. Neuroscientists have identified a part of the midbrain called the nucleus accumbens (or NAc), an extension of the amygdala that plays a vital role in our learning to repeat a rewarded behavior (Schultz, 2006). In essence, a special input into the NAc tells the organism to "do it again." We can think of the brain's response as literally reinforcing the synapses in the brain that connect the stimulus and response.

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Researchers have found that the neurotransmitter dopamine plays a crucial role in the reinforcement of behaviors (Darvas & Palmiter, 2010; Schlosser & others, 2009; Thomsen & others, 2009). An electrode that records dopamine cells in the brain of a monkey, for example, shows that dopamine is released not only when the monkey tastes food, but also when it sees signals in the environment suggesting that food is available (Schultz, Dayan, & Montague, 1997). By comparison, imagine that you are walking through a shopping mall. You see a "50 percent off" sign outside the shoe store. That sign might just start a dopamine explosion in your brain.

What are some of the rewarding experiences in your life that other people just don't understand? Why do you find them rewarding?

The role of dopamine in the activation of reinforcement is also demonstrated in animals that lack dopamine. Animals that have been given a drug that blocks dopamine find rewards less rewarding. They treat sugar as less sweet and fail to react to potential rewards in the environment (G. P. Smith, 1995). As researchers bring questions of basic learning principles into the neuroscience laboratory, they get ever-closer to understanding what "rewarding" really means.

nagged you to clean out the garage and kept nagging until you cleaned out the garage, your response (cleaning out the garage) removed the unpleasant stimulus (your dad's nagging). Taking an aspirin when you have a headache works the same way: A reduction of pain reinforces the act of taking an aspirin. Similarly, if your TV is making an irritating buzzing sound, you might give it a good smack on the side, and if the buzzing stops, you are more likely to smack the set again if the buzzing resumes. Ending the buzzing sound rewards the TV-smacking.

A special kind of response to negative reinforcement is avoidance learning. **Avoidance learning** occurs when the organism learns that by making a particular response, a negative stimulus can be altogether avoided. For instance, a student who receives one bad grade might thereafter always study hard in order to avoid the negative outcome of bad grades in the future. Even when the bad grade is no longer present, the pattern of behavior sticks. Avoidance learning is very powerful in the sense that the behavior is maintained even in the absence of any aversive stimulus. For example, animals that have been trained to avoid a negative stimulus, such as an electrical shock, by jumping into a safe area may always thereafter gravitate toward the safe area, even when the shock is no longer presented.

● **avoidance learning** An organism's learning that it can altogether avoid a negative stimulus by making a particular response.

Experience with unavoidable negative stimuli can lead to a particular deficit in avoidance learning called learned helplessness. In **learned helplessness,** the organism has learned that it has no control over negative outcomes. Learned helplessness was first identified by Martin Seligman and his colleagues (Altenor, Volpicelli, & Seligman, 1979; Hannum, Rossellini, & Seligman, 1976). Seligman and his associates found that dogs that were first exposed to inescapable shocks were later unable to learn to avoid those shocks, even when they could (Seligman & Maier, 1967). This inability to learn to escape was persistent: The dogs would suffer painful shocks hours, days, and even weeks later and never attempt to escape. Exposure to unavoidable negative circumstances may also set the stage for humans' inability to learn avoidance, such as with the experience of depression and despair (Huston, Schulz, & Topic, 2009). Learned helplessness has aided psychologists in understanding a variety of perplexing issues, such as why some victims of domestic violence fail to escape their terrible situation and why some students respond to failure at school by seeming to give up trying.

learned helplessness An organism's learning through experience with unavoidable negative stimuli that it has no control over negative outcomes.

Notice that both positive and negative reinforcement involve rewarding behavior—but they do so in different ways. Positive reinforcement means following a behavior with something pleasant, and negative reinforcement means following a behavior with the removal of something unpleasant. Remember that, in this case, "positive" and "negative" have nothing to do with "good" and "bad." Rather, they refer to processes in which something is given (positive reinforcement) or something is removed (negative reinforcement). Whether it is positive or negative, reinforcement is about increasing a behavior. Figure 6.7 provides further examples to help you understand the distinction between positive and negative reinforcement.

TYPES OF REINFORCERS

Psychologists classify positive reinforcers as primary or secondary based on whether the rewarding quality of the consequence is innate or learned. A **primary reinforcer** is innately satisfying; that is, a primary reinforcer does not take any learning on the organism's part to make it pleasurable. Food, water, and sexual satisfaction are primary reinforcers. A **secondary reinforcer** acquires its positive value through an organism's

primary reinforcer A reinforcer that is innately satisfying; one that does not take any learning on the organism's part to make it pleasurable.

secondary reinforcer A reinforcer that acquires its positive value through an organism's experience; a secondary reinforcer is a learned or conditioned reinforcer.

Positive Reinforcement

Behavior	Rewarding Stimulus Provided	Future Behavior
You turn in homework on time.	Teacher praises your performance.	You increasingly turn in homework on time.
You wax your skis.	The skis go faster.	You wax your skis the next time you go skiing.
You randomly press a button on the dashboard of a friend's car.	Great music begins to play.	You deliberately press the button again the next time you get into the car.

Negative Reinforcement

Behavior	Unpleasant Stimulus Removed	Future Behavior
You turn in homework on time.	Teacher stops criticizing late homework.	You increasingly turn in homework on time.
You wax your skis.	People stop zooming by you on the slope.	You wax your skis the next time you go skiing.
You randomly press a button on the dashboard of a friend's car.	An annoying song shuts off.	You deliberately press the button again the next time the annoying song is on.

FIGURE 6.7 **Positive and Negative Reinforcement** Negative reinforcers involve taking something aversive away. Positive reinforcers mean adding something pleasant.

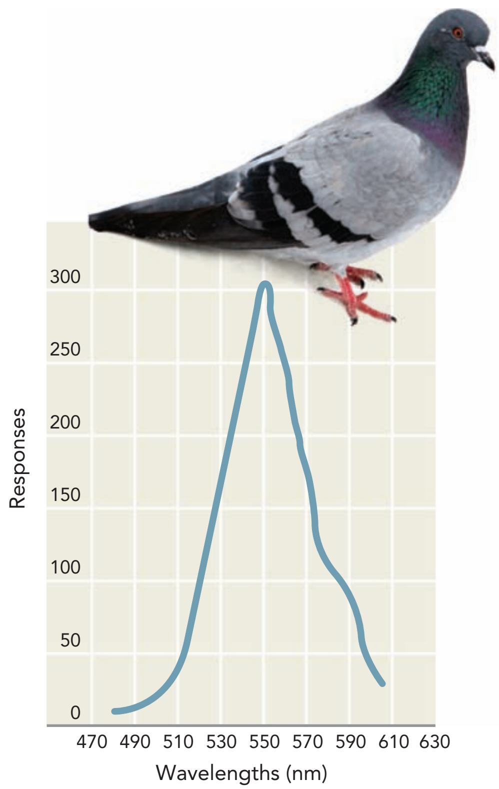


FIGURE 6.8 Stimulus Generalization In the experiment by Norman Guttman and Harry Kalish (1956), pigeons initially pecked a disk of a particular color (in this graph, a color with a wavelength of 550 nm) after they had been reinforced for this wavelength. Subsequently, when the pigeons were presented disks of colors with varying wavelengths, they were likelier to peck those that were similar to the original disk.

experience; a secondary reinforcer is a learned or conditioned reinforcer. We encounter hundreds of secondary reinforcers in our lives, such as getting an *A* on a test and a paycheck for a job. Although we might think of these as positive outcomes, they are not innately positive. We learn through experience that *A*'s and paychecks are good. Secondary reinforcers can be used in a system called a *token economy*. In a token economy behaviors are rewarded with tokens (such as poker chips or stars on a chart) that can be exchanged later for desired rewards (such as candy or money).

GENERALIZATION, DISCRIMINATION, AND EXTINCTION

Not only are generalization, discrimination, and extinction important in classical conditioning, they also are key principles in operant conditioning.

Generalization In operant conditioning, **generalization** means performing a reinforced behavior in a different situation. For example, in one study pigeons were reinforced for pecking at a disk of a particular color (Guttman & Kalish, 1956). To assess stimulus generalization, researchers presented the pigeons with disks of varying colors. As Figure 6.8 shows, the pigeons were most likely to peck at disks closest in color to the original. When a student who gets excellent grades in a calculus class by studying the course material every night starts to study psychology and history every night as well, generalization is at work.

Discrimination In operant conditioning, **discrimination** means responding appropriately to stimuli that signal that a behavior will or will not be reinforced (Carlsson & Swedberg, 2010). For example, you go to a restaurant that has a "University Student Discount" sign in the front window, and you enthusiastically flash your student ID with the expectation of getting the reward of a reduced-price meal. Without the sign, showing your ID might get you only a puzzled look, not cheap food.

The principle of discrimination helps to explain how a service dog "knows" when she is working. Typically, the dog wears a training harness while on duty but not at other times. Thus, when a service dog is wearing her harness, it is important to treat her like the professional that she is. Similarly, an important aspect of the training of service dogs is the need for selective disobedience. Selective disobedience means that in addition to obeying commands from its human partner, the service dog must at times override such commands if the context provides cues that obedience is not the appropriate response. So, if a guide dog is standing at the corner with her visually impaired human, and the human commands her to move forward, the dog might refuse if she sees the "Don't Walk" sign flashing. Stimuli in the environment serve as cues, informing the organism if a particular reinforcement contingency is in effect.

Extinction In operant conditioning, **extinction** occurs when a behavior is no longer reinforced and decreases in frequency (Leslie & others, 2006). If, for example, a soda machine that you frequently use starts "eating" your coins without dispensing soda, you quickly stop inserting more coins. Several weeks later, you might try to use the machine again, hoping that it has been fixed. Such behavior illustrates spontaneous recovery in operant conditioning.

- **generalization (in operant conditioning)** Performing a reinforced behavior in a different situation.
- **discrimination (in operant conditioning)** Responding appropriately to stimuli that signal that a behavior will or will not be reinforced.
- **extinction (in operant conditioning)** Decreases in the frequency of a behavior when the behavior is no longer reinforced.

CONTINUOUS REINFORCEMENT, PARTIAL REINFORCEMENT, AND SCHEDULES OF REINFORCEMENT

Most of the examples of reinforcement we have considered so far involve *continuous reinforcement,* in which a behavior is reinforced every time it occurs. When continuous reinforcement takes place, organisms learn rapidly. However, when reinforcement stops, extinction takes place quickly. A variety of conditioning procedures have been developed that are particularly resistant to extinction. These involve *partial reinforcement,* in which a reinforcer follows a behavior only a portion of the time (Mitchell & others, 2010). Partial reinforcement characterizes most life experiences. For instance, a golfer does not win every tournament she enters; a chess whiz does not win every match he plays; a student does not get a pat on the back each time she solves a problem.

Schedules of reinforcement are specific patterns that determine when a behavior will be reinforced (Mitchell & others, 2010; Orduna, Garcia, & Hong, 2010). There are four main schedules of partial reinforcement: fixed ratio, variable ratio, fixed interval, and variable interval. With respect to these, *ratio schedules* involve the number of behaviors that must be performed prior to reward, and *interval schedules* refer to the amount of time that must pass before a behavior is rewarded. In a fixed schedule, the number of behaviors or the amount of time is always the same. In a variable schedule, the required number of behaviors or the amount of time that must pass changes and is unpredictable from the perspective of the learner. Let's look concretely at how each of these schedules of reinforcement influences behavior.

schedules of reinforcement Specific patterns that determine when a behavior will be reinforced.

A *fixed-ratio schedule* reinforces a behavior after a set number of behaviors. For example, if you are playing the slot machines in Atlantic City and if the machines are on a fixed-ratio schedule, you might get $5 back every 20th time you put money in the machine. It would not take long to figure out that if you watched someone else play the machine 18 or 19 times, not get any money back, and then walk away, you should step up, insert your coin, and get back $5. The business world often uses fixed-ratio schedules to increase production. For instance, a factory might require a line worker to produce a certain number of items in order to get paid a particular amount.

Of course, if the reward schedule for a slot machine were that easy to figure out, casinos would not be so successful. What makes gambling so tantalizing is the unpredictability of wins (and losses). Slot machines are on a *variable-ratio schedule,* a timetable in which behaviors are rewarded an average number of times but on an unpredictable basis. For example, a slot machine might pay off at an average of every 20th time, but the gambler does not know when this payoff will be. The slot machine might pay off twice in a row and then not again until after 58 coins have been inserted. This averages out to a reward for every 20 behavioral acts, but *when* the reward will be given is unpredictable. Variable-ratio schedules produce high, steady rates of behavior that are more resistant to extinction than the other three schedules.

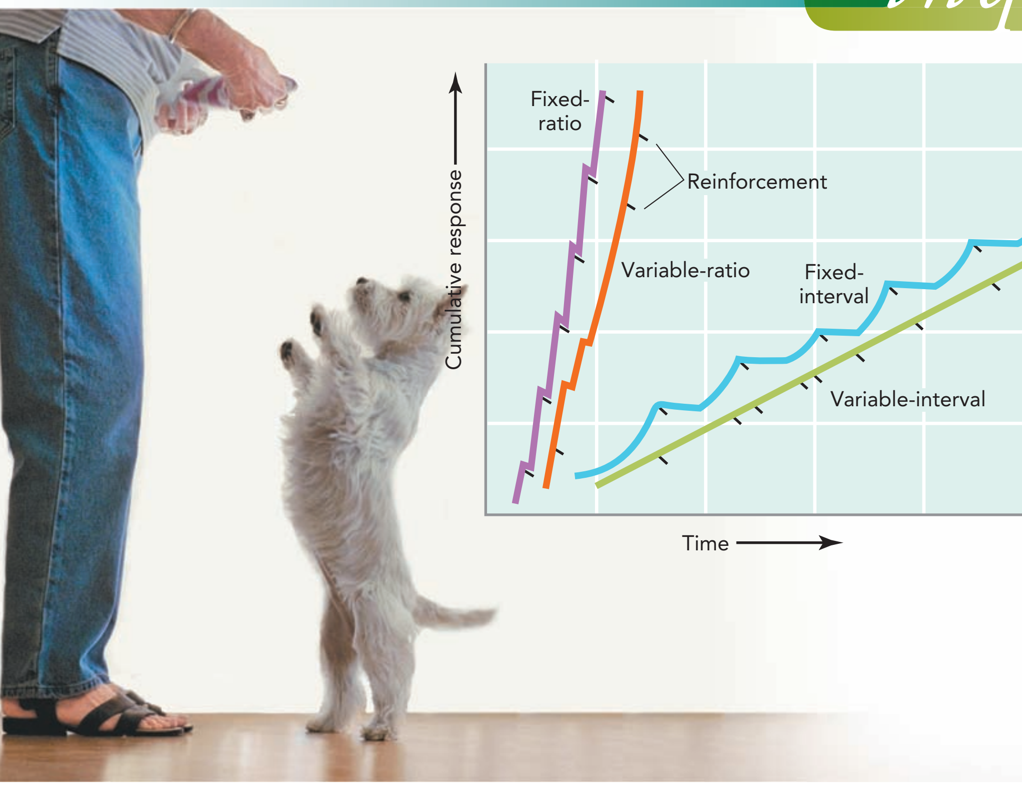
Whereas ratio schedules of reinforcement are based on the *number* of behaviors that occur, interval reinforcement schedules are determined by the *time elapsed* since the last behavior was rewarded. A *fixed-interval schedule* reinforces the first behavior after a fixed amount of time has passed. If you take a class that has four scheduled exams, you might procrastinate most of the semester and cram just before each test. Fixed-interval schedules of reinforcement are also responsible for the fact that pets seem to be able to "tell time," eagerly sidling up to their food dish at 5 P.M. in anticipation of dinner. On a fixed-interval schedule, the rate of a behavior increases rapidly as the time approaches when the behavior likely will be reinforced. For example, a government official who is running for reelection may intensify her campaign activities as Election Day draws near.

A *variable-interval schedule* is a timetable in which a behavior is reinforced after a variable amount of time has elapsed. Pop quizzes occur on a variable-interval schedule. So does fishing—you do not know if the fish will bite in the next minute, in a half hour, in an hour, or ever. Because it is difficult to predict when a reward will come, behavior is slow and consistent on a variable-interval schedule (Staddon, Chelaru, & Higa, 2002). This is why pop quizzes lead to more consistent levels of studying compared to the cramming that might be seen with scheduled tests.

To sharpen your sense of the differences between fixed- and variable-interval schedules, consider the following example. Penelope and Edith both design slot machines for their sorority's charity casino night. Penelope puts her slot machine on a variable-interval schedule of reinforcement; Edith puts hers on a fixed-interval schedule of reinforcement. On average, both machines will deliver a reward every 20 minutes. Whose slot machine is likely to make the most money for the sorority charity? Edith's machine is likely to lead to long lines just before the 20-minute mark, but people will be unlikely to play on it at other times. In contrast, Penelope's is more likely to entice continuous play, because the players never know when they might hit a jackpot. The magic of variable schedules of reinforcement is that the learner can never be sure exactly when the reward is coming. Let's take a closer look at the responses associated with each schedule of reinforcement in the Psychological Inquiry feature.

Slot machines are on a variable-ratio schedule of reinforcement.

psychological inquiry



Schedules of Reinforcement and Different Patterns of Responding

This figure shows how the different schedules of reinforcement result in different rates of responding. The graph's X or horizontal axis represents time. The Y or vertical axis represents the cumulative responses. That means that as the line goes up, the total number of responses are building and building. In the figure, each hash mark indicates the delivery of reinforcement. That is, each of those little ticks indicates that a reward is being given.

Look closely at the pattern of responses over time for each schedule of reinforcement. On the fixed-ratio schedule, notice the dropoff in responding after each response; on the variable-ratio schedule, note the high, steady rate of responding. On the fixed-interval schedule, notice the immediate dropoff in responding after reinforcement and the increase in responding just before reinforcement (resulting in a scalloped curve); and on the variable-interval schedule, note the slow, steady rate of responding.

1. Which schedule of reinforcement represents the "most bang for the buck"? That is, which one is associated with the most responses for the least amount of reward?
2. Which schedule of reinforcement is most like pop quizzes?
3. Which is most like regular tests on a course syllabus?
4. Which schedule of reinforcement would be best if you have very little time for training?
5. Which schedule of reinforcement do you think is most common in your own life? Why?

PUNISHMENT

We began this section by noting that behaviors can be followed by something good or something bad. So far, we have explored only the good things—reinforcers that are meant to increase behaviors. Sometimes, however, the goal is to decrease a behavior, and in such cases the behavior might be followed by something unpleasant. **Punishment** is a consequence that decreases the likelihood that a behavior will occur. For instance, a child plays with matches and gets burned when he lights one; the child consequently is less likely to play with matches in the future. As another example, a student interrupts the instructor, and the instructor scolds the student. This consequence—the teacher's verbal reprimand—makes the student less likely to interrupt in the future. In punishment, a response decreases because of its unpleasant consequences.

● **punishment** A consequence that decreases the likelihood that a behavior will occur.

Just as the positive–negative distinction applies to reinforcement, it can also apply to punishment. As was the case for reinforcement, "positive" means adding something, and "negative" means taking something away. Thus, in **positive punishment** a behavior decreases when it is followed by the presentation of an unpleasant stimulus, whereas in **negative punishment** a behavior decreases when a positive stimulus is removed. Examples of positive punishment include spanking a misbehaving child and scolding a spouse who forgot to call when she was running late at the office; the coach who makes his

● **positive punishment** The presentation of an unpleasant stimulus following a given behavior in order to decrease the frequency of that behavior.

● **negative punishment** The removal of a positive stimulus following a given behavior in order to decrease the frequency of that behavior.

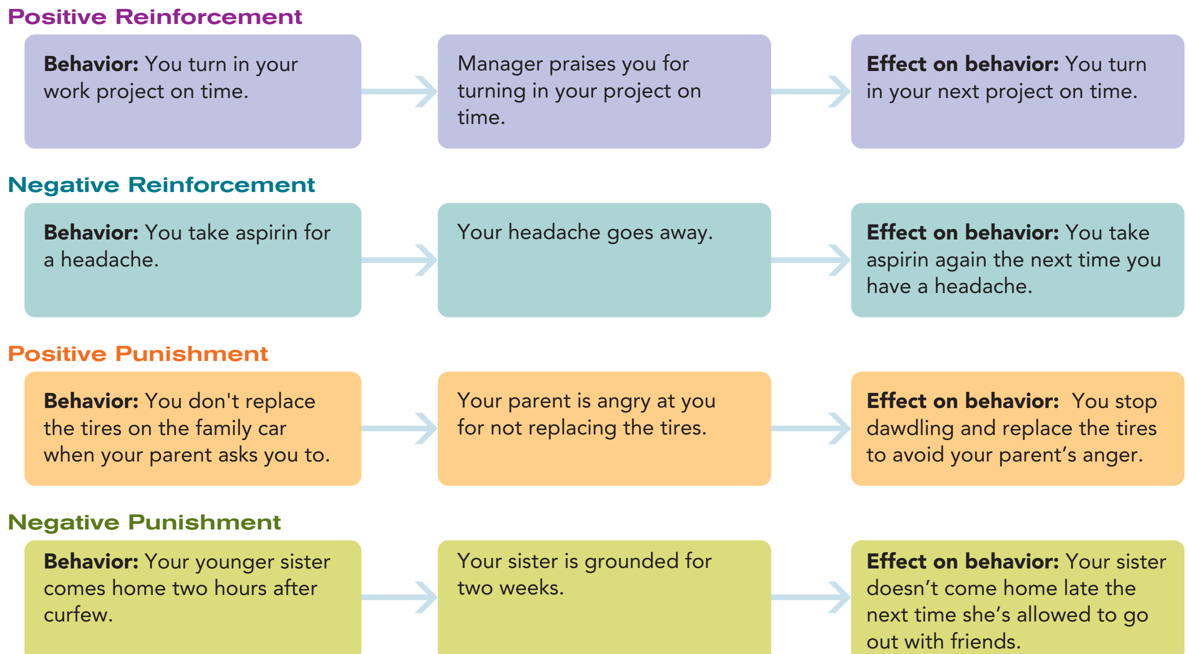


FIGURE 6.9 Positive Reinforcement, Negative Reinforcement, Positive Punishment, and Negative Punishment The fine distinctions here can be confusing. With respect to reinforcement, *positive* means presenting—or adding—something pleasant in order to increase a behavior's frequency, and *negative* means taking away something unpleasant in order to increase a behavior's frequency. With regard to punishment, *positive* and *negative* refer to whether the response to a behavior is adding something unpleasant (positive punishment such as being scolded) or taking away something pleasant (negative punishment such as being grounded).

team run wind sprints after a lackadaisical practice is also using positive punishment. *Time-out* is a form of negative punishment in which a child is removed from a positive reinforcer, such as her toys. Getting grounded is also a form of negative punishment as it involves taking a teenager away from the fun things in his life. Figure 6.9 compares positive reinforcement, negative reinforcement, positive punishment, and negative punishment.

The use of positive punishment, especially physical punishment such as spanking children, has been a topic of some debate. To learn how psychologists view the physical punishment of children, see the Critical Controversy.

TIMING, REINFORCEMENT, AND PUNISHMENT

How does the timing of reinforcement and punishment influence behavior? And does it matter whether the reinforcement is small or large?

Immediate Versus Delayed Reinforcement As is the case in classical conditioning, in operant conditioning learning is more efficient when the interval between a behavior and its reinforcer is a few seconds rather than minutes or hours, especially in lower animals (Freestone & Church, 2010). If a food reward is delayed for more than 30 seconds after a rat presses a bar, it is virtually ineffective as reinforcement. Humans, however, have the ability to respond to delayed reinforcers (Holland, 1996).

Sometimes important life decisions involve whether to seek and enjoy a small, immediate reinforcer or to wait for a delayed but more highly valued reinforcer (Martin & Pear, 2007). For example, you might spend your money now on clothes, concert tickets, and the latest iPod, or you might save your money and buy a car later. You might choose to enjoy yourself now in return for immediate small reinforcers, or you might opt to study hard in return for delayed stronger reinforcers such as good grades, a scholarship to graduate school, and a better job.

CRITICAL CONTROVERSY

Will Sparing the Rod Spoil the Child?

For centuries, experts considered corporal (physical) punishment such as spanking a necessary and even desirable method of disciplining children. The use of corporal punishment is legal in every U.S. state, and an estimated 94 percent of American 3- and 4-year-olds have been spanked at least once in any given year (Straus & Stewart, 1999). A cross-cultural comparison found that individuals in the United States and Canada were among the most favorable toward corporal punishment and remembered their parents' using it (Curran & others, 2001).

Despite the widespread use of corporal punishment, there have been surprisingly few research studies on it, and those that have been conducted are correlational (Kazdin & Benjet, 2003). Recall that cause and effect cannot be determined in a correlational study. In one such study, the researchers found a link between parents' spanking and children's antisocial behavior, including cheating, telling lies, being mean to others, bullying, getting into fights, and being disobedient (Straus, Sugarman, & Giles-Sims, 1997). Moreover, culture seems to play a big role in the outcomes associated with spanking.

A research review concluded that although corporal punishment by parents is associated with children's higher levels of immediate compliance, it is also associated with aggression among children, as well as with lower levels of moral internalization and mental health (Gershoff, 2002). High and harsh levels of corporal punishment are especially detrimental to children's well-being (Alyahri & Goodman, 2008; de Zoysa, Newcombe, & Rajapakse, 2008) and may affect adolescents as well (Bender & others, 2007).

Debate is ongoing about the effects of corporal punishment on children's development (Grusec, 2009; Thompson, 2009). Some experts argue that much of the evidence for the negative effects of physical punishment is based on studies in which parents acted in an abusive manner (Baumrind, Larzelere, & Cowan, 2002). A research review of 26 studies concluded that only severe or predominant use of spanking, not mild spanking, compared unfavorably with alternative discipline practices with children (Larzelere & Kuhn, 2005). Indeed, there are few longitudinal studies of punishment and few studies that distinguish adequately between moderate and heavy use of punishment. Thus, in the view of some experts, based on the research evidence available, it is still difficult to tell whether the effects of physical punishment are harmful to children's development, although such a view might be distasteful to some individuals (Grusec, 2009). Clearly, though, when physical punishment involves abuse, it can be very harmful to children's development (Cicchetti & others, 2010).

What are some reasons for avoiding spanking or similar punishments?

- When adults yell, scream, or spank, they are presenting children with out-of-control models for handling stressful situations (Sim & Ong, 2005). Children may imitate this aggressive, out-of-control behavior.
- Punishment can instill fear, rage, or avoidance. For example, spanking the child may cause him or her to avoid being around the parent and to fear the parent.
- Punishment tells children what not to do rather than what to do. It would be preferable to give children feedback such as "Why don't you try this?"
- Punishment can be abusive. Even if parents do not so intend, they might get so carried away during the act of punishing that they become abusive (Dunlap & others, 2009).

For such reasons, Sweden passed a law in 1979 forbidding parents to punish children physically (to spank or slap them, for example). Since the law's enactment, youth rates of delinquency, alcohol abuse, rape, and suicide have dropped in Sweden (Durrant, 2008). Because this study is correlational in nature, however, we cannot assume that the anti-spanking law caused these social changes. These improvements may have occurred for other reasons, such as shifting attitudes and broadened opportunities for youth. Nonetheless, the Swedish experience suggests that the physical punishment of children may be unnecessary. Other countries with anti-spanking laws include Finland, Denmark, Norway, Austria, Cyprus, Croatia, Latvia, Germany, and Israel.

When asked why they use corporal punishment, parents often respond that their children need strong discipline to learn how to behave. Parents also sometimes reason that they were spanked by their own parents and they turned out okay, so there is nothing wrong with corporal punishment.

WHAT DO YOU THINK?

- Should the United States outlaw the physical punishment of children? Why or why not?
- Did your parents spank you when you were a child? If so, what effects do you think physical punishment had on your behavior? Might the effects on you be different depending on whether the physical punishment was severe or harsh as opposed to light or moderate?
- Might negative punishment, such as time-outs, be more effective than positive punishment, such as spanking? Explain.

Immediate Versus Delayed Punishment As with reinforcement, in most instances of research with lower animals, immediate punishment is more effective than delayed punishment in decreasing the occurrence of a behavior. However, also as with reinforcement, delayed punishment can have an effect on human behavior. Not studying at the beginning of a semester can lead to poor grades much later, and humans have the capacity to notice that this early behavior contributed to the negative outcome.

Immediate Versus Delayed Reinforcement *and* Punishment Many daily behaviors revolve around rewards and punishments, both immediate and delayed. We might put off going to the dentist to avoid a small punisher (such as the discomfort that comes with getting a cavity filled). However, this procrastination might contribute to greater pain later (such as the pain of having a tooth pulled). Sometimes life is about enduring a little pain now to avoid a lot of pain later.

How does receiving immediate small reinforcement versus delayed strong punishment affect human behavior (Martin & Pear, 2007)? One reason that obesity is such a major health problem is that eating is a behavior with immediate positive consequences—food tastes great and quickly provides a pleasurable, satisfied feeling. Although the potential delayed consequences of overeating are negative (obesity and other possible health risks), the immediate consequences are difficult to override. When the delayed consequences of behavior are punishing and the immediate consequences are reinforcing, the immediate consequences usually win, even when the immediate consequences are minor reinforcers and the delayed consequences are major punishers.

Smoking and drinking follow a similar pattern. The immediate consequences of smoking are reinforcing for most smokers—the powerful combination of positive reinforcement (enhanced attention, energy boost) and negative reinforcement (tension relief, removal of craving). The primarily long-term effects of smoking are punishing and include shortness of breath, a chronic sore throat and/or coughing, chronic obstructive pulmonary disease (COPD), heart disease, and cancer. Likewise, the immediate pleasurable consequences of drinking override the delayed consequences of a hangover or even alcoholism and liver disease.

Now think about the following situations. Why are some of us so reluctant to take up a new sport, try a new dance step, run for office on campus or in local government, or do almost anything different? One reason is that learning new skills often involves minor punishing consequences, such as initially looking and feeling stupid, not knowing what to do, and having to put up with sarcastic comments from others. In these circumstances, reinforcing consequences are often delayed. For example, it may take a long time to become a good enough golfer or a good enough dancer to enjoy these activities, but persevering through the rough patches just might be worth it.

Applied Behavior Analysis

Some thinkers have criticized behavioral approaches for ignoring mental processes and focusing only on observable behavior. Nevertheless, these approaches do provide an optimistic perspective for individuals interested in changing their behaviors. That is, rather than concentrating on factors such as the type of person you are, behavioral approaches imply that you can modify even longstanding habits by changing the reward contingencies that maintain those habits (Watson & Tharp, 2007).

One real-world application of operant conditioning principles to promote better functioning is applied behavior analysis. **Applied behavior analysis** (also called *behavior modification*) is the use of operant conditioning principles to change human behavior. In applied behavior analysis, the rewards and punishers that exist in a particular setting are carefully analyzed and manipulated to change behaviors. Applied behavior analysis seeks to identify the rewards that might be maintaining unwanted behaviors and to enhance the rewards of more appropriate behaviors. From this perspective, we can understand all human behavior as being influenced by rewards and punishments.

applied behavior analysis Also called behavior modification, the use of operant conditioning principles to change human behavior.

test yourself

1. What is operant conditioning?
2. Define shaping and give two examples of it.
3. What is the difference between positive reinforcement and negative reinforcement? Between positive punishment and negative punishment?

If we can figure out what rewards and punishers are controlling a person's behavior, we can change them—and eventually the behavior itself.

A manager who rewards his or her staff with a casual-dress day or a half day off if they meet a particular work goal is employing applied behavior analysis. So are a therapist and a client when they establish clear consequences of the client's behavior in order to reinforce more adaptive actions and discourage less adaptive ones (Chance, 2009). A teacher who notices that a troublesome student seems to enjoy the attention he receives—even when that attention is scolding—might use applied behavior analysis by changing her responses to the child's behavior, ignoring it instead (an example of negative punishment).

These examples show how attending to the consequences of behavior can be used to improve performance in settings such as the workplace and a classroom. Advocates of applied behavior analysis believe that many emotional and behavioral problems stem from inadequate or inappropriate consequences (Alberto & Troutman, 2009).

Applied behavior analysis has been effective in a wide range of situations. Practitioners have used it, for example, to train autistic individuals (Ashcroft, Argiro, & Keohane, 2010), children and adolescents with psychological problems (Miltenberger, 2008), and residents of mental health facilities (Phillips & Mudford, 2008); to instruct individuals in effective parenting (Phaneuf & McIntyre, 2007); to enhance environmentally conscious behaviors such as recycling and not littering (Geller, 2002); to get people to wear seatbelts (Streff & Geller, 1986); and to promote workplace safety (Geller, 2006). Applied behavior analysis can help people improve their self-control in many aspects of mental and physical health (Spiegler & Guevremont, 2010).

4- OBSERVATIONAL LEARNING

Would it make sense to teach a 15-year-old boy how to drive with either classical conditioning or operant conditioning procedures? Driving a car is a voluntary behavior, so classical conditioning would not apply. In terms of operant conditioning, we could ask him to try to drive down the road and then reward his positive behaviors. Not many of us would want to be on the road, though, when he makes mistakes. Albert Bandura (2007b, 2008, 2009, 2010a) believes that if all our learning was conducted in such a trial-and-error fashion, learning would be exceedingly tedious and at times hazardous. Instead, he says, many complex behaviors are the result of exposure to competent models. By observing other people, we can acquire knowledge, skills, rules, strategies, beliefs, and attitudes (Schunk, 2011). The capacity to learn by observation eliminates trial-and-error learning, and often such learning takes less time than operant conditioning.

Bandura's *observational learning,* also called *imitation* or *modeling,* is learning that occurs when a person observes and imitates behavior. Perhaps the most famous example of observational learning is the Bobo doll study (Bandura, Ross, & Ross, 1961). Bandura and his colleagues randomly assigned some children to watch an adult model aggressive behavior and other children to watch an adult behaving non-aggressively. In the experimental condition, children saw the model hit an inflated Bobo doll with a mallet, kick it in the air, punch it, and throw it, all the while hollering aggressive phrases such as "Hit him!" "Punch him in the nose!" and "Pow!" In the control condition, the model played with Tinkertoys and ignored the Bobo doll. Children who watched the aggressive model were much more likely to engage in aggressive behavior when left alone with Bobo (Bandura, Ross, & Ross, 1961).

Bandura (1986) described four main processes that are involved in observational learning: attention, retention, motor reproduction, and reinforcement. The first process that must occur is *attention* (which we considered in Chapter 4 due to its crucial role in perception). To reproduce a model's actions, you must attend to what the model is saying or doing. You might not hear what a friend says if the stereo is blaring, and you might miss your instructor's analysis of a problem if you are admiring someone sitting in the next row. As a further example, imagine that you decide to take a class to improve your drawing skills. To succeed, you need to attend to the instructor's words and hand movements. Characteristics of the model can influence attention to the model. Warm,

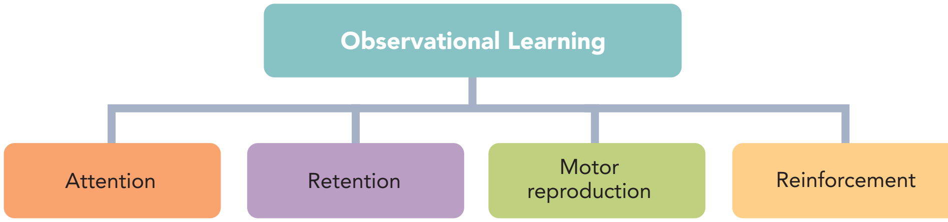


FIGURE 6.10 Bandura's Model of Observational Learning In terms of Bandura's model, if you are learning to ski, you need to attend to the instructor's words and demonstrations. You need to remember what the instructor did and his or her tips for avoiding disasters. You also need the motor abilities to reproduce what the instructor has shown you. Praise from the instructor after you have completed a few moves on the slopes should improve your motivation to continue skiing.

powerful, atypical people, for example, command more attention than do cold, weak, typical people.

Retention is the second process required for observational learning to occur. To reproduce a model's actions, you must encode the information and keep it in memory so that you can retrieve it. A simple verbal description, or a vivid image of what the model did, assists retention. (Memory is such an important cognitive process that Chapter 7 is devoted exclusively to it.) In the example of taking a class to sharpen your drawing skills, you will need to remember what the instructor said and did in modeling good drawing skills.

Motor reproduction, a third element of observational learning, is the process of imitating the model's actions. People might pay attention to a model and encode what they have seen, but limitations in motor development might make it difficult for them to reproduce the model's action. Thirteen-year-olds might see a professional basketball player do a reverse two-handed dunk but be unable to reproduce the pro's play. Similarly, in your drawing class, if you lack fine motor reproduction skills, you might be unable to follow the instructor's example.

Reinforcement is a final component of observational learning. In this case, the question is whether the model's behavior is followed by a consequence. Seeing a model attain a reward for an activity increases the chances that an observer will repeat the behavior—a process called *vicarious reinforcement*. On the other hand, seeing the model punished makes the observer less likely to repeat the behavior—a process called *vicarious punishment*. Unfortunately, vicarious reinforcement and vicarious punishment are often absent in, for example, media portrayals of violence and aggression.

Observational learning can be an important factor in the functioning of role models in inspiring people and changing their perceptions. Whether a model is similar to us can influence that model's effectiveness in modifying our behavior. The shortage of role models for women and minorities in science and engineering has often been suggested as a reason for the lack of women and minorities in these fields. After the election of Barack Obama as president of the United States, many commentators noted that for the first time, African American children could see concretely they might also attain the nation's highest office someday.

Figure 6.10 summarizes Bandura's model of observational learning.

test yourself

1. What are the four processes involved in observational learning?
2. What are two other names for observational learning?
3. What are vicarious reinforcement and vicarious punishment?

5. COGNITIVE FACTORS IN LEARNING

In learning about learning, we have looked at cognitive processes only as they apply in observational learning. Skinner's operant conditioning perspective and Pavlov's classical conditioning approach focus on the environment and observable behavior, not what is going on in the head of the learner. Many contemporary psychologists, including some behaviorists, recognize the importance of cognition and believe that learning involves more than environment–behavior connections (Bandura, 2007b, 2008, 2009, 2010a, 2010b; Schunk, 2011). A good starting place for considering cognitive influences in learning is the work of E. C. Tolman.

Purposive Behavior

E. C. Tolman (1932) emphasized the *purposiveness* of behavior—the idea that much of behavior is goal-directed. Tolman believed that it is necessary to study entire behavioral sequences in order to understand why people engage in particular actions. For example, high school students whose goal is to attend a leading college or university study hard in their classes. If we focused only on their studying, we would miss the purpose of their behavior. The students do not always study hard because they have been reinforced for studying in the past. Rather, studying is a means to intermediate goals (learning, high grades) that in turn improve their likelihood of getting into the college or university of their choice (Schunk, 2011).

We can see Tolman's legacy today in the extensive interest in the role of goal setting in human behavior (Urdan, 2010). Researchers are especially curious about how people self-regulate and self-monitor their behavior to reach a goal (Anderman & Anderman, 2010).

EXPECTANCY LEARNING AND INFORMATION

In studying the purposiveness of behavior, Tolman went beyond the stimuli and responses of Pavlov and Skinner to focus on cognitive mechanisms. Tolman said that when classical conditioning and operant conditioning occur, the organism acquires certain expectations. In classical conditioning, the young boy fears the rabbit because he expects it will hurt him. In operant conditioning, a woman works hard all week because she expects a paycheck on Friday. Expectancies are acquired from people's experiences with their environment. Expectancies influence a variety of human experiences. We set the goals we do because we believe that we can reach them.

Expectancies also play a role in the placebo effect, described earlier. Many painkillers have been shown to be more effective in reducing pain if patients can see the intravenous injection sites (Price, Finniss, & Benedetti, 2008). If patients can observe that they are getting a drug, they can harness their own expectations for pain reduction.

Tolman (1932) emphasized that the information value of the CS is important as a signal or an expectation that a UCS will follow. Anticipating contemporary thinking, Tolman believed that the information that the CS provides is the key to understanding classical conditioning.

One contemporary view of classical conditioning describes an organism as an information seeker, using logical and perceptual relations among events, along with preconceptions, to form a representation of the world (Rescorla, 2003, 2004, 2005, 2006a, 2006b, 2006c, 2009).

A classic experiment conducted by Leon Kamin (1968) illustrates the importance of an organism's history and the information provided by a conditioned stimulus in classical conditioning. Kamin conditioned a rat by repeatedly pairing a tone (CS) and a shock (UCS) until the tone alone produced fear (CR). Then he continued to pair the tone with the shock, but he turned on a light (a second CS) each time the tone sounded. Even though he repeatedly paired the light (CS) and the shock (UCS), the rat showed no conditioning to the light (the light by itself produced no CR). Conditioning to the light was blocked, almost as if the rat had not paid attention. The rat apparently used the tone as a signal to predict that a shock would be coming; information about the light's pairing with the shock was redundant with the information already learned about the tone's pairing with the shock. In this experiment, conditioning was governed not by the contiguity of the CS and UCS but instead by the rat's history and the information it received. Contemporary classical conditioning researchers are further exploring the role of information in an organism's learning (Beckers & others, 2006; Rescorla & Wagner, 2009; Schultz, Dayan, & Montague, 2009).

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LATENT LEARNING

latent learning Also called implicit learning, unreinforced learning that is not immediately reflected in behavior.

Experiments on latent learning provide other evidence to support the role of cognition in learning. **Latent learning** or *implicit learning* is unreinforced learning that is not immediately reflected in behavior. In one study, researchers put two groups of hungry rats in a maze and required them to find their way from a starting point to an end point (Tolman & Honzik, 1930). The first group found food (a reinforcer) at the end point; the second group found nothing there. In the operant conditioning view, the first group should learn the maze better than the second group, which is exactly what happened. However, when the researchers subsequently took some of the rats from the non-reinforced group and gave them food at the end point of the maze, they quickly began to run the maze as effectively as the reinforced group. The non-reinforced rats apparently had learned a great deal about the maze as they roamed around and explored it. However, their learning was *latent,* stored cognitively in their memories but not yet expressed behaviorally. When these rats were given a good reason (reinforcement with food) to run the maze speedily, they called on their latent learning to help them reach the end of the maze more quickly.

Outside a laboratory, latent learning is evident when you walk around a new setting to get "the lay of the land." The first time you visited your college campus, you may have wandered about without a specific destination in mind. Exploring the environment made you better prepared when the time came to find that 8 A.M. class.

Insight Learning

Like Tolman, the German gestalt psychologist Wolfgang Köhler believed that cognitive factors play a significant role in learning. Köhler spent four months in the Canary Islands during World War I observing the behavior of apes. There he conducted two fascinating experiments—the stick problem and the box problem. Although these two experiments are basically the same, the solutions to the problems are different. In both situations, the ape discovers that it cannot reach an alluring piece of fruit, either because the fruit is too high or because it is outside of the ape's cage and beyond reach. To solve the stick problem, the ape has to insert a small stick inside a larger stick to reach the fruit. To master the box problem, the ape must stack several boxes to reach the fruit (Figure 6.11).

According to Köhler (1925), solving these problems does not involve trial and error or simple connections between stimuli and responses. Rather, when the ape realizes that its customary actions are not going to help it get the fruit, it often sits for a period of time and appears to ponder how to solve the problem. Then it quickly rises, as if it has had a sudden flash of insight, piles the boxes on top of one another, and gets the fruit. **Insight learning** is a form of problem solving in which the organism develops a sudden insight into or understanding of a problem's solution.

insight learning A form of problem solving in which the organism develops a sudden insight into or understanding of a problem's solution.

Insight learning requires that we think "outside the box," setting aside previous expectations and assumptions. One way to enhance insight learning and creativity in human

FIGURE 6.11 **Insight Learning** Sultan, one of Köhler's brightest chimps, was faced with the problem of reaching a cluster of bananas overhead. He solved the problem by stacking boxes on top of one another to reach the bananas. Köhler called this type of problem solving "insight learning."

beings is through multicultural experiences (Leung & others, 2008). Correlational studies have shown that time spent living abroad is associated with higher insight learning performance among MBA students (Maddux & Galinsky, 2007). Experimental studies have also demonstrated this effect. In one study, U.S. college students were randomly assigned to view one of two slide shows—one about Chinese and U.S. culture and the other about a control topic. Those who saw the multicultural slide show scored higher on measures of creativity and insight, and these changes persisted for a week (Leung & others, 2008).

test yourself

1. What did Tolman mean by the purposiveness of behavior?
2. How do expectancies develop through classical and operant conditioning?
3. Define latent learning and insight learning and give an example of each.

6- BIOLOGICAL, CULTURAL, AND PSYCHOLOGICAL FACTORS IN LEARNING

Albert Einstein had many special talents. He combined enormous creativity with keen analytic ability to develop some of the twentieth century's most important insights into the nature of matter and the universe. Genes obviously endowed Einstein with extraordinary intellectual skills that enabled him to think and reason on a very high plane, but cultural factors also contributed to his genius. Einstein received an excellent, rigorous European education, and later in the United States he experienced the freedom and support believed to be important in creative exploration. Would Einstein have been able to develop his skills fully and to make such brilliant insights if he had grown up in a less advantageous environment? It is unlikely. Clearly, both biological *and* cultural factors contribute to learning.

Biological Constraints

Human beings cannot breathe under water, fish cannot ski, and cows cannot solve math problems. The structure of an organism's body permits certain kinds of learning and inhibits others (Chance, 2009). For example, chimpanzees cannot learn to speak human languages because they lack the necessary vocal equipment. In animals, various aspects of their physical makeup can influence what they can learn. Sometimes, species-typical behaviors (or instincts) can override even the best reinforcers, as we now consider.

INSTINCTIVE DRIFT

instinctive drift The tendency of animals to revert to instinctive behavior that interferes with learning.

Keller and Marion Breland (1961), students of B. F. Skinner, used operant conditioning to train animals to perform at fairs and conventions and in television advertisements. They applied Skinner's techniques to teach pigs to cart large wooden nickels to a piggy bank and deposit them. They also trained raccoons to pick up a coin and drop it into a metal tray.

Although the pigs and raccoons, as well as chickens and other animals, performed most of the tasks well (raccoons became adept basketball players, for example—see Figure 6.12), some of the animals began acting strangely. Instead of picking up the large wooden nickels and carrying them to the piggy bank, the pigs dropped the nickels on the ground, shoved them with their snouts, tossed them in the air, and then repeated these actions. The raccoons began to hold on to their coins rather than dropping them into the metal tray. When two coins were introduced, the raccoons rubbed them together in a miserly fashion. Somehow these behaviors overwhelmed the strength of the reinforcement. This example of biological influences on learning illustrates **instinctive drift,** the tendency of animals to revert to instinctive behavior that interferes with learning.

Why were the pigs and the raccoons misbehaving? The pigs were rooting, an instinct that is used to uncover edible roots. The raccoons were engaging in an instinctive food-washing response. Their instinctive drift interfered with learning.

FIGURE 6.12 **Instinctive Drift** This raccoon's skill in using its hands made it an excellent basketball player, but because of instinctive drift, the raccoon had a much more difficult time dropping coins into a tray.

PREPAREDNESS

Some animals learn readily in one situation but have difficulty learning in slightly different circumstances (Garcia & Koelling, 1966, 2009). The difficulty might result not from some aspect of the learning situation but from the organism's biological predisposition (Seligman, 1970). **Preparedness** is the species-specific biological predisposition to learn in certain ways but not others.

● **preparedness** The species-specific biological predisposition to learn in certain ways but not others.

Much of the evidence for preparedness comes from research on taste aversion (Garcia, 1989; Garcia & Koelling, 2009). Recall that taste aversion involves a single trial of learning the association between a particular taste and nausea. Rats that experience low levels of radiation after eating show a strong aversion to the food they were eating when the radiation made them ill. This aversion can last for as long as 32 days. Such long-term effects cannot be accounted for by classical conditioning, which would argue that a single pairing of the conditioned and unconditioned stimuli would not last that long (Garcia, Ervin, & Koelling, 1966). Taste aversion learning occurs in animals, including humans, that choose their food based on taste and smell. Other species are prepared to learn rapid associations between, for instance, colors of foods and illness.

Another example of preparedness comes from research on conditioning humans and monkeys to associate snakes with fear. Susan Mineka and Arne Ohman have investigated the fascinating natural power of snakes to evoke fear in many mammals (Mineka & Ohman, 2002; Ohman & Mineka, 2003). Many monkeys and humans fear snakes, and both monkeys and humans are very quick to learn the association between snakes and fear. In classical conditioning studies, when pictures of snakes (CS) are paired with electrical shocks (UCS), the snakes are likely to quickly and strongly evoke fear (the CR). Interestingly, pairing pictures of, say, flowers (CS) with electrical shocks produces much weaker associations (Mineka & Ohman, 2002; Ohman & Soares, 1998). Even more significantly, pictures of snakes can serve as conditioned stimuli for fearful responses, even when the pictures are presented so rapidly that they cannot be consciously perceived (Ohman & Mineka, 2001).

The link between snakes and fear has been demonstrated not only in classical conditioning paradigms. Monkeys that have been raised in the lab and that have never seen a snake rapidly learn to fear snakes, even entirely by observational learning. Lab monkeys that see a videotape of a monkey expressing fear toward a snake learn to be afraid of snakes faster than monkeys seeing the same fear video spliced so that the feared object is a rabbit, a flower, or a mushroom (Ohman & Mineka, 2003).

Mineka and Ohman (2002) suggest that these results demonstrate preparedness among mammals to associate snakes with fear and aversive stimuli. They suggest that this association is related to the amygdala (the part of the limbic system that is related to emotion) and is difficult to modify. These researchers suggest that this preparedness for fear of snakes has emerged out of the threat that reptiles likely posed to our evolutionary ancestors.

On the Indonesian island of Bali, young children learn traditional dances, whereas in Norway children commonly learn to ski early in life. As cultures vary, so does the content of learning.

Cultural Influences

Traditionally, interest in the cultural context of human learning has been limited, partly because the organisms in those contexts typically were animals. The question arises, how might culture influence human learning? Most psychologists agree that the principles of classical conditioning, operant conditioning, and observational learning are universal and are powerful learning processes in every culture. However, culture can influence the *degree* to which these learning processes are used (Goodnow, 2010). For example, Mexican American students may learn more through observational learning, while Euro-American students may be more accustomed to learn through direct instruction (Mejia-Arauz, Rogoff, & Paradise, 2005).

In addition, culture can determine the *content* of learning (Shiraev & Levy, 2010). We cannot learn about something we do not experience. The 4-year-old who grows up among the Bushmen of the Kalahari Desert is unlikely to learn about taking baths and eating with a knife and fork. Similarly, a child growing up in Chicago is unlikely to be skilled at tracking animals and finding water-bearing roots in the desert. Learning often requires practice, and certain behaviors are practiced more often in some cultures than in others. In Bali, many children are skilled dancers by the age of 6, whereas Norwegian children are much more likely to be good skiers and skaters by that age.

Psychological Constraints

Are there psychological constraints on learning? For animals, the answer is probably no. For humans, the answer may well be yes. This section opened with the claim that fish cannot ski. The truth of this statement is clear. Biological circumstances make it impossible. If we put biological considerations aside, we might ask ourselves about times in our lives when we feel like a fish trying to ski—when we feel that we just do not have what it takes to learn a skill or master a task.

Carol Dweck (2006) uses the term *mindset* to describe the way our beliefs about ability dictate what goals we set for ourselves, what we think we *can* learn, and ultimately what we *do* learn. Individuals have one of two mindsets: a *fixed mindset,* in which they believe that their qualities are carved in stone and cannot change; or a *growth mindset,* in which they believe their qualities can change and improve through their effort. These two mindsets have implications for the meaning of failure. From a fixed mindset, failure means lack of ability. From a growth mindset, however, failure tells the person what he or she still needs to learn. Your mindset influences whether you will be optimistic or pessimistic, what your goals will be, how hard you will strive to reach those goals, and how successful you are in college and after.

Dweck (2006) studied first-year pre-med majors taking their first chemistry class in college. Students with a growth mindset got higher grades than those with a fixed mindset. Even when they did not do well on a test, the growth-mindset students bounced back on the next test. Fixed-mindset students typically read and re-read the text and class notes or tried to memorize everything verbatim. The fixed-mindset students who did poorly on tests concluded that chemistry and maybe pre-med were not for them. By contrast, growth-mindset students took charge of their motivation and learning, searching for themes and principles in the course and going over mistakes until they understood why they made them. In Dweck's analysis (2006, p. 61), "They were studying to learn, not just ace the test. And, actually, this is why they got higher grades—not because they were smarter or had a better background in science."

Dweck and her colleagues recently incorporated information about the brain's plasticity into their effort to improve students' motivation to achieve and succeed (Blackwell & Dweck, 2008; Blackwell, Trzesniewski, & Dweck, 2007; Dweck & Master, 2009). In one study, they assigned two groups of students to eight sessions of either (1) study skills instruction or (2) study skills instruction plus information about the importance of developing a growth mindset (called *incremental theory* in the research) (Blackwell, Trzesniewski, & Dweck, 2007). One of the exercises in the growth-mindset group was titled "You Can Grow Your Brain," and it emphasized that the brain is like a muscle that can change and grow as it gets exercised and develops new connections. Students were informed that the more they challenged their brain to learn, the more their brain cells would grow. Prior to the intervention, both groups had a pattern of declining math scores. Following the intervention, the group that received only the study skills instruction continued to decline, but the group that received the study skills instruction *plus* the growth-mindset emphasis reversed the downward trend and improved their math achievement.

In other work, Dweck has created a computer-based workshop, "Brainology," to teach students that their intelligence can change (Blackwell & Dweck, 2008). Students experience six modules about how the brain works and how they can make their brain improve. After the recent testing of the modules in 20 New York City schools, students strongly endorsed the value of the computer-based brain modules. One student said, "I will try harder because I know that the more you try, the more your brain knows" (Dweck & Master, 2009, p. 137).

Following are some effective strategies for developing a growth mindset (Dweck, 2006):

- *Understand that your intelligence and thinking skills are not fixed but can change.* Even if you are extremely bright, with effort you can increase your intelligence.
- *Become passionate about learning and stretch your mind in challenging situations.* It is easy to withdraw into a fixed mindset when the going gets tough. However, as you bump up against obstacles, keep growing, work harder, stay the course, and improve your strategies, you will become a more successful person.
- *Think about the growth mindsets of people you admire.* Possibly you have a hero, someone who has achieved something extraordinary. You may have thought his or her accomplishments came easy because the person is so talented. If you find out more about this person, though, you likely will discover that hard work and effort over a long period of time were responsible for his or her achievements.
- *Begin now.* If you have a fixed mindset, commit to changing now. Think about when, where, and how you will begin using your new growth mindset.

Dweck's work challenges us to consider the limits we place on our own learning. Our beliefs about ability profoundly influence what we try to learn. As any 7-year-old with a growth mindset would tell you, you never know what you can do until you try.

test yourself

1. What are two biological constraints on learning?
2. How does culture influence learning?
3. What is the difference between a fixed mindset and a growth mindset?

7· LEARNING AND HEALTH AND WELLNESS

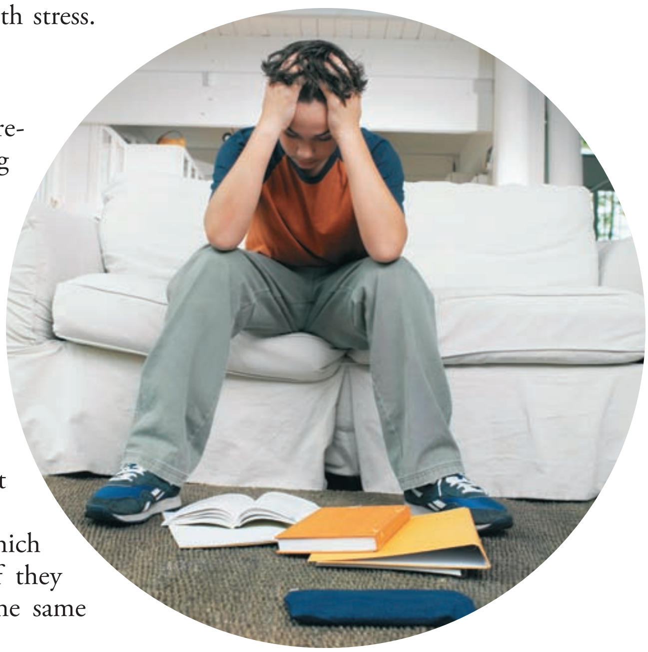
In this chapter, we have examined the main psychological approaches to learning. In this final section, we consider specific ways that research on learning has shed light on human health and wellness. We examine in particular the factors that animal learning models have identified as playing an important role in the experience of stress—which, as you will recall from Chapter 3, is the organism's response to a threat in the environment.

What Can a Rat Tell Us About Stress?

A great deal of research in learning has relied primarily on models of animals, such as rats, to probe the principles that underlie human learning. Research on the stress response in rats provides useful insights into how we humans can deal with stress.

PREDICTABILITY

One very powerful aspect of potentially stressful experiences is their predictability. For a rat, predictability might depend on getting a warning buzzer before receiving a shock. Although the rat still experiences the shock, a buzzer-preceded shock causes less stress than a shock that is received with no warning (Abbott, Schoen, & Badia, 1984). Even having *good* experiences on a predictable schedule is less stressful than having good things happen at random times. For example, a rat might do very well receiving its daily chow at specific times during the day, but if the timing is random, the rat experiences stress. Similarly, when you receive a gift on your birthday or a holiday, the experience feels good. However, if someone surprises you with a present out of the blue, you might feel some stress as you wonder, "What is this person up to?"



Also relevant is classic research by Judith Rodin and her colleagues, which demonstrated that nursing home residents showed better adjustment if they experienced a given number of visits at predictable times rather than the same number of visits at random times (Langer & Rodin, 1976).

CONTROL

Feeling in control may be a key to avoiding feelings of stress over difficulties. Specifically, once you have experienced control over negative events, you may be "protected" from stress, even during trying times.

Returning to an animal model, suppose that a rat has been trained to avoid a shock by pressing a lever. Over time, even when the lever is no longer related to the shock, the rat presses it during the shock—and experiences less stress. We might imagine the rat thinking, "Gee, it would be really worse if I weren't pressing this lever!" Researchers have also found links between having control and experiencing stress in humans. For example, nursing home residents are more likely to thrive if they receive visits at times they personally choose. In addition, simply having a plant to take care of is associated with living longer for nursing home residents (Langer & Rodin, 1976).

A lack of control over aversive stimuli can be particularly stressful. For example, individuals exposed to uncontrollable loud blasts of noise show lowered immune system function (Sieber & others, 1992). One result of exposure to uncontrollable negative events is *learned helplessness,* which we examined earlier in this chapter. In learned helplessness, the organism has learned through experience that outcomes are not controllable. As a result, the organism stops trying to exert control.

Research has shown that, to break the lock of learned helplessness, dogs and rats have to be forcibly moved to escape an aversive shock (Seligman, Rosellini, & Kozak, 1975). From such animal studies, we can appreciate how difficult it may be for individuals who find themselves in situations in which they have little control—for example, women who are victims of domestic violence (L. E. A. Walker, 2009)—to take action. We can also appreciate the helplessness sometimes experienced by students with learning difficulties who withdraw from their coursework because they feel unable to influence outcomes in school (Gwernan-Jones & Burden, 2010).

IMPROVEMENT

Imagine that you have two mice, both of which are receiving mild electrical shocks. One of them, Jerry, receives 50 shocks every hour, and the other, Chuck-E, receives 10 shocks every hour. The next day both rats are switched to 25 shocks every hour. Which one is more stressed out at the end of the second day? The answer is that even though Jerry has experienced more shocks in general, Chuck-E is more likely to show the wear and tear of stress. In Jerry's world, even with 25 shocks an hour, *things are better*. The perception of improvement, even in a situation that is objectively worse than another, is related to lowered stress (Sapolsky, 2004).

OUTLETS FOR FRUSTRATION

When things are not going well for us, it often feels good to seek out an outlet, such as going for a run or, perhaps even better, taking a kickboxing class. Likewise, for a rat, having an outlet for life's frustrations is related to lowered stress symptoms. Rats that have a wooden post to gnaw on or even a furry little friend to complain to are less stressed out in response to negative circumstances.

Although studies using rats and dogs may seem far afield of our everyday experiences, researchers' observations provide important clues for avoiding stress. When we cultivate predictable environments and take control of circumstances, stress decreases. Further, when we can see improvement, even in difficult times, stress is likely to diminish. Finally, when we have an outlet for our frustrations in life—whether it is physical exercise, writing, or art—we can relieve our stress. When it comes to stress, humans have a lot to learn from rats.

test yourself

1. Based on research involving animal models, what are four ways in which human beings can reduce stress?
2. What is the main effect of learned helplessness on an organism?
3. Why do individuals who are experiencing domestic violence often have difficulty in overcoming their troubles?

1. TYPES OF LEARNING

Learning is a systematic, relatively permanent change in behavior that occurs through experience. Associative learning involves learning by making a connection between two events. Observational learning is learning by watching what other people do. Conditioning is the process by which associative learning occurs. In classical conditioning, organisms learn the association between two stimuli. In operant conditioning, they learn the association between behavior and a consequence.

2. CLASSICAL CONDITIONING

Classical conditioning occurs when a neutral stimulus becomes associated with a meaningful stimulus and comes to elicit a similar response. Pavlov discovered that an organism learns the association between an unconditioned stimulus (UCS) and a conditioned stimulus (CS). The UCS automatically produces the unconditioned response (UCR). After conditioning (CS–UCS pairing), the CS elicits the conditioned response (CR) by itself. Acquisition in classical conditioning is the initial linking of stimuli and responses, which involves a neutral stimulus being associated with the UCS so that the CS comes to elicit the CR. Two important aspects of acquisition are contiguity and contingency.

Generalization in classical conditioning is the tendency of a new stimulus that is similar to the original conditioned stimulus to elicit a response that is similar to the conditioned response. Discrimination is the process of learning to respond to certain stimuli and not to others. Extinction is the weakening of the CR in the absence of the UCS. Spontaneous recovery is the recurrence of a CR after a time delay without further conditioning. Renewal is the occurrence of the CR (even after extinction) when the CS is presented in a novel environment.

In humans, classical conditioning has been applied to eliminating fears, treating addiction, understanding taste aversion, and explaining such different experiences as pleasant emotions and drug overdose.

3. OPERANT CONDITIONING

Operant conditioning is a form of learning in which the consequences of behavior produce changes in the probability of the behavior's occurrence. Skinner described the behavior of the organism as operant: The behavior operates on the environment, and the environment in turn operates on the organism. Whereas classical conditioning involves respondent behavior, operant conditioning involves operant behavior. In most instances, operant conditioning is better at explaining voluntary behavior than is classical conditioning.

Thorndike's law of effect states that behaviors followed by positive outcomes are strengthened, whereas behaviors followed by negative outcomes are weakened. Skinner built on this idea to develop the notion of operant conditioning.

Shaping is the process of rewarding approximations of desired behavior in order to shorten the learning process. Principles of reinforcement include the distinction between positive reinforcement (the frequency of a behavior increases because it is followed by a rewarding stimulus) and negative reinforcement (the frequency of behavior increases because it is followed by the removal of an aversive, or unpleasant, stimulus). Positive reinforcement can be classified as primary reinforcement (using reinforcers that are innately satisfying) and secondary reinforcement (using reinforcers that acquire positive value through experience). Reinforcement can also be continuous (a behavior is reinforced every time) or partial (a behavior is reinforced only a portion of the time). Schedules of reinforcement—fixed ratio, variable ratio, fixed interval, and variable interval—determine when a behavior will be reinforced.

Operant, or instrumental, conditioning involves generalization (giving the same response to similar stimuli), discrimination (responding to stimuli that signal that a behavior will or will not be reinforced), and extinction (a decreasing tendency to perform a previously reinforced behavior when reinforcement is stopped).

Punishment is a consequence that decreases the likelihood that a behavior will occur. In positive punishment, a behavior decreases when it is followed by an unpleasant stimulus. In negative punishment, a behavior decreases when a positive stimulus is removed from it.

Applied behavior analysis, or behavior modification, involves the application of operant conditioning principles to a variety of real-life behaviors.

4. OBSERVATIONAL LEARNING

Observational learning occurs when a person observes and imitates someone else's behavior. Bandura identified four main processes in observational learning: attention (paying heed to what someone is saying or doing), retention (encoding that information and keeping it in memory so that you can retrieve it), motor reproduction (imitating the actions of the person being observed), and reinforcement (seeing the person attain a reward for the activity).

5. COGNITIVE FACTORS IN LEARNING

Tolman emphasized the purposiveness of behavior. His belief was that much of behavior is goal-directed. In studying purposiveness, Tolman went beyond stimuli and responses to discuss cognitive mechanisms; he believed that expectancies, acquired through experiences with the environment, are an important cognitive mechanism in learning.

Latent learning is unreinforced learning that is not immediately reflected in behavior. Latent learning may occur when a rat or a person roams a particular location and shows knowledge of the area when that knowledge is rewarded.

Köhler developed the concept of insight learning, a form of problem solving in which the organism develops a sudden insight into or understanding of a problem's solution.

6. BIOLOGICAL, CULTURAL, AND PSYCHOLOGICAL FACTORS IN LEARNING

Biology restricts what an organism can learn from experience. These constraints include instinctive drift (the tendency of animals to revert to instinctive behavior that interferes with learned behavior), preparedness (the species-specific biological predisposition to learn in certain ways but not in others), and taste aversion (the biological predisposition to avoid foods that have caused sickness in the past).

Although most psychologists agree that the principles of classical conditioning, operant conditioning, and observational learning are universal, cultural customs can influence the degree to which these learning processes are used. Culture also often determines the content of learning.

In addition, what we learn is determined in part by what we believe we can learn. Dweck emphasizes that individuals benefit enormously from having a growth mindset rather than a fixed mindset.

7. LEARNING AND HEALTH AND WELLNESS

Research using rats and other animals has demonstrated four important variables involved in the human stress response: predictability, perceived control, perceptions of improvement, and outlets for frustration.

SUMMARY

key terms

learning, p. 174
behaviorism, p. 174
associative learning, p. 174
observational learning, p. 175
classical conditioning, p. 175
unconditioned stimulus (UCS), p. 176
unconditioned response (UCR), p. 176
conditioned stimulus (CS), p. 176
conditioned response (CR), p. 176
acquisition, p. 177
generalization (in classical conditioning), p. 178
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insight learning, p. 197
instinctive drift, p. 198
preparedness, p. 199

apply your knowledge

1. Enlist some of your classmates to play this mind game on your professor. Every time your instructor moves to the right side of the room during lecture, be more attentive, smile, and nod. Start out by shaping—every time he or she moves even a little to the right, give a smile or nod. See how far you can get the instructor to go using this simple reward. In one introductory psychology class, students got their professor to move all the way to the right wall of the classroom, where she leaned, completely clueless.
2. The next time you are alone with a friend, try your best to use shaping and the principles of operant conditioning to get the person to touch the tip of his or her nose. Can you do it?
3. Demonstrate Pavlov's work with your friends. First buy some lemons and slice them. Then gather a group of friends to watch something on TV together, maybe the Academy Awards or the Super Bowl. Pick a CS that you know will come up a lot on the show—for example, someone saying "thank you" during the Oscars or a soft drink or beer ad during the Super Bowl. For the first half hour, everyone has to suck on a lemon slice (the UCS) when the CS is presented. After the first half hour, take the lemons away. Have everyone report on their salivation levels (the CR) whenever the CS is presented later in the show. What happens?
4. Positive reinforcement and negative reinforcement can be difficult concepts to grasp. The real-world examples and accompanying practice exercises on the following website should help to clarify the distinction: http://psych.athabascau.ca/html/prtut/reinpair.htm
5. Imagine that you are about to begin an internship in an organization where you would like to have a permanent position someday. Use the processes of observational learning to describe your strategy for making the most of your internship.