5

LEARNING

We acquire and refine our skills, abilities, and behavior through learning.

WHAT'S TO COME

A FOUR-LEGGED COWORKER

Declan lies on his back wanting his belly scratched. The 8-year-old black Labrador swings his legs in the air for a few minutes before resigning himself to chewing on someone's shoe. . . . In the office he behaves like any pet dog, but in the field he is like a tornado—focused on finding illegal drugs being smuggled. Declan is a drug-detector dog for the Customs Service and has been busting drug smugglers with his handler, Kevin Hattrill, for eight years.

Airport passengers look on with curiosity as Declan darts around people and their luggage. Within minutes he sniffs out a person of interest, who is taken away and questioned by airport authorities.

Dogs like Declan are trained to detect illegal drugs, such as cannabis, methamphetamine and cocaine, or explosives. Hattrill said the dogs were dual response-trained when they detected something. "If the odor is around a passenger, they are trained to sit beside them. If it's around cargo, they are trained to scratch. When they detect something, their whole temperament changes. The dogs can screen up to 300 people within 10 to 15 minutes at the airport. Nothing else can do that" (McKenzie-McLean, 2006, p. 7).

Declan's expertise did not just happen, of course. It is the result of painstaking training procedures—the same ones that are at work in humans, illustrated by our ability to read a book, drive a car, play poker, study for a test, or perform any of the numerous activities that make up our daily routine. Like Declan, each of us must acquire and then refine our skills and abilities through learning.

As You READ >>

- What is the role of reward and punishment in learning?
- How can the information from this chapter be used to change undesired behaviors?
- Does thinking matter at all in learning?

Times Square in New York City is a favorite destination for tourists, who can't help but notice all the large neon signs, crowded streets, noise, and unfamiliar smells, all stimuli to which long-time residents are habituated.

Learning is a relatively permanent change in behavior that is brought about by experience. From the beginning of life, humans are primed for learning. Infants exhibit a primitive type of learning called *habituation*, defined by psychologists as the decrease in response to a stimulus that occurs after repeated presentations of the same stimulus. Young infants, for example, may initially show interest in a novel stimulus, such as a brightly colored toy, but they will soon lose interest if they see the same toy over and over. Habituation permits us to ignore things that have stopped providing new information. Adults exhibit habituation, too: Newlyweds soon stop noticing that they are wearing a wedding ring.

Most learning is considerably more complex than habituation, and the study of learning has been at the core of the field of psychology. Psychologists have approached the study of learning from several angles. Among the most fundamental are studies of the type of learning that is illustrated in responses ranging from a dog salivating when it hears its owner opening a can of dog food to the emotions we feel when our national anthem is played. Other theories consider how learning is a consequence of rewarding circumstances. Finally, several other approaches focus on the cognitive aspects of learning, that is, the thought processes that underlie learning.

Although philosophers have speculated on the foundations of learning since the time of Aristotle, the first systematic research on learning in the West was done at the beginning of the twentieth century, when Ivan Pavlov (does the name ring a bell?) developed a framework for learning called classical conditioning.

>> Classical Conditioning

In Hawaii, there is a popular snack called *li hing mui*. If you just say these three words out loud around people who grew up in Hawaii, many will start to salivate. If you are not from Hawaii, you probably have no reaction to the words *li hing mui*. Is there a word or phrase or event that makes you salivate? Maybe McDonald's golden arches make you salivate. If so, you are displaying a basic form of learning called classical conditioning. *Classical conditioning* helps explain such diverse phenomena as shivering when you look outside at night and see snow, and getting sweaty palms and a racing heart while watching a movie that has scary music, dark scenes, and sudden scene changes.

WHAT IS CLASSICAL CONDITIONING?

Ivan Pavlov (1849–1936), a Russian physiologist, never intended to do psychological research. In 1904 he won the Nobel Prize for his work on digestion, a testament to his contribution to that field. Yet Pavlov is remembered not for his physiological research but for his experiments on learning—work that he began quite accidentally (Marks, 2004; Samoilov & Zayas, 2007).

Pavlov had been studying the secretion of stomach acids and salivation in dogs in response to the ingestion of varying amounts and kinds of food. While doing that, he observed a curious phenomenon: Sometimes stomach secretions and salivation would begin in the dogs when they had not yet eaten any food. The mere sight of the experimenter who normally brought the food, or even the sound of the experimenter's footsteps, was enough to produce salivation in the dogs. Pavlov's genius lay in his ability to recognize the implications of this discovery. He saw that the dogs were responding not only on the basis of a biological need (hunger) but also as a result of learning—or, as it came to be called, classical conditioning. **Classical conditioning** is a type of learning in which a neutral stimulus (such as the experimenter's footsteps) comes to elicit a response after being paired with a stimulus (such as food) that naturally brings about that response.

To demonstrate classical conditioning, Pavlov (1927) attached a tube to a dog's mouth so that he could measure precisely the dog's salivation. He then rang a bell and, just a few seconds later, allowed the dog to eat its food. This pairing occurred repeatedly and was carefully planned so that, each time, exactly the same amount of time elapsed between the presentation of the bell and the food. At first the dog would salivate only when the food was in its mouth, but soon it began to salivate at the sound of the bell. In fact, even when Pavlov stopped giving the food to the dog, the dog still salivated after hearing the sound. The dog had been classically conditioned to salivate to the bell.

To people who grew up in Hawaii, *li hing mui,* a salty sweet or sour snack, is a mouth-watering treat. For anyone else, it may or may not be something you can learn to enjoy.

The basic processes of classical conditioning that underlie Pavlov's discovery are straightforward, although the terminology he chose is not simple. Before conditioning, there are two unrelated stimuli: the ringing of a bell and food. We know that normally the ringing of a bell does not lead to salivation, although it may lead to some other type of response, such as pricking up the ears. The bell is therefore called the **neutral stimulus**, because it is a stimulus that, before conditioning, does not naturally bring about the response in which we are interested. We also have food, which naturally causes a dog to salivate when it is placed on the tongue—the response we want to condition. The food on the tongue is considered an **unconditioned stimulus**, or **UCS**, because food placed in a dog's mouth automatically causes salivation to occur. The reflexive response that the food elicits (salivation) is called an **unconditioned response**, or **UCR**. This is a natural, inborn, reflexive response that is not associated with previous learning.

learning A relatively permanent change in behavior brought about by experience.

classical conditioning A type of learning in which a neutral stimulus comes to bring about a response after it is paired with a stimulus that naturally brings about that response.

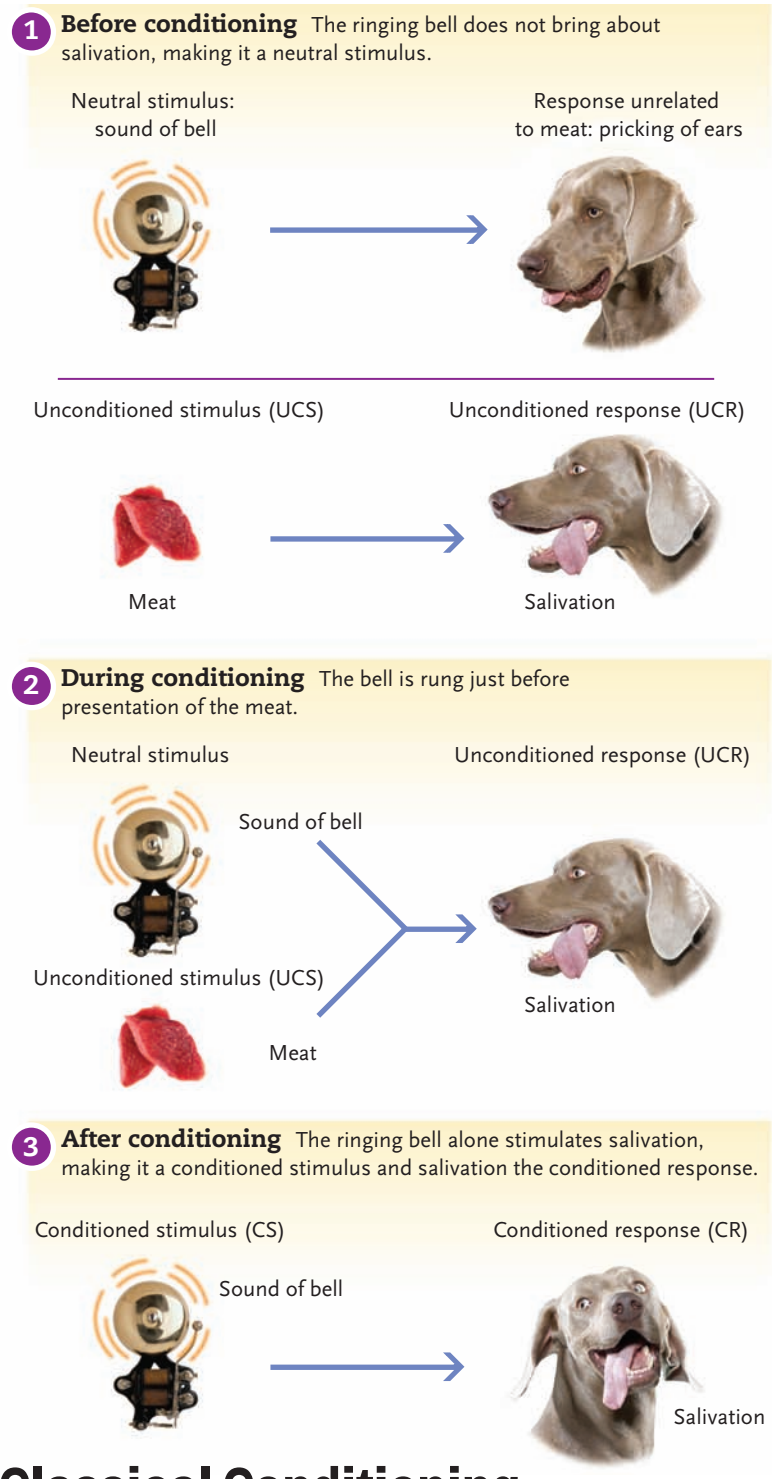
neutral stimulus A stimulus that, before conditioning, does not naturally bring about the response of interest.

unconditioned stimulus (UCS) A stimulus that naturally brings about a particular response without having been learned.

unconditioned response (UCR) A response that is natural and needs no training (for example, salivation at the smell of food).

One way to tell if a stimulus is a UCS is to consider whether every normal human would experience the UCR. If the answer is yes, then it is likely a UCS. For example, would any healthy human experience sweating in extremely hot and humid weather? The answer is yes. So extreme heat and humidity are the UCS and sweating is the UCR. Unconditioned responses are always brought about by the presence of unconditioned stimuli.

Returning to Pavlov's study, the bell is rung each time the dog is about to receive food. The goal of conditioning is for the dog to associate the bell with the unconditioned stimulus (meat) and



Classical Conditioning

STUDY TIP

To understand the process of classical conditioning, you need to know the difference between the US and the UCS and their relationship to the UR and the UCR.

therefore to bring about the same response as the unconditioned stimulus. After a number of pairings of the bell and meat, the bell alone causes the dog to salivate.

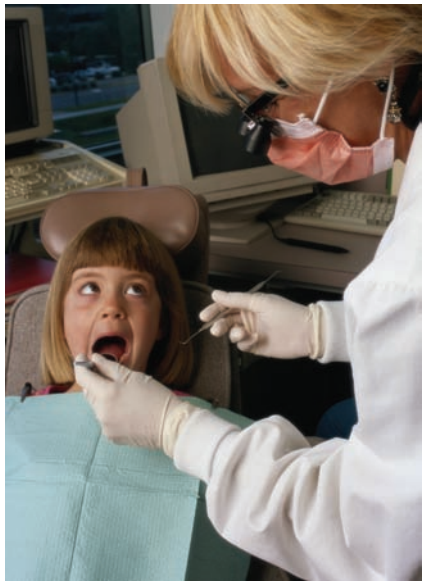
When conditioning is complete, the bell is no longer a neutral stimulus but has become a **conditioned stimulus**, or **CS**. At this point, salivation in response to the conditioned stimulus (bell) is considered a **conditioned response**, or **CR**. After conditioning, then, the conditioned stimulus evokes the conditioned response.

Although the terminology Pavlov used to describe classical conditioning may seem confusing, the following summary can help make the relationships between stimuli and responses easier to understand and remember:

- Conditioned = learned
- Unconditioned = not learned (inborn, genetically programmed)
- An *un*conditioned stimulus leads to an *un*conditioned response.
- *Un*conditioned stimulus–*un*conditioned response pairings are *un*learned and *un*trained.
- During conditioning, a previously neutral stimulus is transformed into the conditioned stimulus.
- A conditioned stimulus leads to a conditioned response, and a conditioned stimulus–conditioned response pairing is a consequence of learning and training.
- An unconditioned response and a conditioned response are similar (such as salivation in Pavlov's experiment), but the unconditioned response occurs naturally and is typically stronger, whereas the conditioned response is learned and usually less intense.

HOW DO CONDITIONING PRINCIPLES APPLY TO HUMAN BEHAVIOR?

Although the first conditioning experiments were carried out with animals, classical conditioning principles were soon found to explain many aspects of everyday human behavior. Recall, for instance, the earlier illustration of how people may salivate at the sight of McDonald's golden arches. The cause of this reaction is classical conditioning: The previously neutral arches have become associated with the food from inside the restaurant that has been eaten on previous occasions (the unconditioned stimulus), causing the arches to become a conditioned stimulus that brings about the conditioned response of salivation.



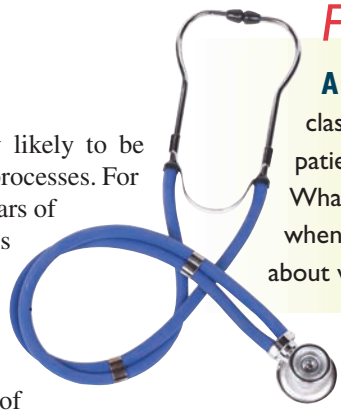
Avoiding the dentist because of a previous unpleasant experience isn't uncommon. That's how stimulus generalization works.

Emotional responses are especially likely to be learned through classical conditioning processes. For instance, how do some of us develop fears of mice, cockroaches, and other creatures that are typically harmless? In a now infamous case study, psychologist John B. Watson and colleague Rosalie Rayner (1920) showed that classical conditioning could be one cause of such fears by conditioning an 11-month-old infant named Albert to be afraid of rats. "Little Albert," like any healthy infant with normal hearing, initially was frightened by loud noises (UCS) but had no fear of rats (neutral stimulus).

In the study, the experimenters went behind Albert and made a very loud, sudden noise just as they showed Little Albert a rat. The noise (the unconditioned stimulus) evoked fear (the unconditioned response). After just a few pairings of noise and rat, Albert began to show fear of the rat by itself, bursting into tears when he saw it. The rat, then, had become a CS that brought about the CR, fear. Furthermore, the conditioning effects lingered: Five days later, Albert reacted with fear not only when shown a rat but also when shown objects that looked similar to the white, furry rat, including a white rabbit, a white sealskin coat, and even a white Santa Claus mask. (By the way, we don't know what happened to the unfortunate Little Albert. Watson, the experimenter, has been condemned for using ethically questionable procedures that would not be permitted today.)

conditioned stimulus (CS) A once-neutral stimulus that has been paired with an unconditioned stimulus to bring about a response formerly caused only by the unconditioned stimulus.

conditioned response (CR) A response that, after conditioning, follows a previously neutral stimulus (for example, salivation at the ringing of a bell).



From the perspective of . . .

A PHYSICIAN How could knowledge of classical conditioning be useful in addressing patients' anxieties about visits to the doctor? What are some changes a physician could make when dealing with a patient who has a phobia about visiting the doctor?

Learning through classical conditioning occurs throughout our lives. For example, you may be one of many who do not go to a dentist as often as you should because of prior associations of dentists with pain. In this case, the UCS would be the drill hitting a nerve in your tooth, and the UCR would be pain. What is the CS? In extreme cases, classical conditioning can lead to the development of *phobias*, which are intense, irrational fears that we will consider later in the book.

Classical conditioning also accounts for pleasant experiences. That is, certain events trigger the release of neurotransmitters that help us feel pleasure. The runner's high, for example, occurs when endorphins are released in response

get involved!

How quickly can you classically condition your pet (or a friend's pet)? Begin teaching the animal a new association by saying "The British are coming, the British are coming!" (or any statement you come up with) and then immediately getting a treat for the pet. How many times must you do this before the animal starts responding to your statement in the same way it reacts to treat presentation? If you have access to a number of dogs and cats, you can even compare them. Which species do you think would be the speediest at learning through classical conditioning? You might be surprised.

to jogging a long distance. The UCS is the extended jogging, and the UCR is the release of endorphins. The CS could be any number of things, including the smell or sight of running clothes or shoes. Classical conditioning, then, may explain many of the reactions we have to stimuli in the world around us.

EXTINCTION OF A CONDITIONED RESPONSE

What would happen if a dog that had become classically conditioned to salivate at the ringing of a bell never again received food when the bell was rung? The answer lies in one of the basic phenomena of learning: extinction. **Extinction** occurs when a previously conditioned response decreases in frequency and eventually disappears.

extinction A basic phenomenon of learning that occurs when a previously conditioned response decreases in frequency and eventually disappears.

spontaneous recovery The reemergence of an extinguished conditioned response after a period of rest and with no further conditioning.

stimulus generalization Occurs when a conditioned response follows a stimulus that is similar to the original conditioned stimulus; the more similar the two stimuli are, the more likely generalization is to occur.

To produce extinction, one needs to end the association between conditioned stimuli and unconditioned stimuli. For instance, if we had trained a dog to salivate (CR) at the ringing of a bell (CS), we could produce extinction by repeatedly ringing the bell but *not* providing food. At first the dog would continue to salivate when it heard the bell, but after a few such instances, the amount of salivation would probably decline, and the dog would eventually stop responding to the bell altogether. At that point, we could say that the response had been extinguished. In sum, extinction occurs when the conditioned stimulus is presented repeatedly without the unconditioned stimulus.

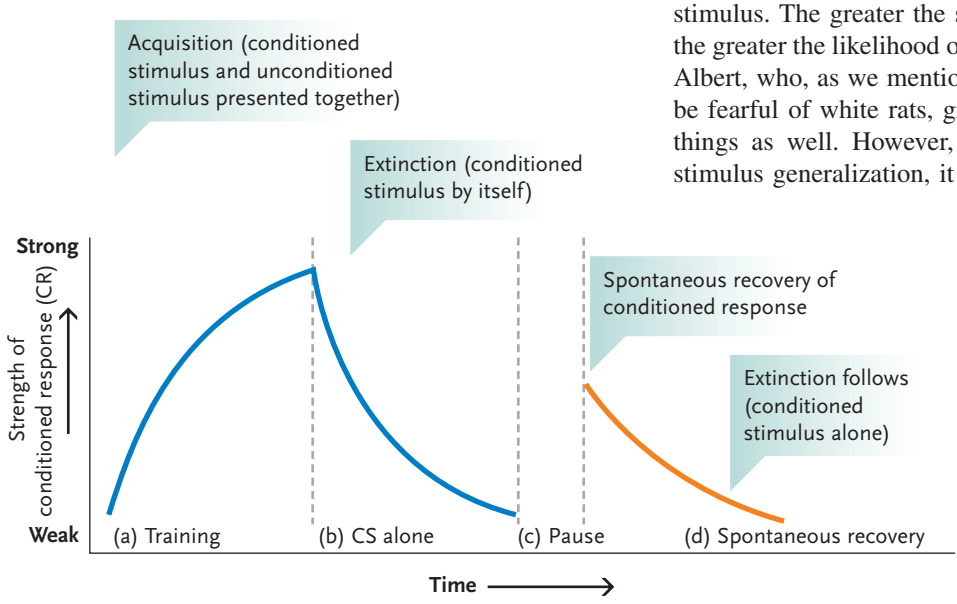
Once a conditioned response has been extinguished, has it vanished forever? Not necessarily. Pavlov discovered this phenomenon when he returned to his dog a few days after the conditioned behavior had seemingly been extinguished. If he rang a bell, the dog once again salivated—an effect known as **spontaneous recovery**, or the reemergence of an extinguished conditioned response after a period of rest and with no further conditioning.

Spontaneous recovery helps explain why it is so hard to overcome drug addictions. For example, cocaine addicts who are thought to be "cured" can experience an irresistible impulse to use the drug again if they are subsequently confronted by a stimulus with strong connections to the drug, such as a white powder (DiCano & Everitt, 2002; Plowright, Simonds, & Butler, 2006; Rodd et al., 2004).

GENERALIZATION AND DISCRIMINATION

Despite differences in color and shape, to most of us a rose is a rose is a rose. The pleasure we experience at the beauty, smell, and grace of the flower is similar for different types of roses. Pavlov noticed a similar phenomenon. His dogs often salivated not only at the ringing of the bell that was used during their original conditioning but also at the sound of a buzzer as well.

Such behavior is called stimulus generalization. **Stimulus generalization** occurs when a conditioned response follows a stimulus that is similar to the original conditioned stimulus. The greater the similarity between two stimuli, the greater the likelihood of stimulus generalization. Little Albert, who, as we mentioned earlier, was conditioned to be fearful of white rats, grew afraid of other furry white things as well. However, according to the principle of stimulus generalization, it is unlikely that he would have



Acquisition, Extinction, and Spontaneous Recovery in Classical Conditioning

been afraid of a black dog, because its color would have differentiated it sufficiently from the original fear-evoking stimulus.

Stimulus generalization is the reason drivers know that they should brake at all red lights, even if there are minor variations in the size, shape, and shade of the traffic signal.

The conditioned response elicited by the new stimulus is usually not as intense as the original conditioned response, although the more similar the new stimulus is to the old one, the more similar the new response will be. It is unlikely, then, that Little Albert's fear of the Santa Claus mask was as great as his learned fear of a rat. Still, stimulus generalization is the reason drivers know, for example, that they ought to brake at all red lights, even if there are minor variations in the size, shape, and shade of the traffic signal.

Stimulus discrimination, in contrast, occurs if two stimuli are sufficiently distinct from each other that one evokes a conditioned response but the other does not. Stimulus discrimination is the ability to differentiate between stimuli. For example, my dog Cleo comes running into the kitchen when she hears the sound of the electric can opener, which she has learned is used to open her dog food when her dinner is about to be served. But she does not race into the kitchen at the sound of the food processor, which is similar. In other words, she discriminates between the stimuli of can opener sound and food processor sound. Similarly, our ability to discriminate between the behavior of a growling dog and that of one whose tail is wagging can lead to adaptive behavior—avoiding the growling dog and petting the friendly one.

PSYCH think

> > > How likely is it that Little Albert, Watson's experimental subject, went through life afraid of Santa Claus? Describe what could have happened to prevent his continual dread of Santa.

>> Operant Conditioning

Very good . . . What a clever idea . . . Fantastic . . . I agree . . . Thank you . . . Excellent . . . Super . . . Right on . . . This is the best paper you've ever written; you get an A . . . You are really getting the hang of it . . . I'm impressed . . . You're getting a raise . . . Have a cookie . . . You look great . . . I love you . . .

Few of us mind being the recipient of any of these comments. But what is especially noteworthy about them is that each of these simple statements can be used, through a process known as operant conditioning, to bring about powerful changes in behavior and to teach the most complex tasks. Operant conditioning is the basis for many of the most important kinds of human, and animal, learning.

Operant conditioning is learning in which a voluntary response becomes more likely to occur again or less likely, depending on its favorable or unfavorable consequences. For example, if some money fell down out of the sky every time you finished reading a page in your textbook, would you be more likely to read more pages in your book? If so, the money would be considered a favorable consequence that led to the strengthening of your reading response.

Unlike classical conditioning, in which the original behaviors are the natural, involuntary biological responses to the presence of a stimulus such as food, water, or pain, operant conditioning applies to *voluntary* responses, which an organism performs deliberately to produce a desirable outcome. The term *operant* emphasizes this point: The organism *operates* on its environment to produce a desirable result. Operant conditioning is at work when we learn that working industriously can bring about a raise or that studying hard results in good grades.

stimulus discrimination The process that occurs if two stimuli are sufficiently distinct from each other that one evokes a conditioned response but the other does not; the ability to differentiate between stimuli.

operant conditioning Learning in which a voluntary response is strengthened or weakened, depending on its favorable or unfavorable consequences.

As with classical conditioning, the basis for understanding operant conditioning was laid by work with animals. We turn now to some of that early research.

HOW OPERANT CONDITIONING WORKS

B. F. Skinner (1904–1990), one of the 20th century's most influential psychologists, inspired a whole generation of psychologists studying operant conditioning. Skinner became interested in specifying how behavior varies as a result of alterations in the environment. To illustrate, let's consider what happens to a rat in the typical Skinner box,

a chamber with a highly controlled environment that Skinner designed to study operant conditioning processes with laboratory animals (Pascual & Rodríguez, 2006).

Suppose you want to teach a hungry rat to press a lever that is in its box. At first the rat will wander around the box, exploring the environment in a relatively random fashion. At some point, however, it will probably press the lever by chance, and when it does, you have set up the box so that the rat will receive a food pellet. The first time this happens, the rat will not learn the connection between pressing a lever and receiving food and will continue to explore the box. Sooner or later the rat will press the lever again and receive a pellet, and in time the frequency of the pressing response will increase. Eventually, the rat will press the lever continually until it satisfies its hunger, thereby demonstrating that it has learned that receiving food is contingent on pressing the lever.

B.F. Skinner devised the Skinner box to condition rats to press a lever in order to obtain food.

Did you know?

Skinner actually taught pigeons to bowl and play table tennis, and dogs to climb walls using *operant conditioning*.

Reinforcement: The Central Concept of Operant Conditioning Skinner called the process that leads the rat to continue pressing the key "reinforcement." **Reinforcement** is the process by which a stimulus increases the probability that a preceding behavior will be repeated. In other words, pressing the lever is more likely to occur again because of the stimulus of food.

In a situation such as this one, the food is called a reinforcer. A **reinforcer** is any stimulus that increases the probability that a preceding behavior will occur again. Hence, food is a reinforcer, because it increases the probability that the behavior of pressing (formally referred to as the *response* of pressing) will take place.

reinforcement The process by which a stimulus increases the probability that a preceding behavior will be repeated.

reinforcer Any stimulus that increases the probability that a preceding behavior will occur again.

What kind of stimuli can act as reinforcers? Bonuses, toys, and good grades can serve as reinforcers—if they strengthen the probability of the response that occurred before their introduction. What makes something a reinforcer depends on individual preferences. Although a chocolate bar can act as a reinforcer for one person, an individual who dislikes chocolate may find 75 cents more desirable. The only way we can know if a stimulus is a reinforcer for a particular organism is to observe whether the frequency of a previously occurring behavior increases after the presentation of the stimulus.

Of course, we are not born knowing that 75 cents can buy a candy bar. Rather, through experience we learn that money is a valuable commodity because of its association with stimuli, such as food and drink, that are naturally reinforcing. This fact suggests a distinction between primary reinforcers and secondary reinforcers. A *primary reinforcer* satisfies some biological need and works naturally, regardless of a person's prior experience. Food for a hungry person, warmth for a cold person, and relief for a person in pain all would be classified as primary reinforcers. A *secondary reinforcer*, in contrast, is a stimulus that becomes reinforcing because of its association with a primary reinforcer. For instance, we know that money is valuable because we have learned that it allows us to obtain other desirable objects, including primary reinforcers such as food and shelter. Money thus becomes a secondary reinforcer.

Positive Reinforcers, Negative Reinforcers, and Punishment In many respects, reinforcers can be thought of in terms of rewards; both a reinforcer and a reward increase the probability that a preceding response will occur again. But the term *reward* is limited to *positive* occurrences, and this is where it differs from a reinforcer—for it turns out that reinforcers can be positive or negative.

A **positive reinforcer** is a stimulus *added* to the environment that brings about an increase in a preceding response. If food, water, money, or praise is provided after

STUDY TIP

Remember that primary reinforcers satisfy a biological need; secondary reinforcers are effective due to previous association with a primary reinforcer.

We learn the value of money as a secondary reinforcer at a young age.

a response, it is more likely that that response will occur again in the future. The paychecks that workers get at the end of the week, for example, increase the likelihood that they will return to their jobs the following week.

In contrast, a **negative reinforcer** refers to an unpleasant stimulus whose *removal* leads to an increase in the probability that a preceding response will be repeated in the future. For example, if you have an itchy rash (an unpleasant stimulus) that is relieved when you apply a certain brand of ointment, you are more likely to use that ointment the next time you have an itchy rash. Using the ointment, then, is negatively reinforcing, because it removes the unpleasant itch. Similarly, if your iPod volume is so loud that it hurts your ears when you first turn it on, you are likely to reduce the volume level. Lowering the volume is negatively reinforcing, and you are more apt to repeat the action in the future when you first turn it on. Negative reinforcement, then, teaches the individual that taking an action removes a negative condition that exists in the environment. Like positive reinforcers, negative reinforcers increase the likelihood that preceding behaviors will be repeated.

Reinforcement *increases* the frequency of the behavior preceding it; punishment *decreases* the frequency of the behavior preceding it.

Note that negative reinforcement is not the same as punishment. **Punishment** refers to a stimulus that *decreases* the probability that a prior behavior will occur again.

Unlike negative reinforcement, which produces an *increase* in behavior, punishment *reduces* the likelihood of a prior response.

Let's consider something unpleasant that might happen in your environment: nagging by your housemates or parents. Your mother nagging you to clean your room could be an unpleasant stimulus. If you clean your room to make the nagging stop, you are more likely to repeat this behavior in the future. In this way your room-cleaning behavior has been strengthened. Suppose, however, that your housemate nags you every time you turn up the volume on the TV. To avoid getting nagged, you might stop turning up the volume so loud. In this case, your loud-volume behavior decreases to avoid the punishment of nagging. In the first case, the specific behavior is apt to increase because of the negative reinforcement; in the second, it is likely to decrease because of the punishment.

positive reinforcer A stimulus added to the environment that brings about an increase in a preceding response.

negative reinforcer An unpleasant stimulus whose *removal* leads to an increase in the probability that a preceding response will be repeated in the future.

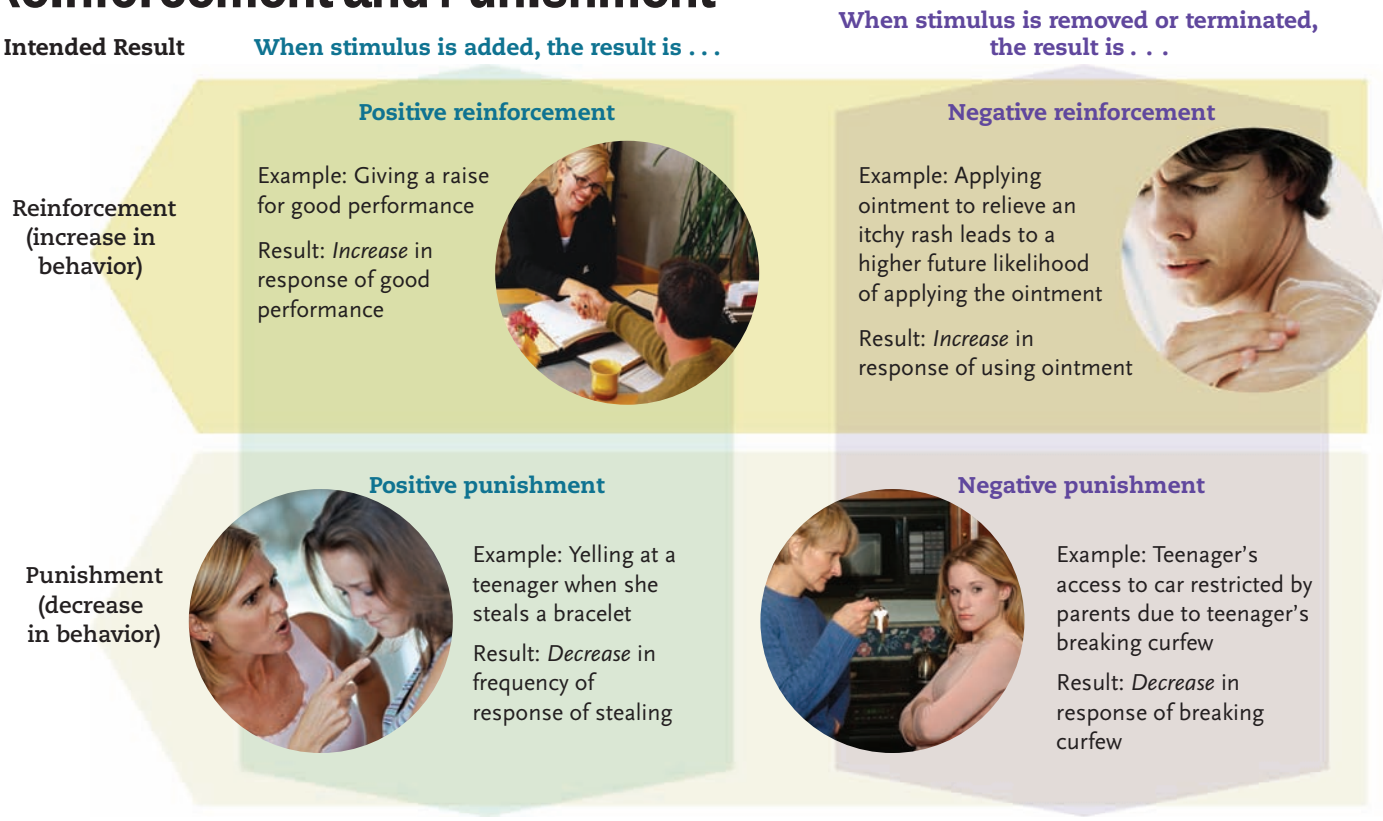
punishment A stimulus that decreases the probability that a previous behavior will occur again.

There are two types of punishment: positive punishment and negative punishment, just as there are positive reinforcement and negative reinforcement. In both cases, "positive" means adding something, and "negative" means removing something. *Positive punishment* weakens a response through the application of an unpleasant stimulus. For instance, spanking a child for misbehaving or spending ten years in jail for committing a crime is positive punishment. In contrast, *negative punishment* consists of the removal of something pleasant. For instance, when a teenager is told she is "grounded" and will no longer be able to use the family car because of her poor grades, or when an employee is informed that he has been demoted with a cut in pay because of a poor job evaluation, negative punishment is being administered. Both positive and negative punishment result in a decrease in the likelihood that a previous behavior will be repeated.

These rules can help you distinguish among the concepts of positive and negative reinforcement and punishment:

- Reinforcement *increases* the frequency of the behavior preceding it; punishment *decreases* the frequency of the behavior preceding it.
- The *application* of a *positive* stimulus brings about an increase in the frequency of behavior and is referred to as positive reinforcement; the *application* of a *negative* stimulus decreases or reduces the frequency of behavior and is called positive punishment.

Reinforcement and Punishment



- The *removal* of a *negative* stimulus that results in an increase in the frequency of behavior is negative reinforcement; the *removal* of a *positive* stimulus that decreases the frequency of behavior is negative punishment.

The Pros and Cons of Punishment: Why Reinforcement Beats Punishment Is punishment an effective way to modify behavior? Punishment often presents the quickest route to changing behavior that, if allowed to continue, might be dangerous to an individual. For instance, a parent may not have a second chance to warn a child not to run into a busy street, and so punishing the first incidence of this behavior may prove to be wise. Moreover, the use of punishment to suppress behavior, even temporarily, provides an opportunity to reinforce a person for subsequently behaving in a more desirable way.

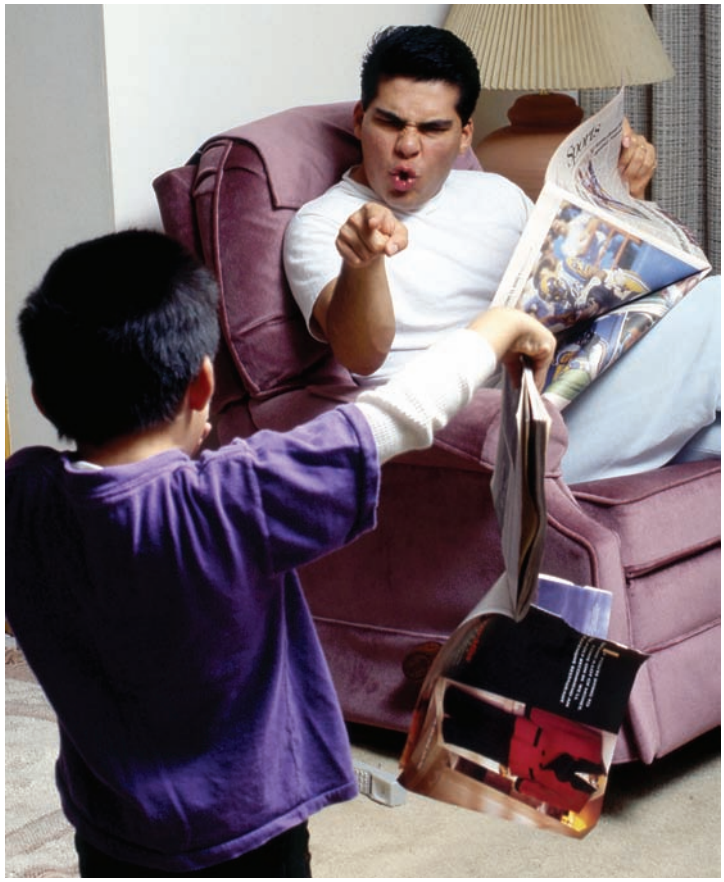
STUDY TIP

The differences between positive reinforcement, negative reinforcement, positive punishment, and negative punishment are trickier than you might think, so pay special attention to the list and the summary chart in the figure above.

There are some rare instances in which punishment can be the most humane approach to treating certain severe disorders. For example, some children suffer from *autism*, a psychological disorder that can lead them to abuse themselves by tearing at their skin or banging their heads against the wall, injuring themselves severely in the process. In such cases—and when all other treatments have failed—punishment in the form of a quick but intense electric shock has been used to prevent self-injurious behavior. Such punishment is used only to keep the child safe and to buy time until positive reinforcement procedures can be initiated (Ducharme, Sanjuan, & Drain, 2007; Salvy, Mulick, & Butter, 2004; Toole et al., 2004).

Punishment has several disadvantages that make its routine use questionable. For one thing, punishment is frequently ineffective, particularly if it is not delivered shortly after the undesired behavior or if the individual is able to leave the setting in which the punishment is being given. An employee who is reprimanded by the boss may quit; a teenager who loses the use of the family car may borrow a friend's car instead. In such instances, the initial behavior that is being punished may be replaced by one that is even less desirable.

Even worse, physical punishment can convey to the recipient the idea that physical aggression is permissible and perhaps even desirable. A father who yells at and hits his son for misbehaving teaches the son that aggression is an appropriate, adult response. The son soon may copy his father's behavior by acting aggressively toward others.



In what ways is punishment ineffective?

In addition, physical punishment is often administered by people who are themselves angry or enraged. It is unlikely that individuals in such an emotional state will be able to think through what they are doing or control carefully the degree of punishment they are inflicting. Ultimately, those who resort to physical punishment run the risk that they will grow to be feared. Punishment can also reduce the self-esteem of recipients unless they can understand the reasons for it (Baumrind, Larzelere, & Cowan, 2002; Sorbring, Deater-Deckard, & Palmerus, 2006).

Finally, punishment does not convey any information about what an alternative, more appropriate behavior might be. To be useful in bringing about more desirable behavior in the future, punishment must be accompanied by specific information about the behavior that is being punished, along with specific suggestions concerning a more desirable behavior. Punishing a child for staring out the window in school could merely lead her to stare at the floor instead. Unless we teach her appropriate ways to respond, we have merely managed to substitute one undesirable behavior for another. If punishment is not followed up with reinforcement for subsequent behavior that is more appropriate, little will be accomplished.

In short, reinforcing desired behavior is a more effective technique for modifying behavior than using punishment. Both in and out of the scientific arena, reinforcement usually beats punishment (Hiby, Rooney, & Bradshaw, 2004; Pogarsky & Piquero, 2003; Sidman, 2006).

Schedules of Reinforcement The world would be a different place if poker players never played cards again after the first losing hand, fishermen returned to shore as soon as they missed a catch, or telemarketers never made another phone call after their first hang-up. The fact that such unreinforced behaviors continue, often with great frequency and persistence, illustrates that reinforcement need not be received continually for behavior to be learned and maintained. In fact, behavior that is reinforced only occasionally can ultimately be learned better than can behavior that is always reinforced.

When we refer to the frequency and timing of reinforcement that follows desired behavior, we are talking about **schedules of reinforcement**. Behavior that is reinforced every time it occurs is said to be on a **continuous reinforcement schedule**; if it is reinforced some but not all of the time, it is on a **partial** (or **intermittent**) **reinforcement schedule**. Learning occurs more rapidly when the behavior is continuously reinforced. Imagine, for example, that you are trying to teach your cat to greet you every time you come home. The cat will learn much more quickly that it is going to get a reward when it greets you if you give it a reward every single time it greets you. Later, once a behavior is learned, it will last longer if you stop giving reinforcement all the time. If you reinforce the cat's greeting only sometimes, that is, if you use a partial reinforcement schedule to maintain its behavior, it will be more likely to keep on greeting you long after you stop giving it a reward (Casey, Cooper-Brown, & Wacher, 2006; Gottlieb, 2004; Staddon & Cerutti, 2003).

schedules of reinforcement Different patterns of frequency and timing of reinforcement following desired behavior.

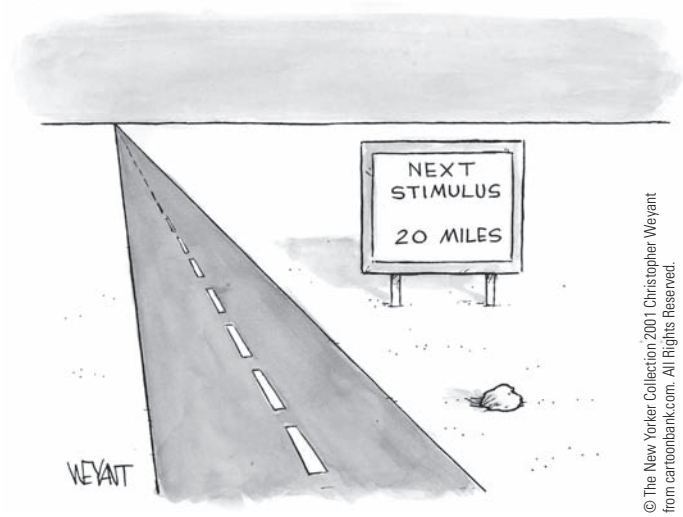
continuous reinforcement schedule Reinforcing of a behavior every time it occurs.

partial (or intermittent) reinforcement schedule Reinforcing of a behavior sometimes but not all of the time.

Why should intermittent reinforcement result in stronger, longer-lasting learning than continuous reinforcement does? We can answer the question by examining how we might behave when using a candy vending machine

PSYCH think

> > > Given the scientific findings we have just discussed, what would you tell parents who ask if the routine use of physical punishment is likely to be a useful strategy for helping their children learn to love learning? Do you think your answer might change based on differences in cultural background and experience?



fixed-ratio schedule A schedule by which reinforcement is given only after a specific number of responses are made.

variable-ratio schedule A schedule by which reinforcement occurs after a varying number of responses rather than after a fixed number.

fixed-interval schedule A schedule that provides reinforcement for a response only if a fixed time period has elapsed, making overall rates of response relatively low.

compared with a Las Vegas slot machine. When we use a vending machine, prior experience has taught us that every time we put in the appropriate amount of money, the reinforcement, a candy bar, ought to be delivered. In other words, the schedule of reinforcement is continuous. In comparison, a slot machine offers intermittent reinforcement. People who use these machines learn that after putting in their cash, most of the time they will not receive anything in return. At the same time, though, they know that they will occasionally win something.

Now suppose that, unknown to us, both the candy vending machine and the slot machine are broken, and so neither one is able to dispense anything. It would not be very long before we stopped depositing coins into the broken candy machine. Probably at most we would try only two or three times before leaving the machine in disgust. But the story would be quite different with the broken slot machine. Here, money might be dropped into the machine for a considerably longer time, even though there would be no payoff.

STUDY TIP

Remember that the different schedules of reinforcement affect the rapidity with which a response is learned and how long it lasts after reinforcement is no longer provided.

In formal terms, we can see the difference between the two reinforcement schedules: Partial reinforcement schedules (such as those provided by slot machines) maintain performance longer than do continuous reinforcement schedules (such as those established in candy vending machines) before *extinction*—the disappearance of the conditioned response—occurs.

Certain kinds of partial reinforcement schedules produce stronger and lengthier responding before extinction than do others. Although many different partial reinforcement schedules have been examined, they can most readily be put into two categories: schedules that consider the *number of responses* made before reinforcement is given, called *fixed-ratio* and *variable-ratio schedules*, and those that consider the *amount of time* that elapses before reinforcement is provided, called *fixed-interval* and *variable-interval schedules* (Gottlieb, 2006; Pellegrini et al., 2004; Svartdal, 2003).

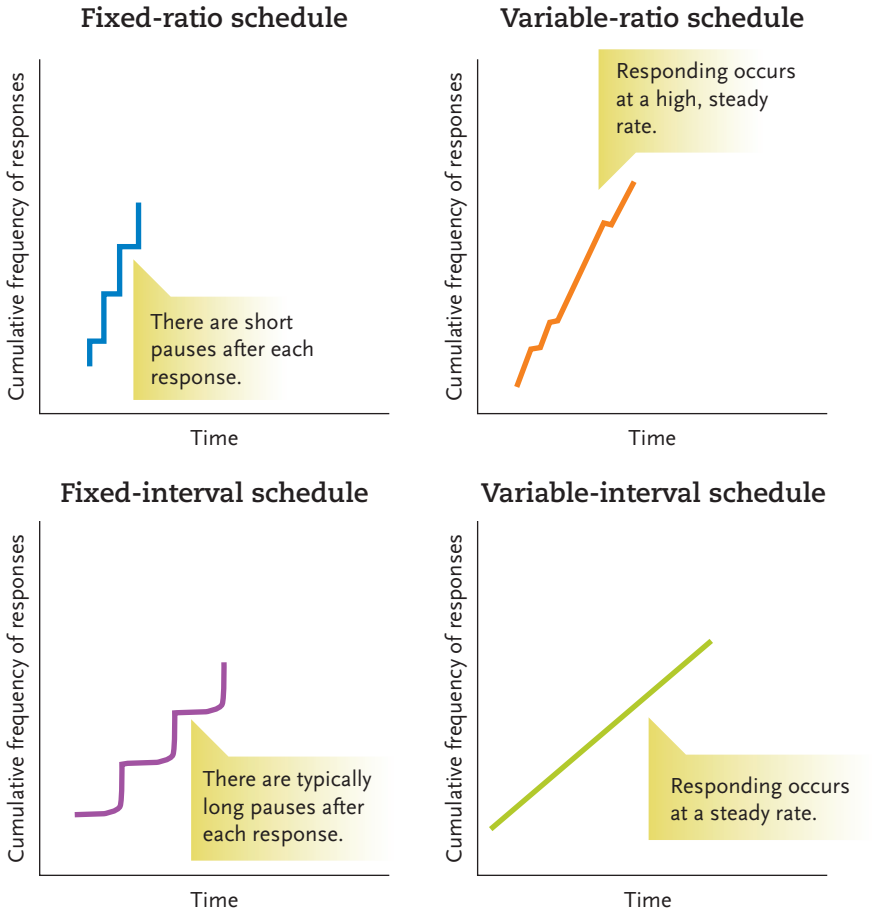
In a **fixed-ratio schedule**, reinforcement is given only after a specific number of responses. For instance, a rat might receive a food pellet every tenth time it pressed a lever; here, the ratio would be 1:10. Similarly, garment workers are generally paid on fixed-ratio schedules: They receive a specific number of dollars for every blouse they sew. Because a greater rate of production means more reinforcement, people on fixed-ratio schedules are apt to work as quickly as possible.

In a **variable-ratio schedule**, reinforcement occurs after a varying number of responses rather than after a fixed number. Although the specific number of responses necessary to receive reinforcement varies, the number of responses usually hovers around a specific average. A good example of a variable-ratio schedule is a telephone salesperson's job. She might make a sale during the third, eighth, ninth, and twentieth calls without being successful during any call in between. Although the number of responses that must be made before making a sale varies, it averages out to a 20 percent success rate. Under these circumstances, you might expect that the salesperson would try to make as many calls as possible in as short a time as possible. This is the case with all variable-ratio schedules, which lead to a high rate of response and resistance to extinction.

In contrast to fixed-ratio and variable-ratio schedules, in which the crucial factor is the number of responses, fixed-*interval* and variable-*interval* schedules focus on the amount of time that has elapsed since a person or animal was rewarded. One example of a fixed-interval schedule is a weekly paycheck. For people who receive regular, weekly paychecks, it typically makes relatively little difference exactly how much they produce in a given week.

Because a **fixed-interval schedule** provides reinforcement for a response only if a fixed time period has elapsed,

Outcomes of Reinforcement Schedules



overall rates of response are relatively low. This is especially true in the period just after reinforcement, when the wait time before another reinforcement is relatively long. Students' study habits often exemplify this reality. If the periods between exams are relatively long (meaning that the opportunity for reinforcement for good performance is given fairly infrequently), students often study minimally or not at all until the day of the exam draws near. Just before the exam, however, students begin to cram for it, signaling a rapid increase in the rate of their studying response. As you might expect, immediately after the exam there is a rapid decline in the rate of responding, with few people opening a book the day after a test. Fixed-interval schedules produce the kind of "scalloping effect" shown in the graphic above.

One way to decrease the delay in responding that occurs just after reinforcement, and to maintain the desired behavior more consistently throughout an interval, is to use a variable-interval schedule. In a **variable-interval schedule**, the time between reinforcements varies around some average rather than being fixed. For example, a professor who gives surprise quizzes that vary from one every three days to one every three weeks, averaging one every two weeks, is using a variable-interval schedule. Compared to the study habits we observed with a fixed-interval schedule, students' study habits under such a variable-interval schedule would most likely be very different. Students would be apt to study more regularly, because they would never know when the next surprise quiz was coming. Variable-interval schedules, in general, are more likely to produce relatively steady rates of responding than are fixed-interval schedules, with responses that take longer to extinguish after reinforcement ends.

variable-interval schedule A schedule by which the time between reinforcements varies around some average rather than being fixed.

Discrimination and Generalization in Operant Conditioning It does not take a child long to learn that sharing toys gets rewarded with a cookie and refusing to

PSYCH think

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Schedules of Reinforcement

> > > How might operant conditioning be applied in the classroom to increase the likelihood that children will complete their homework more frequently?

Take the PsychSmart challenge! Learn how to use psychology to motivate people. Then answer question 8 in the Pop Quiz on p. 135 to check your understanding of reinforcement schedules.

Do your study habits follow a fixed-interval schedule?

share results in a time out. The same operant conditioning principles account for the way that a pigeon can learn to peck a key when a green light goes on, but not when a red light appears. Just as in classical conditioning, then, operant learning involves the phenomena of discrimination and generalization.

The process by which people learn to discriminate stimuli is known as stimulus control training. In *stimulus control training*, a behavior is reinforced in the presence of a specific stimulus, but not in its absence. For example, one of the most difficult discriminations many people face is determining when someone's friendliness is not mere friendliness but a signal of romantic interest. People learn to make the discrimination by observing the presence of certain nonverbal cues—such as increased eye contact and touching—that indicate romantic interest. When such cues are absent, people learn that no romantic interest is indicated. In this case, the nonverbal cue acts as a discriminative stimulus, one to which an organism learns to respond during stimulus control training. A *discriminative stimulus* signals the likelihood that reinforcement will follow a response. For example, if you wait until your roommate is in a good mood before you ask to borrow her favorite compact disc, your behavior can be said to be under stimulus control because you can discriminate among her moods.

shaping The process of teaching a complex behavior by rewarding closer and closer approximations of the desired behavior.

Just as in classical conditioning, the phenomenon of stimulus generalization, in which an organism learns a response to one stimulus and then exhibits the same response to slightly different stimuli, occurs in operant conditioning. If you have learned that being polite helps you to get your way in a certain situation (reinforcing your politeness), you are likely to generalize your response to other situations. Sometimes, though, generalization can have unfortunate consequences, as when people behave negatively toward all members of a racial group because they have had an unpleasant experience with one member of that group.

Shaping: Reinforcing What Doesn't Come Naturally Consider the difficulty of using only operant conditioning to teach people to repair an automobile transmission. You would have to wait until they performed a desired behavior before providing reinforcement. It would probably take them a very long time to accidentally stumble on the correct behavior.

There are many complex behaviors, ranging from auto repair to zoo management, that we would not expect to occur naturally as part of anyone's spontaneous behavior. Since these behaviors would never occur naturally, there would be no opportunity to reinforce them. However, there is a procedure, known as shaping, that can be used to guide someone toward the desired behavior. **Shaping** is the process of teaching a complex behavior by rewarding closer and closer approximations of the desired behavior. In shaping, you start by reinforcing any behavior that is at all similar to the behavior you want the person to learn. Later, you reinforce only responses that are closer to the behavior you ultimately want to teach. Finally, you reinforce only the desired response. Each step in shaping, then, moves only slightly beyond the previously learned behavior, permitting the person to link the new step to the behavior learned earlier.

Shaping is the process of teaching a complex behavior by rewarding closer and closer approximations of the desired behavior.

Shaping allows other species to learn complex responses that would never occur naturally, ranging from lions jumping through hoops, dolphins rescuing divers lost at sea, or rodents finding hidden land mines. Shaping also underlies the learn-

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Shaping

> > > In light of what you've learned about classical and operant conditioning, do you think that Declan, the drug-and-bomb-sniffing dog described at the beginning of this chapter, learned his particular skills primarily by classical conditioning or by operant conditioning? Why? If you've ever had a puppy, what conditioning techniques did you use to train it?

Take the PsychSmart challenge! Become a bird whisperer. Train Jingles the macaw to ring a bell. Then answer question 9 in the Pop Quiz on p. 135 to make sure you understand shaping.

ing of many complex human skills. For instance, the ability to participate in a college psychology class is shaped from the first childhood experiences in a classroom. Behaviors such as attention and concentration, for example, are much less apparent in a preschool than they are in a college classroom. Over the years, we are rewarded for closer and closer approximations of desirable attention and concentration behaviors.

Comparing Classical and Operant Conditioning We've considered classical conditioning and operant conditioning as two completely different processes. And there are a number of key distinctions between the two forms of learning. For example, the key concepts in classical conditioning are the associations between stimuli and the *reflexive* responses we experience, whereas in operant conditioning the key concept is making a *voluntary* response to obtain reinforcement.

BEHAVIOR ANALYSIS AND BEHAVIOR MODIFICATION

Two people who had been living together for three years began to fight frequently. The issues of disagreement ranged from who was going to do the dishes to the quality of their love life.

Disturbed, the couple went to a *behavior analyst,* a psychologist who specializes in behavior-modification techniques. He asked both partners to keep a detailed written record of their interactions over the next two weeks.

When they returned with the data, he carefully reviewed the records with them. In doing so, he noticed a pattern: Each of their arguments had occurred just after one or the other had left a household chore undone, such as leaving dirty dishes in the sink or draping clothes on the only chair in the bedroom.

Using the data the couple had collected, the behavior analyst asked both partners to list all the chores that could possibly arise and assign each one a point value depending

Classical and Operant Conditioning Compared

Concept	Classical Conditioning	Operant Conditioning
Basic principle	Building associations between a conditioned stimulus and conditioned response.	Reinforcement *increases* the frequency of the behavior preceding it; punishment *decreases* the frequency of the behavior preceding it.
Nature of behavior	Based on involuntary, natural, innate behavior. Behavior is elicited by the unconditioned or conditioned stimulus.	Organism voluntarily operates on its environment to produce a desirable result. After behavior occurs, the likelihood of the behavior occurring again is increased or decreased by the behavior's consequences.
Order of events	Before conditioning, an unconditioned stimulus leads to an unconditioned response. After conditioning, a conditioned stimulus leads to a conditioned response.	Reinforcement leads to an increase in behavior; punishment leads to a decrease in behavior.
Example	After a physician gives a child a series of painful injections (an unconditioned stimulus) that produce an emotional reaction (an unconditioned response), the child develops an emotional reaction (a conditioned response) whenever she sees the physician (the conditioned stimulus).	A student who, after studying hard for a test, earns an A (the positive reinforcer), is more likely to study hard in the future. A student who, after going out drinking the night before a test, fails the test (punishment) is less likely to go out drinking the night before the next test.

behavior modification A formalized technique for promoting the frequency of desirable behaviors and decreasing the incidence of unwanted ones.

on how long it took to complete. Then he had them divide the chores equally and agree in a written contract to fulfill the ones assigned to them. If either failed to carry out one of the assigned chores, he or she would have to place $1 per point in a fund for the other to spend. They also agreed to a program of verbal praise, promising to reward each other verbally for completing a chore.

Both partners agreed to try the program for a month and to keep careful records of the number of arguments they had during that period. To their surprise, the number declined rapidly.

This case provides an illustration of **behavior modification**, a formalized technique for promoting the frequency of desirable behaviors and decreasing the incidence of unwanted ones. Using the basic principles of learning theory, behavior-modification techniques have proved to be helpful in a variety of situations. For example, people with severe mental retardation have started dressing and feeding themselves for the first time in their lives as a result of behavior modification. Behavior modification has also helped people lose weight, give up smoking, and behave more safely (Delinsky, Latner, & Wilson, 2006; Ntinas, 2007; Wadden, Crerand, & Brock, 2005).

The techniques used by behavior analysts are as varied as the list of processes that modify behavior. They include reinforcement scheduling, shaping, generalization training, and extinction. Participants in a behavior-change program do, however, typically follow a series of similar basic steps:

- *Identifying goals and target behaviors.* The first step is to define *desired behavior*. Is it an increase in time spent studying? A decrease in weight? An increase in the use of language? A reduction in the amount of aggression displayed by a child? The goals must be stated in observable terms and must lead to specific targets. For instance, a goal might be "to increase study time," whereas the target behavior would be "to study at least two hours per day on weekdays and an hour on Saturdays."
- *Designing a data-recording system and recording preliminary data.* To determine whether behavior has changed, one must collect data before any changes are made in the situation. This information provides a baseline against which future changes can be measured.
- *Selecting a behavior-change strategy.* The most crucial step is to select an appropriate strategy. Because all the principles of learning can be employed to bring about behavior change, a "package" of treatments is normally used. This might include the systematic use of positive reinforcement for desired behavior (verbal praise or something more tangible, such as food), as well as a program of extinction for undesirable behavior (ignoring a child who throws a tantrum). Selecting the right reinforcers is critical, and it may be necessary to experiment a bit to find out what is important to a particular individual.
- *Implementing the program.* Probably the most important aspect of program implementation is consistency. It is also important to reinforce the intended behavior. For example, suppose a mother wants her daughter to spend more time on her homework, but as soon as the child sits down to study, she asks for a snack. If the mother gets a snack for her, she is likely to be reinforcing her daughter's delaying tactic, not her studying.
- *Keeping careful records after the program is implemented.* Another crucial task is record keeping. If the target behaviors are not monitored, there is no way of knowing whether the program has actually been successful.
- *Evaluating and altering the ongoing program.* Finally, the results of the program should be compared with baseline, pre-implementation data to determine the program's effectiveness. If the program has been successful, the procedures employed can be phased out gradually. For instance, if the program called for reinforcing every instance of picking up one's clothes from the bedroom floor, the reinforcement schedule could be modified to a fixed-ratio schedule in which every third instance was reinforced. However, if the program has not been successful in bringing about the desired behavior change, consideration of other approaches might be advisable.

Behavior-change techniques based on these general principles have enjoyed wide success and have proved to be one of the most powerful means of modifying behavior. Clearly, it is possible to employ the basic notions of learning theory to improve our lives.

>> Cognitive Approaches to Learning

Consider what happens when people learn to drive a car. They don't just get behind the wheel and stumble around until they randomly put the key into the ignition and, later, after many false starts, accidentally manage to get the car to move forward, thereby receiving positive reinforcement. This is how it would work if conditioning were the only type of learning. In real life, however, conditioning is only part of how we learn complex behaviors. For example, we already know the basic elements of driving from prior experience as passengers, when we likely noticed how the key was inserted into the ignition, the car was put in drive, and the gas pedal was pressed to make the car go forward.

Clearly, not all learning can be explained by operant and classical conditioning paradigms. In fact, activities like learning to drive a car imply that some kinds of learning must involve higher-order processes in which people's thoughts and memories and the way they process information account for their responses. Such situations argue against regarding learning as the unthinking, mechanical, and automatic acquisition of associations between stimuli and responses, as in classical conditioning, or the presentation of reinforcement, as in operant conditioning.

Learning to drive a car is an example of a cognitive approach to learning.

Some psychologists view learning in terms of the thought processes, called *cognitions*, that underlie it—an approach known as **cognitive learning theory**. Although psychologists working from the cognitive learning perspective do not deny the importance of classical and operant conditioning, they have developed approaches that focus on the unseen mental processes that occur during learning, rather than concentrating solely on external stimuli, responses, and reinforcements. For example, two types of learning that cannot be explained by operant or classical conditioning concepts are latent learning and observational learning.

LATENT LEARNING

Early evidence for the importance of cognitive processes comes from a series of animal experiments that revealed a type of cognitive learning called latent learning. In **latent learning**, a new behavior is learned but not demonstrated until some incentive is provided for displaying it (Tolman & Honzik, 1930). In short, latent learning occurs without reinforcement.

In the studies demonstrating latent learning, psychologists examined the behavior of rats in a maze such as the one shown on page 128. In one experiment, rats were randomly assigned to one of three experimental conditions. One group of rats was allowed to wander around the maze once a day for 17 days without ever receiving a reward. Understandably, those rats made many errors and spent a relatively long time reaching the end of the maze. A second group, however, was always given food at the end of the maze. Not surprisingly, those rats learned to run quickly and directly to the food box, making few errors.

Latent learning occurs without reinforcement.

A third group of rats started out in the same situation as the unrewarded rats, but only for the first 10 days. On the 11th day, a critical experimental manipulation was introduced: From that point on, the rats in this group were given food for completing the maze. The results of this manipulation were dramatic. The previously unrewarded rats, which had earlier seemed to wander about aimlessly, showed such reductions in running time and declines in error rates that their performance almost immediately matched that of the group that had received rewards from the start.

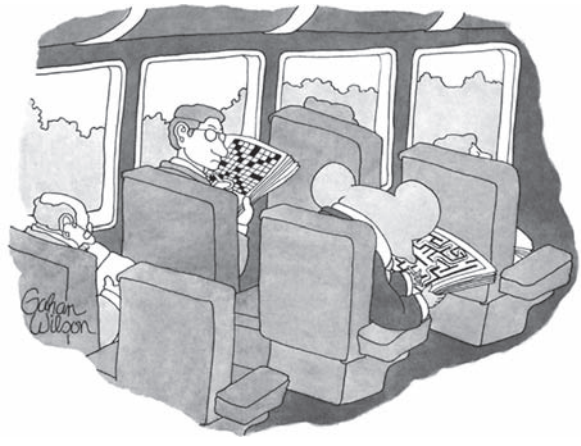
To cognitive theorists, it seemed clear that the unrewarded rats had learned the layout of the maze early in their explorations; they just never displayed their latent learning until the reinforcement was offered. Instead, those rats seemed to develop a *cognitive map* of the maze—a mental representation of spatial locations and directions.

People, too, develop cognitive maps of their surroundings. For example, latent learning may permit you to know the location of a kitchenware store at a local mall you've frequently visited, even though you've never entered the store and don't even like to cook.

cognitive learning theory An approach to the study of learning that focuses on the thought processes that underlie learning.

latent learning Learning in which a new behavior is acquired but is not demonstrated until some incentive is provided for displaying it.

The possibility that we develop our cognitive maps through latent learning presents something of a problem for strict operant conditioning theorists. If we consider the results of the maze-learning experiment, for instance, we cannot clearly see what reinforcement

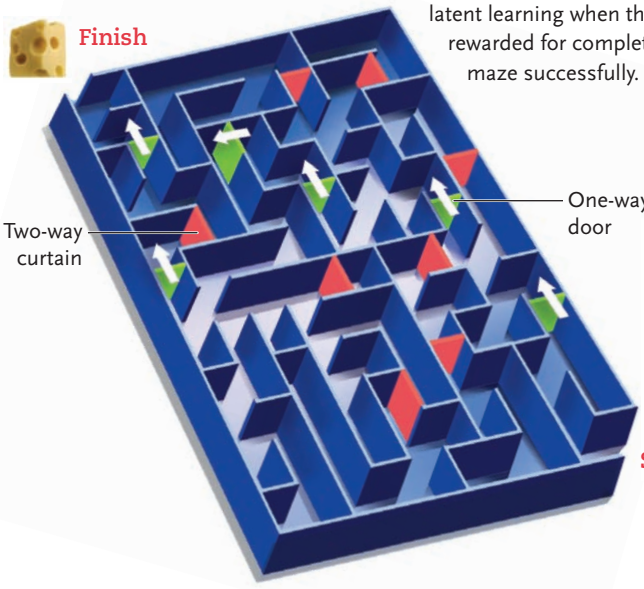


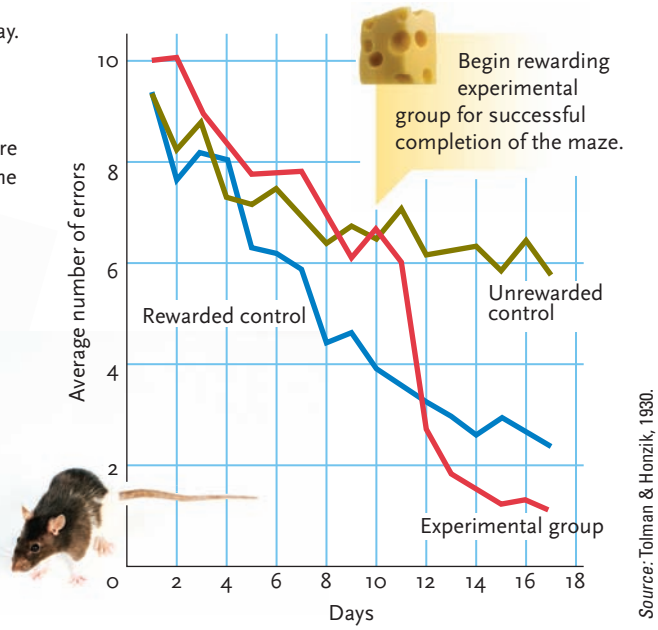
STUDY TIP

Remember that the cognitive learning approach focuses on the *internal* thoughts and expectations of learners, whereas classical and operant conditioning approaches focus on *external* stimuli, responses, and reinforcement.

Latent Learning in Rats

Once a day for 17 days rats were allowed to run through a maze. Rats that were never rewarded (unrewarded control condition) consistently made the most errors. Those that received food for finishing the maze each time (rewarded control condition) made far fewer errors. The experimental group was initially unrewarded but began to be rewarded on the tenth day. Soon their error rate fell to about the same level as that of the rewarded controls. Apparently, this group had developed a cognitive map of the maze and demonstrated their latent learning when they were rewarded for completing the maze successfully.





Source: Tolman & Honzik, 1930.

permitted the rats that initially received no reward to learn the layout of the maze, because there was no obvious reinforcer present. Instead, the results support a cognitive view of learning, in which changes occur in unobservable mental processes (Beatty, 2002; Frensch & Rünger, 2003; Stouffer & White, 2006; Voicu & Schmajuk, 2002).

observational learning
Learning by observing the behavior of another person, or model.

OBSERVATIONAL LEARNING: LEARNING THROUGH IMITATION

Let's return for a moment to the case of a person learning to drive. How can we account for instances in which an individual with no direct experience in carrying out a particular behavior learns the behavior and then performs it? To answer this question, psychologists have focused on another aspect of cognitive learning: observational learning.

According to psychologist Albert Bandura and colleagues, a major part of human learning consists of **observational learning**, which is learning by watching the behavior of another person, or *model*. Because of its reliance on observation of others—a social phenomenon—the perspective taken by Bandura is often referred to as a *social cognitive* approach to learning (Bandura, 1999, 2004).

Bandura dramatically demonstrated the ability of models to stimulate learning in a classic experiment. In the study, young children saw a film of an adult wildly hitting a 5-feet-tall inflatable punching toy called a Bobo doll (Bandura, Ross, & Ross, 1963a, 1963b). Later the children were given the opportunity to play with the Bobo doll themselves, and, sure enough, most displayed the same kind of behavior, in some cases mimicking the aggressive behavior almost identically.

Observational learning is particularly important in acquiring skills in which the operant conditioning technique of shaping is inappropriate. Piloting an airplane and performing brain surgery, for example, are behaviors that could hardly be learned by using trial-and-error methods without grave cost—literally—to those involved in the learning process.

Not all behavior that we witness is learned or carried out, of course. One crucial factor that determines whether we

Did you know?

Learning actually changes your brain! When you learn new information, the neurons in your brain become better networked or wired. The more you use the information, the stronger those networks will be—and the longer you will retain it.

later imitate a model is whether the model is rewarded for his or her behavior. If we observe a friend being rewarded for putting more time into her studies by receiving higher grades, we are more likely to imitate her behavior than we would if her behavior resulted only in being stressed and tired. Models who are rewarded for behaving in a particular way are more apt to be mimicked than are models who receive punishment. Observing the punishment of a model, however, does not necessarily stop observers from learning the behavior. Observers can still describe the model's behavior—they are just less apt to perform it (Bandura, 1977, 1986, 1994).

Observational learning provides a framework for understanding a number of important issues relating to the extent to which people learn simply by watching the behavior of others. For instance, does watching violence on television cause us to become more violent?

Psych at the Movies

A Clockwork Orange
An ultraviolent young British man, imprisoned for rape and murder, volunteers to participate in an experimental program in which classical conditioning and aversion therapy are used in an attempt to rehabilitate him.

The Manchurian Candidate
The effects of classical conditioning and hypnosis in this movie are so powerful they turn a loyal soldier into a dangerous assassin.

What about Bob?
Bob uses shaping strategies (reinforcing "baby steps") from his psychologist's book in an attempt to overcome his irrational fears and anxieties.

Rounders
Casinos capitalize on the power of intermittent schedules of reinforcement. The main character in this movie battles a gambling addiction that keeps pulling him back in.

Me and You and Everyone We Know
Five-year-old Robby spends a lot of time with his brother on the computer. He gains enough computer skills through observational learning to chat on an adult dating website and arrange to meet a woman in a park.

VIOLENCE IN TELEVISION AND VIDEO GAMES: DOES THE MEDIA'S MESSAGE MATTER?

In an episode of *The Sopranos* television series, fictional mobster Tony Soprano murdered one of his associates. To make identification of the victim's body difficult, Soprano and one of his henchmen dismembered the body and dumped the body parts.

A few months later, two real-life half brothers in Riverside, California, strangled their mother and then cut her head and hands from her body. Victor Bautista, 20, and Matthew Montejo, 15, were caught by

STUDY TIP

A key point of observational learning approaches is that the behavior of models who are rewarded for a given behavior is more likely to be imitated than behavior in which the model is punished for the behavior.

police after a security guard noticed that the bundle they were attempting to throw in a dumpster had a foot sticking out of it. They told police that the plan to dismember their mother was inspired by *The Sopranos* episode (Martelle, Hanley, & Yoshino, 2003).

Like other "media copycat" killings, the brothers' cold-blooded brutality raises a critical issue: Does observing violent and antisocial acts in the media lead viewers to behave in similar ways? Because research on modeling shows that people frequently learn and imitate the aggression that they observe, this question is among the most important issues being addressed by psychologists.

Certainly, the amount of violence in the mass media is enormous. By the time of elementary school graduation, the average child in the United States will have viewed more than 8,000 murders and more than 800,000 violent acts on network television (Huston et al., 1992; Mifflin, 1998).

Most experts agree that watching high levels of media violence makes viewers more susceptible to acting aggressively, and recent research supports this claim. For example, one survey of serious and violent young male offenders incarcerated in Florida showed that one-fourth of them had attempted to commit a media-inspired copycat crime (Surette, 2002). A significant proportion of those teenage offenders noted that they paid close attention to the media.

Violent video games have also been linked with actual aggression. In one of a series of studies by psychologist Craig Anderson and his colleagues, for example, college students who frequently played violent video games, such as *Postal* or *Doom*, were more likely to have been involved in delinquent behavior and aggression than were their peers. Frequent players also had lower academic achievement (Anderson & Dill, 2000; Anderson et al., 2004; Bartholow & Anderson, 2002).

From the perspective of . . .

A SCHOOL PSYCHOLOGIST What advice would you give to families about children's exposure to violent media and video games?

Several aspects of media violence may contribute to real-life aggressive behavior (Bushman & Anderson, 2001; Johnson et al., 2002). For one thing, experiencing violent media content seems to lower inhibitions against carrying out aggression—watching television portrayals of violence or using violence to win a video game makes aggression seem a legitimate response to particular situations. Exposure to media violence also may distort our understanding of the meaning of others' behavior, predisposing us to view even nonaggressive acts by others as aggressive. Finally, a continuous diet of aggression may leave us desensitized to violence, and what previously would have repelled us now produces little emotional response. Our sense of the pain and suffering brought about by aggression may be diminished (Bartholow, Bushman, & Sestir, 2006; Carnagey, Anderson, & Bushman, 2007; Weber, Ritterfeld, & Kostygina, 2006).

By the time of elementary school graduation, the average child in the United States will have viewed more than 8,000 murders and more than 800,000 violent acts on network television.

DOES CULTURE INFLUENCE HOW WE LEARN?

When a member of the Chilcotin Indian tribe teaches her daughter to prepare salmon, at first she allows the girl only to observe the entire process. A little later, she permits her child to try out some basic parts of the task. Her response to questions is noteworthy. For example, when the daughter asks about how to do "the backbone part," the mother's response is to repeat the entire process with another salmon. The reason? The mother feels that one cannot learn the individual parts of the task apart from the context of preparing the whole fish (Tharp, 1989).

It should not be surprising that children raised in the Chilcotin tradition, which stresses instruction that starts by communicating the entire task, may have difficulty with traditional Western schooling. In the approach to teaching most characteristic of Western culture, tasks are broken down into their component parts. Only after each small step is learned is it thought possible to master the complete task.

Do the differences in teaching approaches between cultures affect how people learn? Some psychologists, taking a cognitive perspective on learning, suggest that people develop particular *learning styles*, characteristic ways of approaching material, based on both their cultural background and their personal, unique pattern of abilities (Anderson & Adams, 1992; Barmeyer, 2004; Wilkinson & Olliver-Gray, 2006).

Learning styles differ along several dimensions. For example, one central dimension is relational versus analytical approaches to learning. People with a *relational learning style* master material best through exposure to a full unit or phenomenon. Parts of the unit are comprehended only when their relationship to the whole is understood. For example, a student learning about operant conditioning

Analytical versus Relational Approaches to Learning

	Relational Style	Analytical Style
1	Perceive information as part of total picture	Able to dis-embed information from total picture (focus on detail)
2	Exhibit improvisational and intuitive thinking	Exhibit sequential and structured thinking
3	More easily learn materials that have a human, social content and are characterized by experimental/cultural relevance	More easily learn materials that are inanimate and impersonal
4	Have a good memory for verbally presented ideas and information, especially if relevant	Have a good memory for abstract ideas and irrelevant information
5	Are more task-oriented concerning nonacademic areas	Are more task-oriented concerning academics
6	Are influenced by authority figures' expression of confidence or doubt in students' ability	Are not greatly affected by the opinions of others
7	Prefer to withdraw from unstimulating task performance	Show ability to persist at unstimulating tasks
8	Style conflicts with the traditional school environment	Style matches most school environments

Source: Anderson & Adams, 1992.

would participate in several different operant conditioning experiences and by doing so come to understand the individual elements such as reinforcement and punishment.

In contrast, those with an *analytical learning style* do best when they can carry out an initial analysis of the principles and components underlying a phenomenon or situation. By developing an understanding of the fundamental principles and components, they are best able to understand the full picture. For example, a student learning about operant conditioning would learn first about each element, reinforcement, punishment, schedules of reinforcement, and so on, and then put them altogether to understand the concept.

According to James Anderson and Maurianne Adams, particular minority groups in Western societies display characteristic learning styles. For instance, they argue that Caucasian females and African-American, Native-American, and Hispanic-American males and females are more apt to use a relational style of learning than Caucasian and Asian-American males, who are more likely to employ an analytical style (Adams et al., 2000; Anderson & Adams, 1992).

The conclusion that members of particular ethnic and gender groups have similar learning styles is controversial. Because there is so much diversity within each particular racial and ethnic group, critics argue that generalizations about learning styles cannot be used to predict the style of any single individual, regardless of group membership.

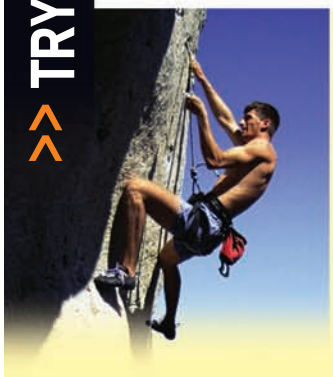
Still, it is clear that values about learning, which are communicated through a person's family and cultural background, have an effect on how successful students are in school. One theory suggests that members of minority groups who were voluntary immigrants are more apt to be successful in school than those who were brought into a majority culture against their will. For example, Korean children in the United States—the sons and daughters of voluntary immigrants—perform quite well, as a group, in school. In contrast, Korean children in Japan, who were often the sons and daughters of people who were forced to immigrate during World War II, essentially as forced laborers, tend to do poorly in school. Presumably, children in the forced immigration group are less motivated to succeed than those in the voluntary immigration group (Foster, 2005; Ogbu, 1992, 2003).

PSYCH think

> > > The relational style of learning sometimes conflicts with the traditional school environment. Could a school be created that takes advantage of the characteristics of the relational style? How? Are there types of learning for which the analytical style is clearly superior?

TRY IT!

Personal Styles



What's Your Receptive Learning Style? Read each of the following statements and rank them in terms of their usefulness to you as learning approaches. Base your ratings on your personal experiences and preferences, using the following scale:

1 = Not at all useful 2 = Not very useful 3 = Neutral 4 = Somewhat useful 5 = Very useful

Scoring information is on the next page.

	1	2	3	4	5
1. Studying alone					
2. Studying pictures and diagrams to understand complex ideas					
3. Listening to class lectures					
4. Performing a process myself rather than reading or hearing about it					
5. Learning a complex procedure by reading written directions					
6. Watching and listening to film, computer, or video presentations					
7. Listening to a book or lecture on tape					
8. Doing lab work					
9. Studying teachers' handouts and lecture notes					
10. Studying in a quiet room					
11. Taking part in group discussions					
12. Taking part in hands-on classroom demonstrations					
13. Taking notes and studying them later					
14. Creating flash cards and using them as a study and review tool					
15. Memorizing and recalling how words are spelled by spelling them "out loud" in my head					
16. Writing key facts and important points down as a tool for remembering them					
17. Recalling how to spell a word by seeing it in my head					
18. Underlining or highlighting important facts or passages in my reading					
19. Saying things out loud when I'm studying					
20. Recalling how to spell a word by "writing" it invisibly in the air or on a surface					
21. Learning new information by reading about it in a textbook					
22. Using a map to find an unknown place					
23. Working in a study group					
24. Finding a place I've been to once by just going there without directions					

Scoring: The statements reflect four receptive learning styles:

Read/write learning style. If you have a read/write learning style, you prefer information that is presented visually in a written format. You feel most comfortable reading, and you may recall the spelling of a word by thinking of how the word looks. You probably learn best when you have the opportunity to read about a concept rather than listening to a teacher explain it.

Visual/graphic learning style. Students with a visual/graphic learning style learn most effectively when material is presented visually in a diagram or picture. You might recall the structure of a chemical compound by reviewing a picture in your mind, and you benefit from instructors who make frequent use of visual aids such as videos, maps, and models. Students with visual learning styles find it easier to see things in their mind's eye—to visualize a task or concept—than to be lectured about them.

Auditory/verbal learning style. Have you ever asked a friend to help you put something together by having her read the directions to you while you worked? If you did, you may have an auditory/verbal learning style. People with auditory/verbal learning styles prefer listening to explanations rather than reading them. They love class lectures and discussions, because they can easily take in the information that is being talked about.

Tactile/kinesthetic learning style. Students with a tactile/kinesthetic learning style prefer to learn by doing—touching, manipulating objects, and doing things. For instance, some people enjoy the act of writing because of the feel of a pencil or a computer keyboard—the tactile equivalent of thinking out loud. Or they may find that it helps them to make a three-dimensional model to understand a new idea.

To find your primary learning style, disregard your 1, 2, and 3 ratings. Add up your 4 and 5 ratings for each learning style (i.e., a "4" equals 4 points and a "5" equals 5 points). Use the following to link the statements to the learning styles and to write down your summed ratings:

Learning Style Statements Total (Sum) of Rating Points
Read/write 1, 5, 9, 13, 17, and 21
Visual/graphic 2, 6, 10, 14, 18, and 22
Auditory/verbal 3, 7, 11, 15, 19, and 23
Tactile/kinesthetic 4, 8, 12, 16, 20, and 24

The total of your rating points for any given style will range from a low of 0 to a high of 30. The highest total indicates your main receptive learning style. Don't be surprised if you have a mixed style, in which two or more styles receive similar ratings.

For REVIEW >>

- What is learning?

  Learning is a relatively permanent change in behavior resulting from experience. Classical conditioning is a form of learning that occurs when a neutral stimulus—one that normally brings about no relevant response—is repeatedly paired with a stimulus (called an unconditioned stimulus) that brings about a reflexive, untrained response. By studying salivation in dogs, Pavlov determined that conditioning occurs when the neutral stimulus is repeatedly presented just before the unconditioned stimulus. After repeated pairings, the neutral stimulus elicits the same response that the unconditioned stimulus brings about. When this occurs, the neutral stimulus has become a conditioned stimulus, and the response a conditioned response. Watson applied Pavlov's principles to condition a human infant called "Little Albert" to fear a white rat. Little Albert also came to fear other white furry objects, demonstrating stimulus generalization. Learning is not always permanent. Extinction occurs when a previously learned response decreases in frequency and eventually disappears. (pp. 112–117)

- What is the role of reward and punishment in learning?

  In operant conditioning, a voluntary behavior is strengthened or weakened through reinforcement or punishment. Skinner's work with animals showed that reinforcing or rewarding behavior increases the probability that the behavior will be repeated. Reinforcers can be positive or negative. In contrast to reinforcement, positive and negative punishment decreases or suppresses a target behavior. (pp. 117–125)

- How can the information from this chapter be used to change undesired behaviors?

  Behavior modification is a method for applying the principles of learning theory to promote the frequency of desired behaviors and to decrease or eliminate unwanted ones. (pp. 125–126)

- Does thinking matter at all in learning?

  Cognitive approaches to learning consider learning in terms of thought processes, or cognition. Latent learning and the apparent development of cognitive maps support cognitive approaches. Learning also occurs when we observe the behavior of others. The major factor that determines whether an observed behavior will actually be performed is the nature of the reinforcement or punishment a model receives. Learning styles vary with cultural background and reflect an individual's unique pattern of abilities. (pp. 126–131)

Pop Quiz

1. _____ involves changes brought about by experience, whereas maturation describes changes resulting from biological development.

   Refer to this passage to answer questions 2 through 5:

   > The last three times little Theresa visited Dr. Lopez for check-ups, he administered a painful preventive immunization shot that left her in tears. Today, when her mother takes her for another checkup, Theresa begins to sob as soon as she comes face to face with Dr. Lopez, even before he has had a chance to say hello.

2. The painful shot that Theresa received during each visit was a(n) _____ _____ that elicited the _____ _____ , her tears.
3. Dr. Lopez is upset because his presence has become a _____ _____ for Theresa's crying.
4. Fortunately, Dr. Lopez gave Theresa no more shots for quite some time. Over that period she gradually stopped crying and even came to like him. _____ had occurred.
5. _____ conditioning describes learning that occurs as a result of reinforcement.
6. Match the type of operant learning with its definition.

   a. positive reinforcement
   b. negative reinforcement
   c. positive punishment
   d. negative punishment

   ____ 1. an unpleasant stimulus is presented to decrease behavior
   ____ 2. an unpleasant stimulus is removed to increase behavior
   ____ 3. a pleasant stimulus is presented to increase behavior
   ____ 4. a pleasant stimulus is removed to decrease behavior

7. Match the type of reinforcement schedule with its definition.

   a. fixed-ratio
   b variable-interval
   c. fixed-interval
   d. variable-ratio

   ____ 1. reinforcement occurs after a set time period
   ____ 2. reinforcement occurs after a set number of responses
   ____ 3. reinforcement occurs after a varying time period
   ____ 4. reinforcement occurs after a varying number of responses

8. The schedules of reinforcement activity taught me that

   a. some people like to get rewarded at the same time each week and some like to be surprised.
   b. giving big rewards may make people more motivated, it depends on their personality.
   c. some people are really easy to get along with and others are more rigid.
   d. most people want lots of little rewards, but a few prefer to get one big reward.

9. In the shaping activity,

   a. I had to alternate between giving positive and negative reinforcement.
   b. the first behavior I reinforced was different from the last one.
   c. there were three birds to train.
   d. I used a model bird that the bird I was training was supposed to imitate.

10. In cognitive learning theory, it is assumed that people develop a(n) _____ about receiving a reinforcer when they behave a certain way.
11. In _____ learning, a new behavior is learned but is not shown until appropriate reinforcement is presented.
12. Bandura's theory of _____ learning states that people learn through watching a(n) _____—another person displaying the behavior of interest.

Answers to Pop Quiz Questions

1. Learning
2. unconditioned stimulus, unconditioned response
3. conditioned stimulus
4. Extinction
5. Operant
6. 1-c, 2-b, 3-a, 4-d
7. 1-c, 2-a, 3-b, 4-d
8. a
9. b
10. expectation
11. latent
12. observational, model