6

Learning

Learning Outcomes for Chapter 6

MODULE 17

LO 17-1 What is learning?

LO 17-2 How do we learn to form associations between stimuli and responses?

MODULE 18

LO 18-1 What is the role of reward and punishment in learning?

LO 18-2 What are some practical methods for bringing about behavior change, both in ourselves and in others?

MODULE 19

LO 19-1 What is the role of cognition and thought in learning?

Prologue *Becoming a Better Driver*

Progressive Insurance has a deal for you: If you drive better, you are going to be rewarded. But it's not going to take your word for how careful a driver you are. Instead, it will install a tiny device called Snapshot under your car's dashboard. Snapshot will monitor how fast you drive, how many miles you travel, and if you make any sudden stops. The data are transmitted to the insurance company, and the better you drive, the more you'll save on your insurance (Schultz, 2011).

Looking Ahead

The strategy this insurance company is using to encourage its clients to become safer drivers is not unique to that industry. Some power companies use a similar type of device to provide customers with real-time feedback on their moment-to-moment energy use, allowing them to see how certain behaviors, such as turning on an air conditioner or turning off unneeded lights, directly affect their electric bill.

Offering rewards for desired behavior takes advantage of some fundamental principles of learning—the same processes that allow us to learn 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. Each of us must acquire and then refine our skills and abilities through learning.

Learning is a fundamental topic for psychologists and plays a central role in almost every specialty area of psychology. For example, a psychologist studying perception might ask, "How do we learn that people who look small from a distance are far away and not simply tiny?" A developmental psychologist might inquire, "How do babies learn to distinguish their mothers from other people?" A clinical psychologist might wonder, "Why do some people learn to be afraid when they see a spider?" A social psychologist might ask, "How do we learn to believe that we've fallen in love?"

Each of these questions, although drawn from very different branches of psychology, can be answered only through an understanding of basic learning processes. In each case, a skill or a behavior is acquired, altered, or refined through experience.

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, or the thought processes that underlie learning.

MODULE 17

Classical Conditioning

Learning Outcomes

LO 17-1 What is learning?

LO 17-2 How do we learn to form associations between stimuli and responses?

Does the mere sight of the golden arches in front of McDonald's make you feel pangs of hunger and think about hamburgers? If it does, you are displaying an elementary form of learning called classical conditioning. *Classical conditioning* helps explain such diverse phenomena as crying at the sight of a bride walking down the aisle, fearing the dark, and falling in love.

Classical conditioning is one of a number of different types of learning that psychologists have identified, but a general definition encompasses them all: **Learning** is a relatively permanent change in behavior that is brought about by experience.

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

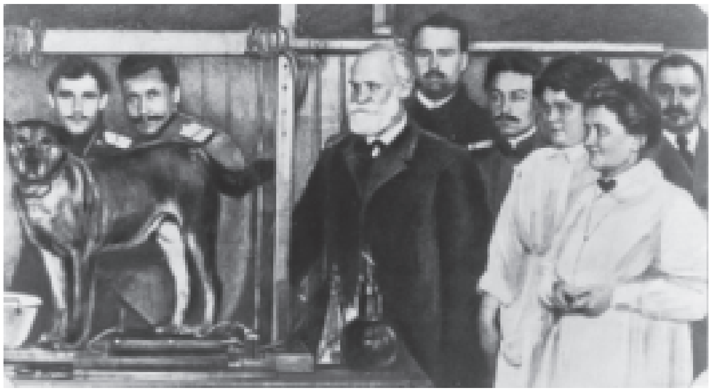
How do we know when a behavior has been influenced by learning—or even is a result of learning? Part of the answer relates to the nature-nurture question, one of the fundamental issues underlying the field of psychology. In the acquisition of behaviors, experience—which is essential to the definition of learning—is the "nurture" part of the nature-nurture question.

However, it's not always easy to identify whether a change in behavior is due to nature or nurture, because some changes in behavior or performance come about through maturation alone and don't involve experience. For instance, children become better tennis players as they grow older partly because their strength increases with their size—a maturational phenomenon. To understand when learning has occurred, we must differentiate maturational changes from improvements resulting from practice, which indicate that learning actually has occurred.

Similarly, short-term changes in behavior that are due to factors other than learning, such as declines in performance resulting from fatigue or lack of effort, are different from performance changes that are due to actual learning. If Serena Williams has a bad day on the tennis court because of tension or fatigue, this does not mean that she has not learned to play correctly or has "unlearned" how to play well. Because there is not always a one-to-one correspondence between learning and performance, understanding when true learning has occurred is difficult.

It is clear that we are primed for learning from the beginning of life. Infants exhibit a simple type of learning called habituation. *Habituation* is the decrease in response to a stimulus that occurs after repeated presentations of the same stimulus. For example, young infants 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. (Adults exhibit habituation, too: Newlyweds soon stop noticing that they are wearing a wedding ring.) Habituation permits us to ignore things that have stopped providing new information.

Most learning is considerably more complex than habituation, and the study of learning has been at the core of the field of psychology. Although philosophers since the time of Aristotle have speculated on the foundations of learning, the first systematic research on learning was done at the beginning of the 20th century, when Ivan Pavlov (does the name ring a bell?) developed the framework for learning called classical conditioning.



Ivan Pavlov (center) developed the principles of classical conditioning.

The Basics of Classical Conditioning

Ivan Pavlov, a Russian physiologist, never intended to do psychological research. In 1904 he won the Nobel Prize for his work on digestion, testimony to his contribution to that field. Yet Pavlov is remembered not for his physiological research but for his experiments on basic learning processes—work that he began quite accidentally (Marks, 2004; Samoilov & Zayas, 2007; Grant & Wingate, 2011).

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.

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.

To demonstrate classical conditioning, Pavlov (1927) attached a tube to the salivary gland of a dog, allowing him to measure precisely the dog's salivation. He then rang a bell and, just a few seconds later, presented the dog with meat. 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 meat. At first the dog would salivate only when the meat was presented, but soon it began to salivate at the sound of the bell. In fact, even when Pavlov stopped presenting the meat, the dog still salivated after hearing the sound. The dog had been classically conditioned to salivate to the bell.

As you can see in Figure 1, the basic processes of classical conditioning that underlie Pavlov's discovery are straightforward, although the terminology he chose is not simple. First, consider the diagram in Figure 1a. Before conditioning, there are two unrelated stimuli: the ringing of a bell and meat. We know that normally the ringing of a bell does not lead to salivation but to some irrelevant response, such as pricking up the ears or perhaps a startle reaction. 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 meat, which naturally causes a dog to salivate—the response we are interested in conditioning. The meat is considered an **unconditioned stimulus (UCS)** because food placed in a dog's mouth automatically causes salivation to occur. The response that the meat elicits (salivation) is called an **unconditioned response (UCR)**—a natural, innate, reflexive response that is not associated with previous learning. Unconditioned responses are always brought about by the presence of unconditioned stimuli.

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 (e.g., salivation at the smell of food).

Figure 1b illustrates what happens during conditioning. The bell is rung just before each presentation of the meat. The goal of conditioning is for the dog to associate the bell with the unconditioned stimulus (meat) and therefore to bring about the same sort of response as the unconditioned stimulus.

After a number of pairings of the bell and meat, the bell alone causes the dog to salivate (as in Figure 1c). When conditioning is complete, the bell has evolved from a neutral stimulus to a **conditioned stimulus (CS).** At this time, salivation that

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.

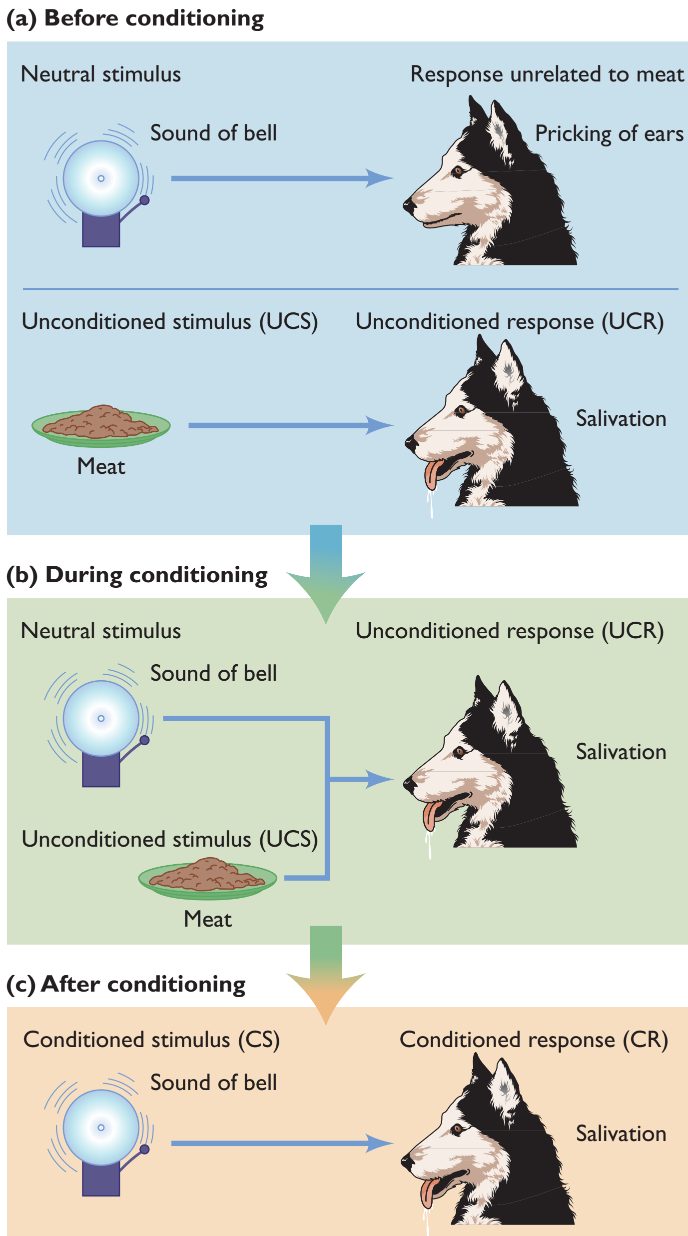


FIGURE 1 The basic process of classical conditioning. (a) Before conditioning, the ringing of a bell does not bring about salivation—making the bell a neutral stimulus. In contrast, meat naturally brings about salivation, making the meat an unconditioned stimulus (UCS) and salivation an unconditioned response (UCR). (b) During conditioning, the bell is rung just before the presentation of the meat. (c) Eventually, the ringing of the bell alone brings about salivation. We now can say that conditioning has been accomplished: The previously neutral stimulus of the bell is now considered a conditioned stimulus (CS) that brings about the conditioned response of salivation (CR).

Study Alert

Figure 1 can help you to learn and understand the process (and terminology) of classical conditioning, which can be confusing.

occurs as a response to the conditioned stimulus (bell) is considered a **conditioned response (CR).** After conditioning, then, the conditioned stimulus evokes the conditioned response.

The sequence and timing of the presentation of the unconditioned stimulus and the conditioned stimulus are particularly important. Like a malfunctioning warning light at a railroad crossing that goes on after the train has passed by, a neutral stimulus that *follows* an unconditioned stimulus has little chance of becoming a conditioned stimulus. However, just as a warning light works best if it goes on right before a train passes, a neutral stimulus that is presented *just before* the unconditioned stimulus is most apt to result in successful conditioning. Research has shown that conditioning is most effective if the neutral stimulus (which will become a conditioned stimulus) precedes the unconditioned stimulus by between a half second and several seconds, depending on what kind of response is being conditioned (Wasserman & Miller, 1997; Bitterman, 2006).

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

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.
- An *un*conditioned stimulus (UCS) leads to an *un*conditioned response (UCR).
- *Un*conditioned stimulus–*un*conditioned response pairings are *not* learned and *not* trained: They are naturally occurring.
- During conditioning, a previously neutral stimulus is transformed into the conditioned stimulus.
- A conditioned stimulus (CS) leads to a conditioned response (CR), 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, whereas the conditioned response is learned.

Applying Conditioning Principles to Human Behavior

Although the initial 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 experience hunger pangs 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 inside the restaurant (the unconditioned stimulus), causing the arches to become a conditioned stimulus that brings about the conditioned response of hunger.

Emotional responses are especially likely to be learned through classical conditioning processes. For instance, how do some of us develop fears of mice, spiders, 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 was at the root of such fears by conditioning an 11-month-old infant named Albert to be afraid of rats. "Little Albert," like most infants, initially was frightened by loud noises but had no fear of rats.

In the study, the experimenters sounded a loud noise whenever Little Albert touched a white, furry 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 effects of the conditioning lingered: five days later, Albert reacted with some degree of fear not only when shown a rat, but when shown objects that looked similar to the white, furry rat, including a white rabbit, a white seal-skin coat, and even a white Santa Claus mask. (By the way, although we don't know for certain what happened to the unfortunate Little Albert, it appears he was a sickly child who died at the age of 5. In any case, Watson, the experimenter, has been condemned for using ethically questionable procedures that could never be conducted today; Beck, Levinson, & Irons, 2009; Powell, 2011.)

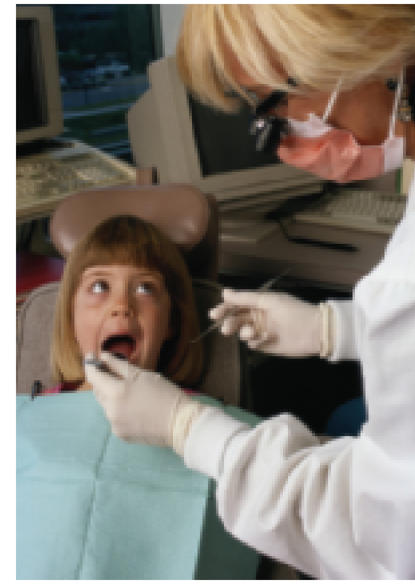
Learning by means of classical conditioning also occurs during adulthood. For example, you may not go to a dentist as often as you should because of previous associations of dentists with pain. In more extreme cases, classical conditioning can lead to the development of *phobias,* which are intense, irrational fears that we will consider later in the book. For example, an insect phobia might develop in someone who is stung by a bee. The insect phobia might be so severe that the person refrains from leaving home.

Posttraumatic stress disorder (PTSD), suffered by some war veterans and others who have had traumatic experiences, can also be produced by classical conditioning.

Even years after their battlefield experiences, veterans may feel a rush of fear and anxiety at a stimulus such as a loud noise (Kaštelan et al., 2007; Roberts, Moore, & Beckham, 2007; Schreurs, Smith-Bell, & Burhans, 2011).

On the other hand, classical conditioning also relates to pleasant experiences. For instance, you may have a particular fondness for the smell of a certain perfume or aftershave lotion because thoughts of an early love come rushing back whenever you encounter it. Or hearing a certain song can bring back happy or bittersweet emotions due to associations that you have developed in the past.

Classical conditioning also explains why drug addictions are so difficult to treat. Drug addicts learn to associate certain stimuli—such as drug paraphernalia like a syringe or a room where they use drugs—with the pleasant feelings produced by the drugs. So simply seeing a syringe or entering a room can produce reactions associated with the drug and continued cravings for it (James et al., 2011).



Because of a previous unpleasant experience, a person may expect a similar occurrence when faced with a comparable situation in the future, a process known as stimulus generalization. Can you think of ways that this process occurs in everyday life?

Extinction

What do you think 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.

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 (the conditioned response) at the ringing of a bell (the conditioned stimulus), we could produce extinction by repeatedly ringing the bell but *not* providing meat (the unconditioned stimulus). 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 (see Figure 2).

We should keep in mind that extinction can be a helpful phenomenon. Consider, for instance, what it would be like if the fear you experienced while watching the shower murder scene in the classic movie *Psycho* never was extinguished. You might well tremble with fright every time you took a shower.

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

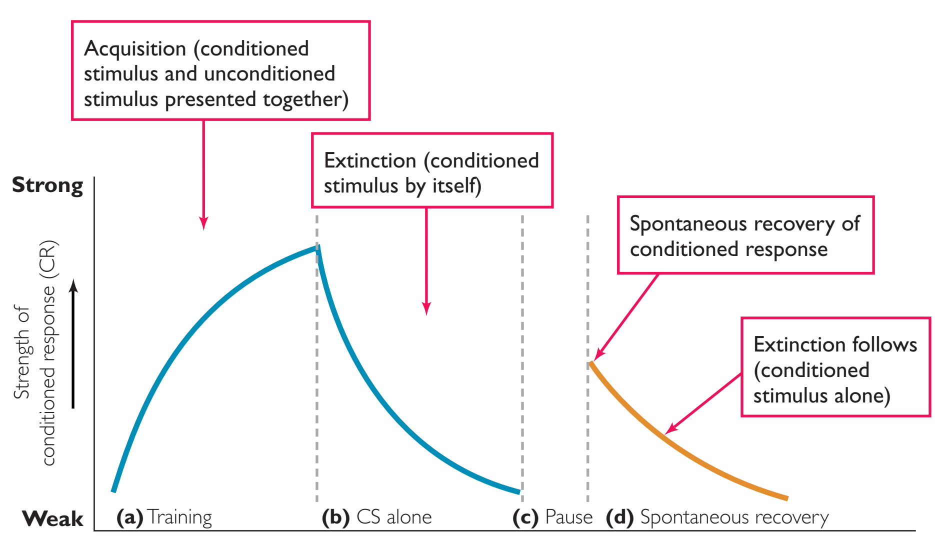


FIGURE 2 Acquisition, extinction, and spontaneous recovery of a classically conditioned response. (a) A conditioned response (CR) gradually increases in strength during training. (b) However, if the conditioned stimulus (CS) is presented by itself enough times, the conditioned response gradually fades, and extinction occurs. (c) After a pause (d) in which the conditioned stimulus is not presented, spontaneous recovery can occur. However, extinction typically reoccurs soon after.

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 time and with no further conditioning.

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

Spontaneous recovery also 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 (Rodd et al., 2004; Plowright, Simonds, & Butler, 2006; Diaz & De la Casa, 2011).

Study Alert

Remember that stimulus generalization relates to stimuli that are similar to one another, while stimulus discrimination relates to stimuli that are different from one another.

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 at the sound of a buzzer as well.

Such behavior is the result of stimulus generalization. **Stimulus generalization** is a process in which, after a stimulus has been conditioned to produce a particular response, stimuli that are similar to the original stimulus produce the same response. 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 been afraid of a black dog, because its color would have differentiated it sufficiently from the original fear-evoking stimulus.

stimulus generalization A process in which, after a stimulus has been conditioned to produce a particular response, stimuli that are similar to the original stimulus produce the same response.

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 permits us to know, for example, that we ought to brake at all red lights, even if there are minor variations in size, shape, and shade.

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 provides 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. She does not bound into the kitchen at the sound of the food processor, although it sounds similar. In other words, she discriminates between the stimuli of can opener and food processor. 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.

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

Beyond Traditional Classical Conditioning: Challenging Basic Assumptions

Although Pavlov hypothesized that all learning is nothing more than long strings of conditioned responses, this notion has not been supported by subsequent research. It turns out that classical conditioning provides us with only a partial explanation of how people and animals learn; indeed, Pavlov was wrong in some of his basic assumptions (Hollis, 1997).

For example, according to Pavlov, the process of linking stimuli and responses occurs in a mechanistic, unthinking way. In contrast to this perspective, learning theorists influenced by cognitive psychology have argued that learners actively develop an understanding and expectancy about which particular unconditioned stimuli are matched with specific conditioned stimuli. A ringing bell, for instance, gives a dog something to think about: the impending arrival of food (Rescorla, 1988; Kirsch et al., 2004).

Traditional explanations of how classical conditioning operates have also been challenged by John Garcia, a learning psychologist. He found that some organisms—including humans—were *biologically prepared* to quickly learn to avoid foods that smelled or tasted like something that made them sick. For instance, a dog quickly learns to avoid rotting food that in the past made it sick. Similarly, if every time you ate peanuts you had an upset stomach several hours later, eventually you would learn to avoid peanuts. In fact, you might develop a learned *taste aversion*,when the taste of a particular food is associated with unpleasant symptoms such as nausea or vomiting. If you developed a taste aversion to peanuts, merely tasting (or even smelling or in more extreme cases seeing a peanut) could produce such disagreeable symptoms (Garcia, 1990, 2003).

The surprising part of Garcia's discovery was his demonstration that conditioning could occur even when the interval between exposure to the conditioned stimulus of tainted food and the response of sickness was as long as eight hours. Furthermore, the conditioning persisted over very long periods and sometimes occurred after just one exposure.

These findings have had important practical implications. For example, to keep crows from stealing eggs, dairy farmers may lace an egg with a chemical and leave it in a place where crows will find it. The drug temporarily makes the crows ill, but it does not harm them permanently. After exposure to a chemical-laden egg, crows no longer find them appetizing (Cox et al., 2004; Baker, Johnson, & Slater, 2007; Bouton et al., 2011).

RECAP/EVALUATE/RETHINK

RECAP

LO17-1 What is learning?

- Learning is a relatively permanent change in behavior resulting from experience. (p. 177)

LO17-2 How do we learn to form associations between stimuli and responses?

- One major form of learning is classical conditioning, which 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 natural, untrained response. (p. 178)
- 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. (pp. 178, 179)
- Learning is not always permanent. Extinction occurs when a previously learned response decreases in frequency and eventually disappears. (p. 181)
- Stimulus generalization is the tendency for a conditioned response to follow a stimulus that is similar to, but not the same as, the original conditioned stimulus. The converse phenomenon, stimulus discrimination, occurs when an organism learns to distinguish between stimuli. (p. 182)

EVALUATE

1. __________ involves changes brought about by experience, whereas maturation describes changes resulting from biological development.
2. __________ is the name of the scientist responsible for discovering the learning phenomenon known as __________ conditioning, whereby an organism learns a response to a stimulus to which it normally would not respond.

Refer to the passage below to answer questions 3 through 5:

The last three times little Theresa visited Dr. Lopez for checkups, 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.

3. The painful shot that Theresa received during each visit was a(n) __________ __________ that elicited the __________ __________, her tears.

4. Dr. Lopez is upset because his presence has become a __________ __________ for Theresa's crying.

5. 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.

RETHINK

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

2. *From the perspective of an advertising executive:* How might knowledge of classical conditioning be useful in creating an advertising campaign? What, if any, ethical issues arise from this use?

Answers to Evaluate Questions

1. Learning; **2.** Pavlov, classical; **3.** unconditioned stimulus, unconditioned response; **4.** conditioned stimulus; **5.** Extinction

KEY TERMS

learning p. 177
classical conditioning p. 178
neutral stimulus p. 178
unconditioned stimulus (UCS) p. 178
unconditioned response (UCR) p. 178
conditioned stimulus (CS) p. 178
conditioned response (CR) p. 179
extinction p. 181
spontaneous recovery p. 182
stimulus generalization p. 182
stimulus discrimination p. 182

MODULE 18

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 is strengthened or weakened, depending on its favorable or unfavorable consequences. When we say that a response has been strengthened or weakened, we mean that it has been made more or less likely to recur regularly.

Unlike classical conditioning, in which the original behaviors are the natural, 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 toiling industriously can bring about a raise or that studying hard results in good grades.

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, which began with a simple inquiry into the behavior of cats.

Learning Outcomes

LO 18-1 What is the role of reward and punishment in learning?

LO 18-2 What are some practical methods for bringing about behavior change, both in ourselves and in others?

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

Thorndike's Law of Effect

If you placed a hungry cat in a cage and then put a small piece of food outside the cage, just beyond the cat's reach, chances are that the cat would eagerly search for a way out of the cage. The cat might first claw at the sides or push against an opening. Suppose, though, you had rigged things so that the cat could escape by stepping on a small paddle that released the latch to the door of the cage (see Figure 1 on page 186). Eventually, as it moved around the cage, the cat would happen to step on the paddle, the door would open, and the cat would eat the food.

What would happen if you then returned the cat to the box? The next time, it would probably take a little less time for the cat to step on the paddle and escape. After a few trials, the cat would deliberately step on the paddle as soon as it was placed in the cage. What would have occurred, according to Edward L. Thorndike (1932), who studied this situation extensively, was that the cat would have learned that pressing the paddle was associated with the desirable consequence of getting food. Thorndike summarized that relationship by formulating the *law of effect:* Responses that lead to satisfying consequences are more likely to be repeated.

Thorndike believed that the law of effect operates as automatically as leaves fall off a tree in autumn. It was not necessary for an organism to understand that there

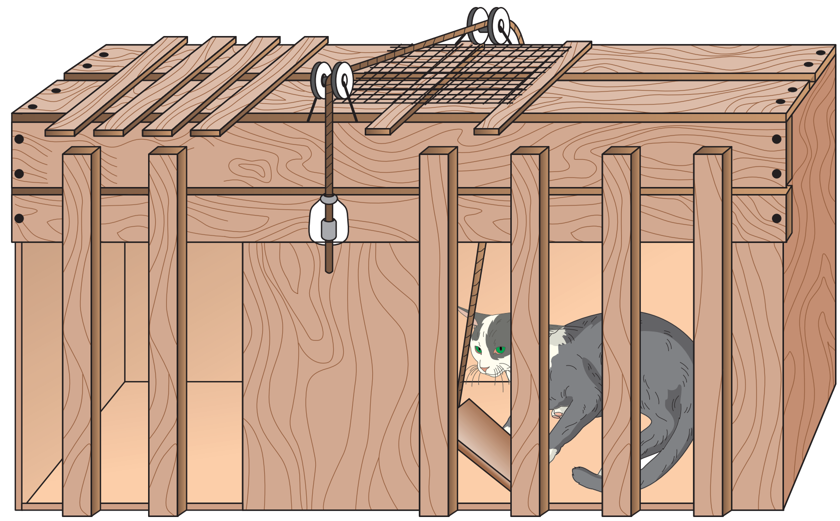


FIGURE 1 Edward L. Thorndike devised this puzzle box to study the process by which a cat learns to press a paddle to escape from the box and receive food. Do you think Thorndike's work has relevance to the question of why people voluntarily work on puzzles and play games, such as sudoku, Angry Birds, and jigsaw puzzles? Do they receive any rewards?

was a link between a response and a reward. Instead, Thorndike believed, over time and through experience the organism would make a direct connection between the stimulus and the response without any awareness that the connection existed.

The Basics of Operant Conditioning

Thorndike's early research served as the foundation for the work of one of the 20th century's most influential psychologists, B. F. Skinner (1904–1990). You may have heard of the Skinner box (shown in Figure 2), a chamber with a highly controlled environment that was used to study operant conditioning processes with laboratory animals. Whereas Thorndike's goal was to get his cats to learn to obtain food by leaving the box, animals in a Skinner box learn to obtain food by operating on their environment within the box. Skinner became interested in specifying how behavior varies as a result of alterations in the environment.

Skinner, whose work went far beyond perfecting Thorndike's earlier apparatus, is considered the inspiration for a whole generation of psychologists studying operant conditioning. To illustrate Skinner's contribution, let's consider what happens to a rat in the typical Skinner box (Pascual & Rodríguez, 2006; Soorya, Carpenter, & Romanczyk, 2011).

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, it 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 the receipt of food is contingent on pressing the lever.

REINFORCEMENT: THE CENTRAL CONCEPT OF OPERANT CONDITIONING

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

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.

FIGURE 2 B. F. Skinner with a Skinner box used to study operant conditioning. Laboratory rats learn to press the lever in order to obtain food, which is delivered in the tray.

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.

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 Hershey's bar can act as a reinforcer for one person, an individual who dislikes chocolate may find one dollar 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 one dollar can buy us 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 previous 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.

In contrast, a *secondary reinforcer* 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 (Moher et al., 2008).

Secondary reinforcers make up the heart of *token systems* sometimes used in the treatment of some psychological disorders for those who are in institutions. In a token system, a patient is rewarded for showing desired behavior with a token such as a poker chip. The token—an example of a secondary reinforcer—can then be redeemed for something desirable, such as snacks, games, or real money.

Neuroscientists are beginning to explore the biological underpinnings of reinforcers. For example, we now know that the neurotransmitter *dopamine* (discussed in the "Neuroscience and Behavior" chapter) plays a key role in the reinforcement of behavior. When we are exposed to certain kinds of stimuli, a flood of dopamine cascades through parts of the brain, leading to feelings of pleasure that are reinforcing (Nargeot & Simmers, 2011; Trujillo-Pisanty et al., 2011).

Study Alert

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

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

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 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.

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

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 (Magoon & Critchfield, 2008).

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

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. If we receive a shock that is meant to decrease a certain behavior, then we are receiving punishment, but if we are already receiving a shock and do something to stop that shock, the behavior that stops the shock is considered to be negatively reinforced. In the first case, the specific behavior is apt to decrease because of the punishment; in the second, it is likely to increase because of the negative reinforcement.

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 10 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 prior behavior will be repeated.

The following rules (and the summary in Figure 3) can help you distinguish these concepts from one another:

- 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 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.

Study Alert

The differences between positive reinforcement, negative reinforcement, positive punishment, and negative punishment are tricky, so pay special attention to Figure 3 and the definitions in the text.

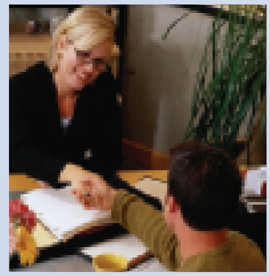
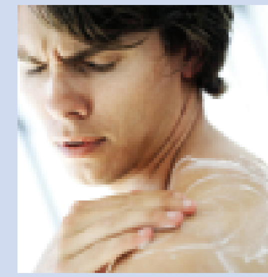
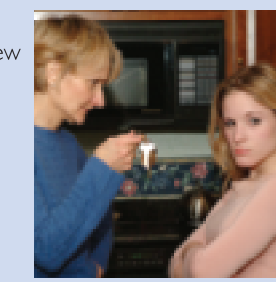
Intended Result	When stimulus is added, the result is …	When stimulus is removed or terminated, the result is …
Increase in behavior (reinforcement)	**Positive reinforcement** Example: Giving a raise for good performance Result: *Increase* in response of good performance 	**Negative reinforcement** Example: Applying ointment to relieve an itchy rash leads to a higher future likelihood of applying the ointment Result: *Increase* in response of using ointment 
Decrease in behavior (punishment)	**Positive punishment** Example: Yelling at a teenager when she steals a bracelet Result: *Decrease* in frequency of response of stealing 	**Negative punishment** Example: Restricting teenager's access to car due to breaking curfew Result: *Decrease* in response of breaking curfew 

FIGURE 3 Types of reinforcement and 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.

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, however, is used only to keep the child safe and to buy time until positive reinforcement procedures can be initiated (Ducharme, Sanjuan, & Drain, 2007; Matson & LoVullo, 2008; Humphreys & Lee, 2011).

Punishment has several disadvantages that make its routine 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 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 (Leary et al., 2008; Zolotor et al., 2008; Miller-Perrin, Perrin, & Kocur, 2009; Smith, Springer, & Barrett, 2011).

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 appropriate technique for modifying behavior than using punishment. Both in and out of the scientific arena, then, reinforcement usually beats punishment (Pogarsky & Piquero, 2003; Hiby, Rooney, & Bradshaw, 2004; Sidman, 2006; Hall et al., 2011).

SCHEDULES OF REINFORCEMENT: TIMING LIFE'S REWARDS

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.** Although learning occurs more rapidly under a continuous reinforcement schedule, behavior lasts longer after reinforcement stops when it is learned under a partial reinforcement schedule (Staddon & Cerutti, 2003; Gottlieb, 2004; Casey, Cooper-Brown, & Wacher, 2006; Reed, 2007).

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 some but not all of the time.

Why should intermittent reinforcement result in stronger, longer-lasting learning than continuous reinforcement? We can answer the question by examining how we might behave when using a candy vending machine compared with a Las Vegas slot machine. When we use a vending machine, previous 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. We have learned that after putting in our cash, most of the time we will not receive anything in return. At the same time, though, we know that we 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, we would drop in money for a considerably longer time, even though there would be no payoff.

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 (Svartdal, 2003; Pellegrini et al., 2004; Gottlieb, 2006; Reed & Morgan, 2008; Miguez, Witnauer, & Miller, 2011).

Fixed- and Variable-Ratio Schedules. 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 10th 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 (see Figure 4).

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

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.

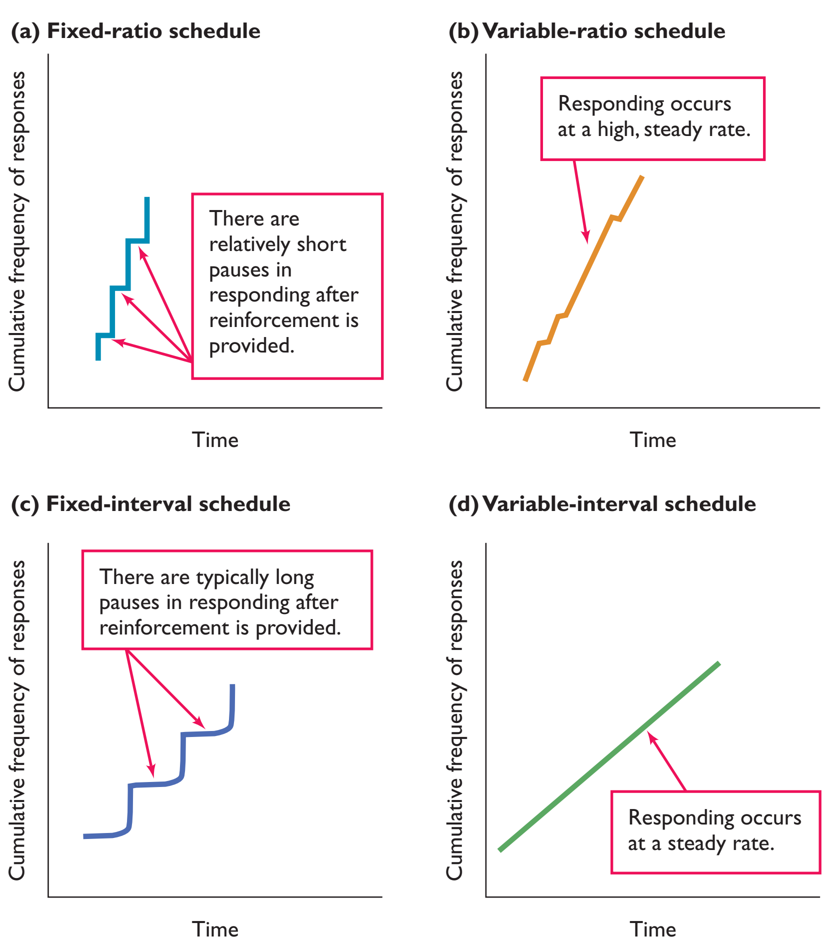


FIGURE 4 Typical outcomes of different reinforcement schedules. (a) In a fixed-ratio schedule, reinforcement is provided after a specific number of responses are made. Because the more responses, the more reinforcement, fixed-ratio schedules produce a high rate of responding. (b) In a variable-ratio schedule, responding also occurs at a high rate. (c) A fixed-interval schedule produces lower rates of responding, especially just after reinforcement has been presented, because the organism learns that a specified time period must elapse between reinforcements. (d) A variable-interval schedule produces a fairly steady stream of responses.

Study Alert

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.

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. He might make a sale during the 3rd, 8th, 9th, and 20th calls without being successful during any call in between. Although the number of responses he must make before making a sale varies, it averages out to a 20% 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.

Fixed- and Variable-Interval Schedules: The Passage of Time. In contrast to fixed 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.

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.

Because a **fixed-interval schedule** provides reinforcement for a response only if a fixed time period has elapsed, overall rates of response are relatively low. This is especially true in the period just after reinforcement, when the time before another reinforcement is relatively great. 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 Figure 4 on page 191 (Saville, 2009).

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

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 3 days to one every 3 weeks, averaging one every 2 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. (Also see *Applying Psychology in the 21st Century*.)

DISCRIMINATION AND GENERALIZATION IN OPERANT CONDITIONING

It does not take a child long to learn that a red light at an intersection means stop and a green light indicates that it is permissible to continue, in the same 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

Applying Psychology in the 21st Century

Using Operant Conditioning Principles to Save Lives

"This workplace has gone 279 days without an accident."

Signs such as this displayed in work environments are intended to remind employees about safety concerns and to motivate them to engage in good safety habits. But the unspoken message is that safety is measured not in terms of positive behaviors, such as following checklists, reporting close calls, or identifying hazards promptly, but rather in terms of failures—the occurrence of actual, and perhaps preventable, accidents.

The problem with focusing on the accidents is that it's a reactive strategy—the accident you want to prevent actually has to happen, and only then does someone investigate its cause and possibly its prevention. This very act of investigating and determining a cause implies that someone is looking to place blame. This act also assumes that there is an identifiable cause. This approach tends to create a punitive atmosphere that instills fear, stifles conversations about safety practices, and discourages reporting of problems (Geller, 2001, 2011).

A better approach is to implement a procedure called *behavior-based safety*. First, employees gather in discussion groups to list the various tasks of their work. They define safe and unsafe behaviors that pertain to each task. These discussions, then, result in a checklist of desirable and undesirable safety behaviors. For instance, if one work task involves lifting a heavy object, safe behaviors might include wearing a back brace and lifting with your legs; unsafe behaviors might be lifting with your back and not using a back brace. Employees can use these checklists to monitor each other's behavior and provide feedback on their safe work habits. Managers can identify tasks where risky behavior is most problematic and take corrective steps, one of which might be to focus employees more on using the checklists (Geller, 2001, 2011).

Instead of focusing on failures in a workplace to promote safety, new studies find that applying a behavior-based safety approach, emphasizing prevention, works better.

These checklists, then, identify and help to correct risks *before* an accident happens. There is no individual blame or punishment—instead employees work together to make the workplace safer for everyone. Instead of reacting to failure, employees proactively strive to do better. And very importantly, employees have a sense of personal control over their own safety. They feel a sense of individual responsibility as well as empowerment to make positive changes. In such an environment, safety isn't just a vague value—it's an everyday concern shared by every single employee working together not just to prevent accidents, but to work smarter (Deci & Ryan, 1995; Geller, 2011).

RETHINK

- Why do you think it's important to use checklists that identify positive safety behaviors as well as risky behaviors?
- Why is it important for employees to feel a sense of personal control over the safety of their workplace?

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 CD, your behavior can be said to be under stimulus control because you can discriminate between her moods.

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 operant conditioning to teach people to repair an automobile transmission. If you had to wait until they chanced to fix a transmission perfectly before you provided them with reinforcement, the Model T Ford might be back in style long before they mastered the repair process.

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. For such behaviors, for which there might otherwise be no opportunity to provide reinforcement (because the behavior would never occur in the first place), a procedure known as shaping is used. **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 (Krueger & Dayan, 2009).

Shaping allows even lower animals 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 learning of many complex human skills. For instance, the organization of most textbooks is based on the principles of shaping. Typically, information is presented so that new material builds on previously learned concepts or skills. Thus, the concept of shaping could not be presented until we had discussed the more basic principles of operant learning (Meyer & Ladewig, 2008). (Also see *PsychWork*.)

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

PsychTech

Computer-based *adaptive learning* techniques—based on the principles of shaping—present students with new material and then quiz them on it online. Presentation of subsequent material is based on students' previous performance on the quiz, so that the level and difficulty of new material is personalized, leading to great student success.

PsychWork

SEEING EYE GUIDE DOG TRAINER

Name: Lea Johnson

Position: Seeing Eye Guide Dog Trainer

Education: BS, Geography, Dartmouth College, Hanover, NH

For decades, guide dogs have provided a set of eyes to the visually impaired, expanding the opportunities open to them and increasing their independence. But it takes a great deal of training to make a dog an effective seeing eye guide dog, according to Lea Johnson, who works with The Seeing Eye agency in Morristown, New Jersey. Johnson teaches apprentice instructors to carry out the demanding, but rewarding, process of training dogs.

"We hire college graduates, and while we don't require a specific major, a background in psychology or animal science allows employees to more easily connect with different aspects of the job," she said.

An apprentice instructor needs to have self-motivation in order to complete all aspects of the dog's training. In addition, they need to be able to work in a team setting, according to Johnson. But that's only part of it.

"The process of training the dogs is complex," says Johnson. "For example, the dog must be obedient and respond to their visually-impaired owner. But they also get praised for sometimes refusing their owner's commands, if it would put their owner in danger."

Once a dog learns the skills it needs, the trainer must then teach a visually-impaired person how to work with the dog.

"After training dogs for four months, the trainers must be able to teach blind people the skills to care for and travel with their Seeing Eye dog safely," Johnson said. Not only must trainers relate well to dogs, but they also must interact well with blind people. She adds, "The training of people is intense and emotionally challenging in a very different way from the dog training portion. Without a good heart to start with, trainers would never be successful."

BIOLOGICAL CONSTRAINTS ON LEARNING: YOU CAN'T TEACH AN OLD DOG JUST ANY TRICK

Biological constraints make it nearly impossible for animals to learn certain behaviors. Here, psychologist Marian Breland attempts to overcome the natural limitations that inhibit the success of conditioning this rooster.

Not all behaviors can be trained in all species equally well. Instead, there are *biological constraints,* built-in limitations in the ability of animals to learn particular behaviors. In some cases, an organism has a special predisposition that will aid in its learning a behavior (such as pecking behaviors in pigeons). In other cases, biological constraints act to prevent or inhibit an organism from learning a behavior. For example, it's impossible to train pigs to pick up a disk, because they are biologically programmed to push objects like it along the ground. Similarly, although a raccoon can be conditioned to drop a single coin into a piggy bank, it will do so only after rubbing the coin against the outside of the bank. The reason? After catching a fish, raccoons instinctually rub them against the ground to remove their outer covering (Breland & Breland, 1966; Stevens & Pashler, 2002).

The existence of biological constraints is consistent with evolutionary explanations of behavior. Clearly, there are adaptive benefits that promote survival for organisms that quickly learn—or avoid—certain behaviors. For example, our ability to rapidly learn to avoid touching hot surfaces increases our chances of survival. Additional support for the evolutionary interpretation of biological constraints lies in the fact the associations that animals learn most readily involve stimuli that are most relevant to the specific environment in which they live (Cosmides & Tooby, 2004; Davis, 2007; Behrendt, 2011).

Furthermore, psychologists taking an evolutionary perspective have suggested that we may be genetically predisposed to be fearful of certain stimuli, such as snakes or even threatening faces. For example, people in experiments learn associations relatively quickly between photos of faces with threatening expressions and neutral stimuli (such as an umbrella). In contrast, they are slower to learn associations between faces that have pleasant expressions and neutral stimuli. Stimuli that pose potential threats, like snakes or people with hostile facial expressions, posed a potential danger to early humans, and there may be an evolved "fear module" in the brain that is sensitized to such threats (Endres & Fendt, 2007; DeLoache & LoBue, 2009; Gerdes, Uhl, & Alpers, 2009).

COMPARING CLASSICAL AND OPERANT CONDITIONING

We've considered classical conditioning and operant conditioning as two completely different processes. And, as summarized in Figure 5 on page 196, there are a number of key distinctions between the two forms of learning. For example, the key concept in classical conditioning is the association between stimuli, whereas in operant conditioning it is reinforcement. Furthermore, classical conditioning involves an involuntary, natural, innate behavior, but operant conditioning is based on voluntary responses made by an organism.

Some researchers are asking if, in fact, the two types of learning are so different after all. Some learning psychologists have suggested that classical and operant conditioning might share some underlying processes. Arguing from an evolutionary viewpoint, they contend that it is unlikely that two completely separate basic processes would evolve. Instead, one process—albeit with considerable complexity in the way it operates—might better explain behavior. Although it's too early to know if this point of view will be supported, it is clear that there are a number of processes that operate both in classical and operant conditioning, including extinction, stimulus generalization, and stimulus discrimination (Donahoe, 2003; Donahoe & Vegas, 2004; Silva, Gonçalves, & Garcia-Mijares, 2007).

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 he 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.

FIGURE 5 Comparing key concepts in classical conditioning and operant conditioning.

BECOMING AN INFORMED CONSUMER of Psychology

Using Behavior Analysis and Behavior Modification

A couple who had been living together for 3 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 specialized in behavior-modification techniques. He asked them to keep a detailed written record of their interactions over the next 2 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 them to list all the chores that could possibly arise and assign each one a point value depending 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.

The couple agreed to try it 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.

The case just presented 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. People with severe mental retardation have, for the first time in their lives, started dressing and feeding themselves. Behavior modification has also helped people lose weight, give up smoking, and behave more safely (Delinsky, Latner, & Wilson, 2006; Ntinas, 2007; Carels et al., 2011).

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

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

- *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 2 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, it is necessary to 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 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 son to spend more time on his homework, but as soon as he sits down to study, he asks for a snack. If the mother gets a snack for him, she is likely to be reinforcing her son's delaying tactic, not his 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 its 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.

RECAP/EVALUATE/RETHINK

RECAP

LO 18-1 What is the role of reward and punishment in learning?

- Operant conditioning is a form of learning in which a voluntary behavior is strengthened or weakened. According to B. F. Skinner, the major mechanism underlying learning is reinforcement, the process by which a stimulus increases the probability that a preceding behavior will be repeated. (pp. 185, 186)
- Primary reinforcers are rewards that are naturally effective without previous experience, because they satisfy a biological need. Secondary reinforcers begin to act as if they were primary reinforcers through association with a primary reinforcer. (p. 187)
- Positive reinforcers are stimuli that are added to the environment and lead to an increase in a preceding response. Negative reinforcers are stimuli that remove something unpleasant from the environment, also leading to an increase in the preceding response. (p. 188)
- Punishment decreases the probability that a prior behavior will occur. Positive punishment weakens a response through the application of an unpleasant stimulus, whereas negative punishment weakens a response by the removal of something positive. In contrast to reinforcement, in which the goal is to increase the incidence of behavior, punishment is meant to decrease or suppress behavior. (p. 189)
- Schedules and patterns of reinforcement affect the strength and duration of learning. Generally, partial reinforcement schedules—in which reinforcers are not delivered on every trial—produce stronger and longer-lasting learning than do continuous reinforcement schedules. (p. 190)
- Among the major categories of reinforcement schedules are fixed- and variable-ratio schedules, which are based on the number of responses made, and fixed- and variable-interval schedules, which are based on the time interval that elapses before reinforcement is provided. (pp. 191, 192)
- Stimulus control training (similar to stimulus discrimination in classical conditioning) is reinforcement of a behavior in the presence of a specific stimulus but not in its absence. In stimulus generalization, an organism learns a response to one stimulus and then exhibits the same response to slightly different stimuli. (pp. 192, 193)
- Shaping is a process for teaching complex behaviors by rewarding closer and closer approximations of the desired final behavior. (p. 194)
- There are biological constraints, or built-in limitations, on the ability of an organism to learn: Certain behaviors will be relatively easy for individuals of a species to learn, whereas other behaviors will be either difficult or impossible for them to learn. (p. 195)

LO 18-2 What are some practical methods for bringing about behavior change, both in ourselves and in others?

- Behavior modification is a method for formally using the principles of learning theory to promote the frequency of desired behaviors and to decrease or eliminate unwanted ones. (p. 197)

EVALUATE

1. __________ conditioning describes learning that occurs as a result of reinforcement.

2. Match the type of operant learning with its definition:

1. An unpleasant stimulus is presented to decrease behavior.	**a.** positive reinforcement
2. An unpleasant stimulus is removed to increase behavior.	**b.** negative reinforcement
3. A pleasant stimulus is presented to increase behavior.	**c.** positive punishment
4. A pleasant stimulus is removed to decrease behavior.	**d.** negative punishment

3. Sandy had had a rough day, and his son's noisemaking was not helping him relax. Not wanting to resort to scolding, Sandy told his son in a serious manner that he was very tired and would like the boy to play quietly for an hour. This approach worked. For Sandy, the change in his son's behavior was

a. positively reinforcing.
b. negatively reinforcing.

4. In a __________ reinforcement schedule, behavior is reinforced some of the time, whereas in a __________ reinforcement schedule, behavior is reinforced all the time.

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

1. Reinforcement occurs after a set time period.	**a.** fixed-ratio
2. Reinforcement occurs after a set number of responses.	**b.** variable-interval
3. Reinforcement occurs after a varying time period.	**c.** fixed-interval
4. Reinforcement occurs after a varying number of responses.	**d.** variable-ratio

RETHINK

1. Using the scientific literature as a guide, what would you tell parents who wish to know if the routine use of physical punishment is a necessary and acceptable form of child rearing?
2. *From the perspective of an educator:* How would you use your knowledge of operant conditioning in the classroom to set up a program to increase the likelihood that children will complete their homework more frequently?

Answers to Evaluate Questions

1. Operant; **2.** 1-c, 2-b, 3-a, 4-d; **3.** b; **4.** partial (or intermittent), continuous; **5.** 1-c, 2-a, 3-b, 4-d

KEY TERMS

operant conditioning p. 185
reinforcement p. 186
reinforcer p. 187
positive reinforcer p. 188
negative reinforcer p. 188
punishment p. 188
schedules of reinforcement p. 190
continuous reinforcement schedule p. 190
partial (or intermittent) reinforcement schedule p. 190
fixed-ratio schedule p. 191
variable-ratio schedule p. 191
fixed-interval schedule p. 192
variable-interval schedule p. 192
shaping p. 194
behavior modification p. 197

MODULE 19

Cognitive Approaches to Learning

Learning Outcome

LO 19-1 What is the role of cognition and thought in 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. Rather, they already know the basic elements of driving from previous experience as passengers, when they more than 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 is due to operant and classical conditioning. In fact, such activities as 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.

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

Some psychologists view learning in terms of the thought processes, or 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.

Study Alert

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.

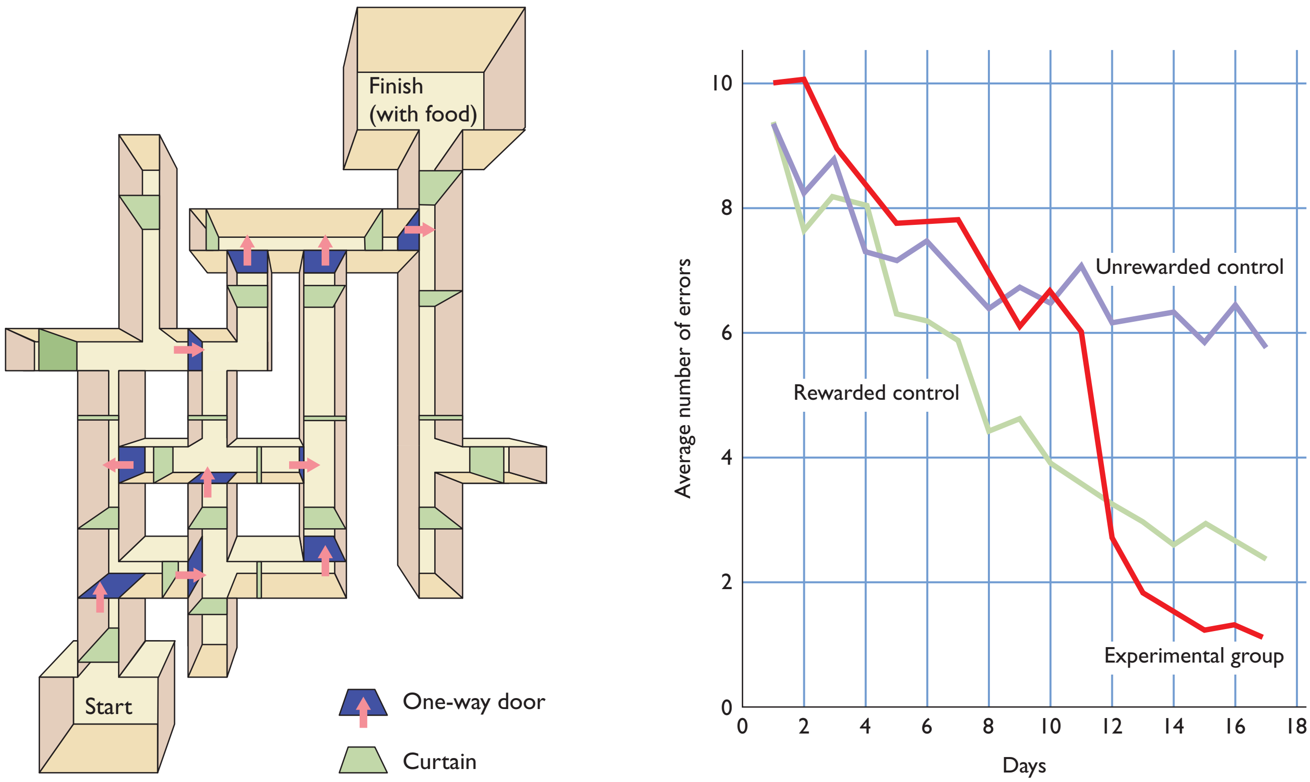
In its most basic formulation, cognitive learning theory suggests that it is not enough to say that people make responses because there is an assumed link between a stimulus and a response—a link that is the result of a past history of reinforcement for a response. Instead, according to this point of view, people, and even lower animals, develop an *expectation* that they will receive a reinforcer after making a response. Two types of learning in which no obvious prior reinforcement is present are latent learning and observational learning.

Latent Learning

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.

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

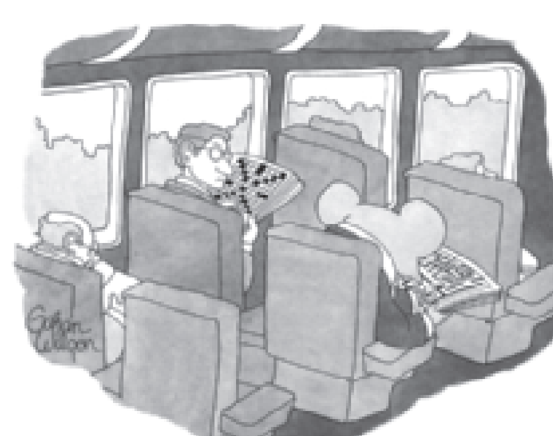
In the studies demonstrating latent learning, psychologists examined the behavior of rats in a maze such as the one shown in Figure 1a. In one experiment, a group of rats was allowed to wander around the maze once a day for 17 days without ever receiving a reward (called the unrewarded group). Understandably, 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 (the rewarded group). Not surprisingly, those rats learned to run quickly and directly to the food box, making few errors.



(a) (b)

FIGURE 1 Latent learning. (a) Rats were allowed to roam through a maze of this sort once a day for 17 days. (b) The rats that were never rewarded (the unrewarded control condition) consistently made the most errors, whereas those that received food at the finish every day (the rewarded control condition) consistently made far fewer errors. But the results also showed latent learning: Rats that were rewarded only after the 10th day (the experimental group) showed an immediate reduction in errors and soon became similar in error rate to the rats that had been rewarded consistently. According to cognitive learning theorists, the reduction in errors indicates that the rats had developed a cognitive map—a mental representation—of the maze. Can you think of other examples of latent learning?

A third group of rats (the experimental group) 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, as you can see from the graph in Figure 1b. 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.

Albert Bandura examined the principles of observational learning.

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, it is unclear what reinforcement 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 occurred in unobservable mental processes (Frensch & Rünger, 2003; Stouffer & White, 2006; Iaria et al., 2009; Lin et al., 2011).

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.

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

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, 2004, 2009).

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.

Not only negative behaviors are acquired through observational learning. In one experiment, for example, children who were afraid of dogs were exposed to a model—dubbed the Fearless Peer—playing with a dog (Bandura, Grusec, & Menlove, 1967). After exposure, observers were considerably more likely to approach a strange dog than were children who had not viewed the Fearless Peer.

This boy is displaying observational learning based on previous observation of his father. How does observational learning contribute to learning gender roles?

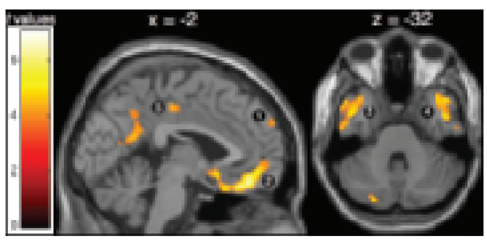
Observational learning is particularly important in acquiring skills in which the operant conditioning technique of shaping is inappropriate. Piloting an airplane and performing brain surgery, for example, are behaviors that could hardly be learned by using trial-and-error methods without grave cost—literally—to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

Observational learning may have a genetic basis. For example, we find observational learning at work with mother animals teaching their young such activities as hunting. In addition, the discovery of *mirror neurons* that fire when we observe another person carrying out a behavior (discussed in the "Neuroscience and Behavior" chapter) suggests that the capacity to imitate others may be innate (Lepage & Theoret, 2007; Schulte-Ruther et al., 2007; Huesmann, Dubow, & Boxer, 2011) (see Figure 2 *Neuroscience in Your Life*).

Not all behavior that we witness is learned or carried out, of course. One crucial factor that determines whether we 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 his studies by receiving higher grades, we are more likely to imitate his behavior than we would if his 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

Neuroscience in Your Life: Learning Through Imitation

FIGURE 2 Both children and adults learn, in part, by imitating others. How this learning occurs in the brain, however, is only beginning to be understood. While many recent studies have focused on the role of mirror neurons, researchers have begun to examine how this process also may occur through a process called *mentalizing*, which involves understanding someone's mental state. In these scans, areas of the prefrontal cortex appear to be associated with mentalizing. These areas are engaged when participants are asked to look at pictures of someone completing an action and then asked to imagine answers to the questions of how the person is performing the action, what action is being performed, and why the person is doing it. With each level of question ("how" being the lowest, "why" being the highest) there is increasing activation in the mentalizing areas of the brain as highlighted in the scan. (Source: Spunt, Satpute, & Lieberman, 2011.)



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 is central to a number of important issues relating to the extent to which people learn simply by watching the behavior of others. For instance, the degree to which observation of media aggression produces subsequent aggression on the part of viewers is a crucial—and controversial—question, as we discuss next.

Study Alert
A key point of observational learning approaches: Behavior of models who are rewarded for a given behavior is more likely to be imitated than that of models who are punished for the behavior.

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

In an episode of *The Sopranos*, a former 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, in real life, two 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 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, 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 psychologists agree that watching high levels of media violence makes viewers more susceptible to acting aggressively. For example, one survey showed that one-fourth of violent young male offenders incarcerated in Florida had attempted to commit a media-inspired copycat crime. A significant proportion of those teenage offenders noted that they paid close attention to the media (Surette, 2002; Savage & Yancey, 2008; Boxer et al., 2009).

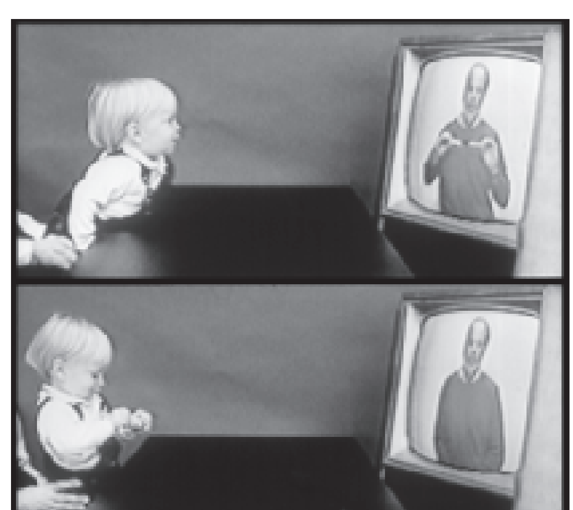
PsychTech

Video gaming can also have positive consequences: Playing video games with positive, prosocial themes increases empathy and thoughts about helping others.

Violent video games have also been linked with actual aggression. In one of a series of studies by psychologist Craig Anderson and his colleagues, 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. Frequent players also had lower academic achievement. Some researchers believe that violent video games may produce certain positive results—such as a rise in social networking (Ferguson, 2010, 2011). But most agree the preponderance of evidence suggests that they produce negative outcomes (Anderson & Carnagey, 2009; Anderson et al., 2010; Bailey, West, & Anderson, 2011).

Several aspects of media violence may contribute to real-life aggressive behavior. 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; Weber, Ritterfeld, & Kostygina, 2006; Carnagey, Anderson, & Bushman, 2007).

What about real-life exposure to *actual* violence? Does it also lead to increases in aggression? The answer is yes. Exposure to actual firearm violence (being shot or being shot at) doubles the probability that an adolescent will commit serious violence over the next 2 years. Whether the violence is real or fictionalized, then, observing violent behavior leads to increases in aggressive behavior (Bingenheimer, Brennan, & Earls, 2005; Allwood, 2007).



Illustrating observational learning, this infant observes an adult on television and then is able to imitate his behavior. Learning has obviously occurred through the mere observation of the television model.

Exploring DIVERSITY

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 daughter 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 their cultural background and unique pattern of abilities (Barmeyer, 2004; Wilkinson & Olliver-Gray, 2006; Sternberg, 2011).

Learning styles differ along several dimensions. For example, one central dimension is relational versus analytical approaches to learning. As illustrated in Figure 3, 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. In contrast, those with an *analytical learning style* do best when they can carry

Relational Style	Analytical Style
• Perceive information as part of total picture	• Focus on detail
• Show intuitive thinking	• Show sequential and structured thinking
• More easily learn materials that have a human, social content	• More easily learn materials that are impersonal
• Have a good memory for verbally presented ideas and information	• Have a good memory for abstract ideas
• Are influenced by others' opinion	• Are not greatly affected by the opinions of others
• Style conflicts with the traditional school environment	• Style matches traditional school environments

FIGURE 3 A comparison of relational versus analytical approaches to learning offers one example of how learning styles differ along several dimensions.

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.

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 are Caucasian and Asian-American males, who are more likely to employ an analytical style (Anderson & Adams, 1992; Adams et al., 2000; Adams, Bell, & Griffin, 2007).

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 impact 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, do less well in school. The theory suggests that the motivation to succeed is lower for children in forced immigration groups (Ogbu, 1992, 2003; Foster, 2005).

RECAP/EVALUATE/RETHINK

RECAP

LO 19-1 What is the role of cognition and thought in learning?

- Cognitive approaches to learning consider learning in terms of thought processes, or cognition. Phenomena such as latent learning—in which a new behavior is learned but not performed until some incentive is provided for its performance—and the apparent development of cognitive maps support cognitive approaches. (p. 200)
- Learning also occurs from observing 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. (p. 202)
- Observation of violence is linked to a greater likelihood of subsequently acting aggressively. (p. 203)
- Learning styles are characteristic ways of approaching learning, based on a person's cultural background and unique pattern of abilities. Whether an individual has an analytical or a relational style of learning, for example, may reflect family background or culture. (p. 205)

EVALUATE

1. Cognitive learning theorists are concerned only with overt behavior, not with its internal causes. True or false?

2. In cognitive learning theory, it is assumed that people develop a(n) __________ about receiving a reinforcer when they behave a certain way.

3. In __________ learning, a new behavior is learned but is not shown until appropriate reinforcement is presented.

4. Bandura's __________ theory of learning states that people learn through watching a(n) __________ (another person displaying the behavior of interest).

RETHINK

1. 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?

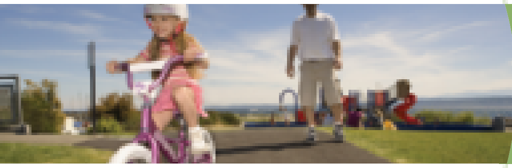
2. *From the perspective of a social worker:* What advice would you give to families about children's exposure to violent media and video games?

Answers to Evaluate Questions

1. False; cognitive learning theorists are primarily concerned with mental processes; **2.** expectation; **3.** latent; **4.** observational, model

KEY TERMS

cognitive learning theory p. 200
latent learning p. 200
observational learning p. 202



Looking Back

Epilogue

Here we have discussed several kinds of learning, ranging from classical conditioning, which depends on the existence of natural stimulus–response pairings, to operant conditioning, in which reinforcement is used to increase desired behavior. These approaches to learning focus on outward, behavioral learning processes. Cognitive approaches to learning focus on mental processes that enable learning.

We have also noted that learning is affected by culture and individual differences, with individual learning styles potentially affecting the ways in which people learn most effectively. And we saw some ways in which our learning about learning can be put to practical use, through such means as behavior-modification programs designed to decrease negative behaviors and increase positive ones.

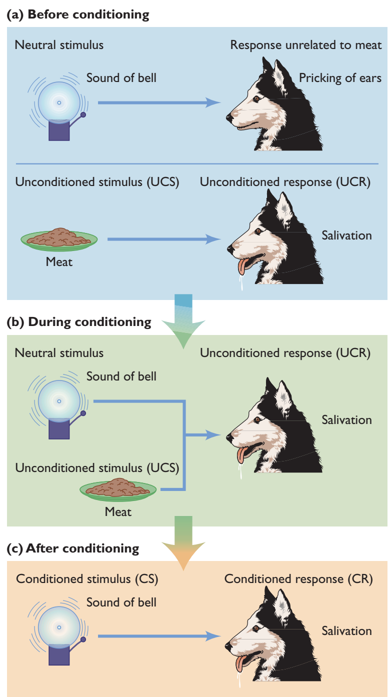
Return to the prologue of this set of modules and consider the following questions about the use of behavior modification to change driving habits:

1. Does the Snapshot device make use of classical conditioning or operant conditioning principles? What are your reasons for your answer?
2. For users of the Snapshot device, what is the reinforcement?
3. Why would a device that provides real-time feedback on energy use (and cost) be a more effective conditioning tool than the electric bill that customers ordinarily get each month?
4. If you were in charge of implementing the Snapshot device program, what additional program features could you implement to take advantage of cognitive learning principles?

VISUAL SUMMARY 6 Learning

MODULE 17 Classical Conditioning

Ivan Pavlov: Basic principles of classical conditioning



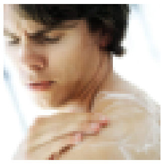
- Extinction:
  Conditioned response disappears over time
- Stimulus generalization:
  Stimuli that are similar to the conditioned stimulus also elicit the conditioned response
- Stimulus discrimination:
  Stimuli that are different from the conditioned stimulus do not elicit the conditioned response

MODULE 18 Operant Conditioning

Basic Principle: Behavior changes in frequency according to its consequences

- Reinforcement: A stimulus that increases the probability that a preceding behavior will be repeated
  - Positive reinforcement:
    A pleasant stimulus is presented

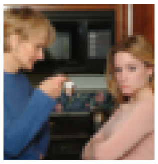
  - Negative reinforcement:
    An unpleasant stimulus is withdrawn



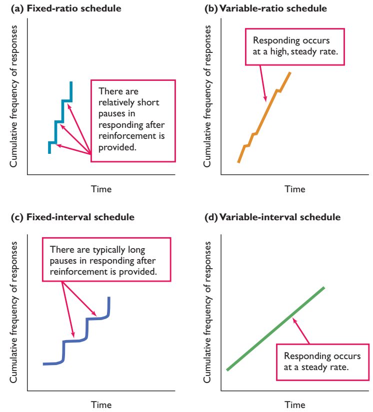
Basic Principle: Behavior changes in frequency according to its consequences *(continued)*

- Punishment : A stimulus that decreases the probability that a preceding behavior will be repeated
  - Positive punishment:
    An unpleasant stimulus is presented

  - Negative punishment:
    A pleasant stimulus is withdrawn



- Schedules of reinforcement

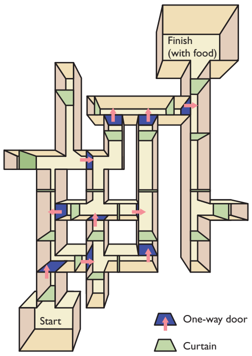


- Shaping: Reinforcing successive approximations of behavior

MODULE 19 Cognitive Approaches to Learning

Cognitive Learning Theory: Focuses on the internal thoughts and expectations

- Latent learning: A new behavior is learned but is not demonstrated until it is reinforced



- Observational learning:
  We learn by watching the behavior of others