As you read Chapter 6, keep the following questions in mind and answer them in your own words:

- What is classical conditioning, and how can we apply it in everyday life?
- What is operant conditioning, and how can we apply it in everyday life?
- How do we learn according to cognitive-social theory, and how can we use it in everyday life?
- How do neurological changes take place during and after learning? What are the evolutionary advantages of learning?
- What are the practical applications of conditioning principles?
On Sunday morning, June 7, 1998, James Byrd, a disabled 49-year-old African American, was walking home along Martin Luther King Boulevard in Jasper, Texas. Three young white men pulled up and offered him a ride. But they had no intention of taking him home. Instead, they chained Mr. Byrd by his ankles to the back of their rusted 1982 pickup and dragged him along an old logging road outside of town until his head and right arm were ripped from his body.

What was the reason for this grisly murder? Byrd was a black man. His three murderers were “white supremacists” who want the United States to be a white-only society. Although white supremacists form only a tiny fraction of the American population, hate crimes are a serious and growing problem around the world. People are ridiculed, attacked, and even murdered simply because of their ethnicity, sexual orientation, gender, or religious preference. Why? Where does such hatred come from? Is prejudice learned?

In the everyday sense, learning usually refers to classroom activities, such as math and reading, or motor skills, like riding a bike or playing the piano. But to psychologists, learning is much broader. It is formally defined as a relatively permanent change in behavior or mental processes resulting from practice or experience. This relative permanence of learning applies to all learned behavior or mental processes, from using a spoon to writing great novels. Once you’ve learned how to use a spoon (or chopsticks) for eating, you will likely be able to use this skill for the rest of your life.

Most of psychology emphasizes learning. For example, developmental psychologists examine how children learn language and other cognitive and motor skills. Clin-
ical and counseling psychologists explore how previous learning and experiences help explain present-day problems. And social psychologists study how attitudes, social behaviors, and prejudices, such as those evidenced by James Byrd’s murderers, are learned through experience.

Tragedies like the murder of James Byrd show us the dark side of human learning. However, the very fact that racism and hatred are learned offers great hope. What is learned can be unlearned (or at least suppressed). In this chapter, we will discover how we learn hatred, racism, phobias, and superstitions, as well as love and generosity. Much of this chapter focuses on the most basic form of learning, called conditioning, which is the process of learning associations between environmental stimuli and behavioral responses. We begin with the two most common types of conditioning—classical and operant. Then we look at cognitive-social learning, followed by the biological factors in learning. The chapter concludes with how learning theories and concepts can be used to improve everyday life.

CLASSICAL CONDITIONING

Have you noticed that when you’re hungry and see a large slice of chocolate cake or a juicy steak, your mouth starts to water? It seems natural that your mouth should water if you put food into it. But why do you salivate at just the sight of the food?

Pavlov and Watson’s Contributions: The Beginnings of Classical Conditioning

The answer to this question was accidentally discovered in the Leningrad laboratory of Ivan Pavlov (1849–1936). Pavlov was a Russian physiologist who was awarded the Nobel Prize for his work on the role of saliva in digestion. One of Pavlov’s experiments involved salivary responses in dogs. He attached a glass funnel to the experimental dogs’ salivary glands to collect and measure the saliva produced under different experimental conditions.
**Pavlov’s (Accidental) Discovery**

In the course of Pavlov’s research, one of his students noticed that many dogs began to salivate at the mere sight of the food or the food dish, the smell of the food, or even the sight of the person who delivered the food. This salivation occurred long before food was placed in their mouth! (This is the important accidental part of the discovery, which might have gone unnoticed if the collection tubes had not been in place.) Although this “unscheduled” salivation interfered with Pavlov’s research design and irritated him, it also was intriguing. Salivation is a reflex response, a largely involuntary, automatic response to an external stimulus. Why were his dogs reflexively salivating before the food was even presented? Why did they salivate to extraneous stimuli other than food?

Pavlov’s scientific training helped him appreciate the significance of what had at first seemed just annoying. A reflex (salivation) that occurred before the appropriate stimulus (food) was presented is clearly not inborn and biological. It had to have been acquired through experience—through learning. Excited by this accidental discovery, Pavlov and his students conducted several experiments. His most basic method involved sounding a tone on a tuning fork just before food was placed in the dog’s mouth. After several pairings of tone and food, the dogs would salivate on hearing the tone alone. Using this same procedure, Pavlov and later experimenters went on to show that all sorts of things can be conditioned stimuli for salivation if they are paired with food—the ticking of a metronome, a bell, a buzzer, a light, and even the sight of a circle or triangle drawn on a card.

The type of learning that Pavlov discovered came to be known as classical conditioning (as in first [classical] learning [conditioning]). Classical conditioning is officially defined as learning that occurs when a neutral stimulus (NS) becomes paired (associated) with an unconditioned stimulus (UCS) to elicit a conditioned response (CR).

To understand this definition, you need to learn five key terms describing each element of the classical conditioning process: unconditioned stimulus (UCS), unconditioned response (UCR), neutral stimulus (NS), conditioned stimulus (CS), and conditioned response (CR).

Before Pavlov’s dogs learned to salivate at something extraneous like the sight of the salivary reflex was inborn, Pavlov’s scientific training helped him appreciate the significance of what had at first seemed just annoying. A reflex (salivation) that occurred before the appropriate stimulus (food) was presented is clearly not inborn and biological. It had to have been acquired through experience—through learning. Excited by this accidental discovery, Pavlov and his students conducted several experiments. His most basic method involved sounding a tone on a tuning fork just before food was placed in the dog’s mouth. After several pairings of tone and food, the dogs would salivate on hearing the tone alone. Using this same procedure, Pavlov and later experimenters went on to show that all sorts of things can be conditioned stimuli for salivation if they are paired with food—the ticking of a metronome, a bell, a buzzer, a light, and even the sight of a circle or triangle drawn on a card.

The type of learning that Pavlov discovered came to be known as classical conditioning (as in first [classical] learning [conditioning]). Classical conditioning is officially defined as learning that occurs when a neutral stimulus (NS) becomes paired (associated) with an unconditioned stimulus (UCS) to elicit a conditioned response (CR).

To understand this definition, you need to learn five key terms describing each element of the classical conditioning process: unconditioned stimulus (UCS), unconditioned response (UCR), neutral stimulus (NS), conditioned stimulus (CS), and conditioned response (CR).

Before Pavlov’s dogs learned to salivate at something extraneous like the sight of the salivary reflex was inborn, Pavlov’s accidental discovery (and great contribution to psychology) was that learning can occur when a neutral stimulus (NS) (a stimulus that does not evoke or bring out a response) is regularly paired with an unconditioned stimulus (UCS). The neutral stimulus then becomes a conditioned stimulus (CS), which elicits or produces a conditioned response (CR). (Study tip: If you’re finding this confusing, note that conditioning is just another word for learning. When you see words like unconditioned stimulus and unconditioned response, mentally rearrange and think “unlearned stimulus” and “unlearned response.” Picture a newborn baby with little or no initial learning. Now imagine what stimuli would cause him or her to respond. With conditioning, these unlearned stimuli and unlearned responses could become conditioned stimuli and conditioned responses. For additional help, read through the diagram in Figure 6.2, which provides a visual organizer and detailed example from Pavlov’s research.)

**Does the neutral stimulus always come first?** Researchers have investigated four different ways to pair stimuli (Table 6.1) and found that both the timing and the order in which the NS is presented are very important (Chang, Stout, & Miller, 2004; Delamater, LoLordo, & Sousa, 2003). For example, delayed conditioning, in which the NS is presented before the UCS and remains until the UCR begins, generally yields the fastest learning. On the other hand, backward conditioning, in which the UCS is presented before the NS, is the least effective.
Watson’s Contribution to Classical Conditioning

At this point, you may be wondering what a dog salivating to the sound of a tone has to do with your life—other than explaining why you salivate at the sight of delicious food. Classical conditioning has been shown to be the most basic and fundamental way that all animals, including humans, learn most new responses, emotions, and attitudes. Your love for your parents (or significant other), the hatred and racism that led to the murder of James Byrd, and your drooling at the sight of chocolate cake are largely the result of classical conditioning.

Figure 6.2 Pavlov’s classical conditioning.
Before conditioning occurs, the neutral stimulus does not elicit a relevant or consistent response. During conditioning, the neutral stimulus is paired several times with an unconditioned stimulus. It now becomes a conditioned stimulus that elicits a conditioned response.
In one of the most famous (and controversial) psychological studies, John Watson and Rosalie Rayner (1920, 2000) experimentally demonstrated how the emotion of fear could be classically conditioned. Albert, a healthy 11-month-old normal child, was tested at Watson’s lab at Johns Hopkins University (Figure 6.3). He was first allowed to play with a white laboratory rat to find out if he was afraid of rats. Like most infants, “Little Albert” was curious and reached for the rat, showing no fear. Using the fact that infants are naturally frightened (UCR) by loud noises (UCS), Watson stood behind Albert and again put the rat (NS) near him. When the infant reached for the rat, Watson banged a steel bar with a hammer. As you might imagine, the loud noise frightened Albert and made him cry. After several pairings of the white rat (NS) with the immediate loud noise (UCS), Albert began to cry when just the rat was presented without the loud noise. Albert’s fear and crying is called a conditioned emotional response (CER). Thus, Watson and Rayner’s original hypothesis that fears are classically conditioned was confirmed.

Watson and Rayner’s experiment could not be performed today because it violates several ethical guidelines for scientific research (Chapter 1). Moreover, Watson and Rayner ended their experiment without extinguishing (removing) Albert’s fear, although they knew that such a conditioned emotional response (CER) could endure for a long period. This disregard for Albert’s well-being is a serious criticism of Watson and Rayner’s study. Their research methodology also has been criticized. Rather than objectively measuring Albert’s fear, Watson and Rayner only subjectively evaluated it, which raises doubt about the degree of fear conditioned (Paul & Blumenthal, 1989).

Despite such criticisms, John B. Watson made important and lasting contributions to psychology. At the time he was conducting research, psychology’s early founders were defining the field as the scientific study of the mind (Chapter 1). Watson criticized this focus on internal mental activities, insisting that they were impossible to study objectively. Instead, he emphasized strictly observable behaviors. Watson is also credited with founding the new approach known as behaviorism, which explains behavior as a result of observable stimuli (in the environment) and observable responses (behavioral actions). In addition, Watson’s study of Little Albert showed us that many of our likes, dislikes, prejudices, and fears are conditioned emotional responses. In Chapter 15, you will also see how Watson’s research in producing Little Albert’s fears later led to powerful clinical tools for eliminating extreme, irrational fears known as phobias.

Historical note: Shortly after the Little Albert experiment, Watson was fired from his academic position. And no other university would hire him, despite his international fame and scientific reputation. His firing resulted from his scandalous and
highly publicized affair with his graduate student Rosalie Rayner and subsequent divorce. Watson later married Rayner and became an influential advertising executive. He is credited with many successful ad campaigns based on classical conditioning, including those for Johnson & Johnson baby powder, Maxwell House coffee, and Lucky Strike cigarettes (Goodwin, 2005; Hunt, 1993).

**CHECK & REVIEW**

**Pavlov and Watson’s Contributions**

In classical conditioning, the type of learning investigated by Pavlov and Watson, an originally neutral stimulus (NS) is paired with an unconditioned stimulus (UCS) that causes an unconditioned response (UCR). After several pairings, the neutral stimulus becomes a conditioned stimulus (CS) that alone will produce a conditioned response (CR) or conditioned emotional response (CER) that is the same as the original unconditioned response (UCR).

There are four conditioning sequences: delayed conditioning, simultaneous conditioning, trace conditioning, and backward conditioning. Delayed conditioning is the most effective, and backward conditioning is the least effective.

Pavlov’s work laid a foundation for Watson’s later insistence that psychology must be an objective science, studying only overt behavior without considering internal mental activity. Watson called this position behaviorism. In his famous “Little Albert” study, Watson demonstrated that emotional responses can be classically conditioned.

**Questions**

1. Eli’s grandma gives him a Tootsie Roll every time she visits. When Eli sees his grandma arriving, his mouth begins to water. In this example the conditioned stimulus (CS) is ______. (a) hunger; (b) grandma; (c) the Tootsie Roll; (d) the watering mouth

2. After conditioning, the _____ elicits the _____.

3. In John Watson’s demonstration of classical conditioning with Little Albert, the unconditioned stimulus was ______. (a) symptoms of fear; (b) a rat; (c) a bath towel; (d) a loud noise

4. An Iraqi War veteran experiences an intense emotional reaction to a clap of thunder. His emotional response is an example of a(n) ______. (a) CS; (b) UCS; (c) CER; (d) UCR

Check your answers in Appendix B.

**Basic Principles: Fine-Tuning Classical Conditioning**

Now that you understand the major key terms in classical conditioning and how they explain CERs, we can build on this foundation. In this section, we will discuss five important principles of classical conditioning: stimulus generalization, stimulus discrimination, extinction, spontaneous recovery, and higher-order conditioning.

**Generalization and Discrimination**

One of Pavlov’s early experiments conditioned dogs to salivate at the sound of low-pitched tones. Pavlov and his students later demonstrated that the dogs would also salivate to higher-pitched tones. Although at first the conditioning was to one specific low- and one specific high-pitched tone, the dogs quickly showed conditioning to other high and low tones resembling the conditioned tones.

When an event similar to the originally conditioned stimulus triggers the same conditioned response (salivation), it is called stimulus generalization. The more the stimulus resembles the conditioned stimulus, the stronger the conditioned response (Hovland, 1937). Have you ever felt afraid when you were driving a car and noticed another car with a rack of lights on its roof following close behind? If so, your fear of police cars (which typically have lights on their roofs) has generalized to all cars with lights on their roofs. Stimulus generalization also occurred in Watson’s experiment with Albert. After conditioning, Albert feared not only rats but also other objects that shared features with the white rat, including a rabbit, dog, and a Santa Claus mask.
Would Little Albert still be afraid of a Santa Claus mask as he grew older? Probably not. As a child in the United States, he undoubtedly had numerous encounters with Santa Claus masks, and would have learned to recognize differences between rats and other stimuli. This process of learning responses to a specific stimulus, but not to other similar stimuli is called **stimulus discrimination**.

Although stimulus generalization seems to follow naturally from initial classical conditioning, organisms only learn to distinguish (or discriminate) between an original conditioned stimulus (CS) and similar stimuli if they have enough experience with both. Just as you learn to discriminate between the sound of your cellular phone and the ringing of others, when Pavlov repeatedly presented food following a high-pitched tone, but not with a low-pitched tone, the dogs gradually learned to distinguish between the two tones. Thus, both Little Albert and Pavlov’s dogs produced conditioned responses only to specific stimuli—stimulus discrimination.

**Extinction and Spontaneous Recovery**

Classical conditioning, like all learning, is only relatively permanent. Most responses that are learned through classical conditioning can be weakened or suppressed through **extinction**. Extinction occurs when the unconditioned stimulus (UCS) is repeatedly withheld whenever the conditioned stimulus (CS) is presented, so that the previous association is weakened. For instance, when Pavlov sounded the tone again and again without presenting food, the dogs’ salivation gradually declined. Similarly, if you have a classically conditioned fear of the sound of a dentist’s drill and later start to work as a dental assistant, your fear will gradually diminish. Can you see the usefulness of this information if you’re trying to get over a destructive love relationship? Rather than thinking, “I’ll always be in love with this person,” remind yourself that given time and repeated contact in a nonloving situation, your feelings will gradually lessen (Figure 6.4).

**Does extinction cause us to “unlearn” a classical conditioned response?** No, extinction is not unlearning (Bouton, 1994). A behavior becomes extinct when the response rate decreases and the person or animal no longer responds to the stimulus. It does not mean the person or animal has “erased” the previous learned connection between the stimulus and the response. In fact, if the stimulus is reintroduced, the conditioning is much faster the second time. Furthermore, Pavlov found that if he allowed several hours to pass after the extinction procedure and then presented the tone again, the salivation would spontaneously reappear. This reappearance of a conditioned response after extinction is called **spontaneous recovery**.

Knowing this term will help you understand why you suddenly feel excited at the sight of your old high school sweetheart even though years have passed (and extinction has occurred). Some people (who haven’t read this book and studied this phenomenon) might mislabel this renewed excitement as “lasting love.” You, on the other hand, would recognize it as simple spontaneous recovery. This phenomenon also explains why couples who’ve recently broken up sometimes misinterpret and overvalue a similar sudden flareup of feelings. They may even return to doomed relationships, despite knowing they were painful and destructive (Figure 6.5).

**Higher-Order Conditioning**

Children are not born salivating at the sign of McDonald’s golden arches. So why do they want to stop and eat at one of the restaurants after simply seeing the golden arches on a passing billboard? It is because of **higher-order conditioning**. This type
of conditioning occurs when a neutral stimulus (NS) becomes a conditioned stimulus (CS) through repeated pairings with a previously conditioned stimulus (CS).

If you wanted to demonstrate higher-order conditioning in Pavlov's dogs, you would first condition the dogs to salivate to the sound of the tone. Then you would pair a flash of light to the ringing of the tone. Eventually, the dog would salivate to the flash of light alone (Figures 6.6a, and 6.6b). In a similar fashion, children first learn to pair McDonald's restaurant with food and later learn that two golden arches are a symbol for McDonald's (Figures 6.6c, and 6.6d). Their salivation and desire to eat at the restaurant are a classic case of higher-order conditioning (and successful advertising).

Figure 6.6 How children learn to salivate for McDonald's. As you can see in the top two boxes (a and b), higher-order conditioning is a two-stage process. In the first stage, a neutral stimulus (such as a tone from a tuning fork) is paired with an unconditioned stimulus (such as meat powder). The NS then becomes a conditioned stimulus that elicits a conditioned response (salivation). During the second stage (higher-order conditioning), a different neutral stimulus (such as a flashing light) is paired with the tone until it also becomes a conditioned stimulus. Now examine the bottom two boxes (c and d). Can you see how the same two-stage type of higher-order conditioning helps explain why children become so excited (and salivate) when they see the golden arches?

CHECK & REVIEW

Basic Principles of Classical Conditioning

In classical conditioning, stimulus generalization occurs when stimuli similar to the original conditioned stimulus (CS) elicit the conditioned response (CR). Stimulus discrimination takes place when only the CS elicits the CR. Extinction occurs when the unconditioned stimulus (UCS) is repeatedly withheld, and the association between the CS and the UCS is weakened. Spontaneous recovery occurs when a CR that had been extinguished suddenly reappears. In higher-order conditioning, the neutral stimulus (NS) is paired with a CS to which the participant has already been conditioned, rather than with a UCS.

Questions

1. Like most college students, your heart rate and blood pressure greatly increase when the fire alarm sounds. If the fire alarm system was malfunctioning and rang every half hour, by the end of the day, your heart rate and blood pressure would no longer
increase. Using classical conditioning terms, explain this change in your
response.
2. A baby is bitten by a dog and then is afraid of all small animals. This is an
example of ______. (a) stimulus discrimination; (b) extinction; (c) reinforce-
ment; (d) stimulus generalization.
3. When a conditioned stimulus is used to reinforce the learning of a second
conditioned stimulus, _____ has occurred.
4. If you wanted to use higher-order condi-
tioning to get Little Albert to fear
Barbie dolls, you would present a Bar-
bie doll with _____. (a) the loud noise;
(b) the original unconditioned
response; (c) the white rat; (d) the orig-
inal conditioned response

Check your answers in Appendix B.

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OPERANT CONDITIONING

Consequences are the heart of operant conditioning. In classical conditioning, con-
sequences are irrelevant—Pavlov’s dog still got the meat powder whether or not it
salivated. But in operant conditioning, the organism performs a behavior (an operant)
that produces an effect on the environment. These effects, reinforcement or punish-
ment, influence whether the response will occur again in the future. Reinforcement
strengthens the response and makes it more likely to recur. Punishment weakens the
response and makes it less likely to recur. If your friends smile and laugh when you
tell a joke, your future joke telling is likely to increase. However, if they frown, groan,
or ridicule you, your joke telling is likely to decrease.

In addition to differences in their emphasis on consequences, the two types of
conditioning differ in another important way. In classical conditioning, the organism’s
response is passive and involuntary. It “happens to” the organism when a UCS follows
a NS. In operant conditioning, however, the organism’s response is active and volun-
tary. The learner “operates” on the environment and produces effects. These effects
(or consequences) influence whether the behavior will be repeated.

It’s important to note that these distinctions between classical and operant condi-
tioning are generally true—but not always true. Technically speaking, classical condi-
tioning does sometimes influence voluntary behavior, and operant conditioning can
influence involuntary, reflexive behavior. Furthermore, both forms of conditioning
often interact to produce and maintain behavior. But for most purposes, the distinc-
tion holds. In most cases, classical conditioning refers to involuntary responses and
operant conditioning refers to voluntary responses.

In the sections that follow, we will examine the historical contributions of
Thorndike and Skinner, and the general principles of operant conditioning. The
chapter closes with interesting applications of operant conditioning to everyday life.

Thorndike and Skinner’s Contributions: The Beginnings of
Operant Conditioning

Edward Thorndike (1874–1949), a pioneer of operant conditioning, was among the
first to examine how voluntary behaviors are influenced by their consequences. In
one of his famous experiments, he put a cat inside a specially built puzzle box (Fig-
ure 6.7). The only way the cat could get out was by pulling on a rope or stepping on
a pedal. Through trial and error, the cat would eventually (and accidentally) pull on
the rope or step on the pedal that opened the door. With each additional success,
the cat’s actions became more purposeful, and it soon learned to open the door
immediately.

According to Thorndike’s law of effect, the probability of an action being
repeated is strengthened if it is followed by a pleasant or satisfying consequence. In
short, rewarded behavior is more likely to reoccur (Thorndike, 1911). Thorndike’s

Figure 6.7 Thorndike box. Thorndike used a box like this in his trial-and-error
experiments with cats. When a cat stepped on a pedal inside the box, the
door latch was released and a weight attached to the door pulled it open so the
cat could exit. (From Thorndike, 1898).
law of effect was a first step in understanding how active voluntary behaviors can be modified by their consequences.

B. F. Skinner (1904–1990) extended Thorndike's law of effect to more complex behaviors. As a strict behaviorist, however, Skinner avoided terms like pleasant, desired, and voluntary because they make unfounded assumptions about what an organism feels and wants. The terms also imply that behavior is due to conscious choice or intention. Skinner believed that to understand behavior, we should consider only observable, external, or environmental stimuli and responses. We must look outside the learner, not inside.

To scientifically test his theories, Skinner conducted systematic research. The typical Skinner experiment used an animal, usually a pigeon or a rat, and an apparatus that has come to be called a Skinner box (Figure 6.8). Skinner trained a rat or other animal to push a lever to receive a food pellet. The animal got a pellet each time it pushed the lever, and the number of responses made by the rat was recorded. Skinner used this basic experimental design to demonstrate a number of operant conditioning principles.

In keeping with his focus on external, observable behavior, Skinner emphasized that reinforcement (which increases the likelihood of a response) and punishment (which decreases it) are always defined after the fact. This emphasis on only reinforcing or punishing after the behavior is important. Suppose you ask to borrow the family car on Friday night, but your parents say you have to wash the car first. If they let you put off washing the car until the weekend, what is the likelihood that you will do it? From their own “trial-and-error” experiences, most parents have learned to make sure the payoff comes after the car washing is completed—not before!

In addition to warning that both reinforcement and punishment must come after the response, Skinner also cautions us to check the respondent’s behavior to see if it increases or decreases. Sometimes we think we’re reinforcing or punishing when we’re doing the opposite. For example, a professor may think she is encouraging shy students to talk by repeatedly praising them each time they speak up in class. But what if shy students are embarrassed by this attention? If so, they may decrease the number of times they talk in class. Similarly, men may buy women candy and flowers after they accept first dates with them because they know all women like these things. However, some women hate candy (imagine that!) or may be allergic to flowers. In this case, the man’s attempt at reinforcement becomes a punishment! Skinner suggests we should watch our target’s actual responses—not what we think the other person should like or do.

Basic Principles: Understanding Operant Conditioning

If you want additional help using operant conditioning to improve your everyday life, you need to understand several important principles. Let’s start with factors involved in strengthening a response (primary and secondary reinforcers, positive and negative reinforcement, schedules of reinforcement, and shaping). Then we’ll explore ways to weaken a response (positive and negative punishment). We conclude with a look at the pros and cons of punishment and a review of terms that are shared between classical and operant conditioning.

Reinforcement—Strengthening a Response

Earlier, we said that Skinner was a strict behaviorist who insisted that scientific observation be limited to that which can be observed. Therefore, instead of using words like rewards (which focus on feelings), Skinner talked about reinforcers and reinforcement in terms of “strengthening the response.” As you can see in Table 6.2, reinforcers can be grouped into two types, primary or secondary. These reinforcers also function as either positive or negative reinforcement.
Primary and secondary reinforcers. One of the chief methods for strengthening a response is with primary and secondary reinforcers. Reinforcers such as food, water, and sex are called primary reinforcers because they normally satisfy an unlearned biological need. In contrast, reinforcers such as money, praise, attention, and material possessions that have no intrinsic value are called secondary reinforcers. Their only power to reinforce behavior results from learning. A baby, for example, would find milk much more reinforcing than a $100 bill. Needless to say, by the time this baby has grown to adolescence, he or she will have learned to prefer the money. Among Westerners, money may be the most widely used secondary reinforcer because of its learned association with desirable commodities.

Positive and negative reinforcement. Adding or taking away certain stimuli also strengthens behavior. Suppose you tickle your baby and he smiles at you. His smile increases (or strengthens) the likelihood that you will tickle him again in the future. The smile itself is a positive reinforcer for you. This is called positive reinforcement. On the other hand, suppose your baby is upset and crying, so you hug him and he stops crying. This time the removal of crying is a negative reinforcer. The process is called negative reinforcement because the “taking away” of the crying by the hugging increases (or strengthens) the likelihood that you will hug him again in the future when he cries. Both responses reinforce or strengthen your smiling and hugging behavior.

(As a critical thinker, you may be wondering what’s happening for the baby in this example. As a parent, you were both positively and negatively reinforced. In the same two examples your baby was only positively reinforced. He learned that his smile caused you to tickle him more and that his crying caused you to hug him. If you’re worried that reinforcing the crying with hugs will create bigger problems, you can relax. Your baby soon will learn to talk and develop “better” ways to communicate.)

### Why Negative Reinforcement Is Not Punishment

Many people hear the term negative reinforcement and automatically think of punishment. But it’s important to remember that these two terms are completely opposite procedures. Reinforcement (either positive or negative) strengthens a behavior. As we will see in the next section, punishment weakens a behavior.

My students find it easier if they think of positive and negative reinforcement in the mathematical sense (as shown in Table 6.2) rather than as personal values of posi-
tive as “good” or negative as “bad.” Think of positive reinforcement as something being added (+) that increases the likelihood that the behavior will increase. Conversely, think of negative reinforcement as something being taken away (–) that also increases the likelihood that the behavior will continue. For example, if your boss compliments you on a job well done, the compliment is added (+) as a consequence of your behavior, and, therefore, your hard work is likely to increase (positive reinforcement). Similarly, if your boss tells you that you no longer have to do a boring part of your job because of your excellent work, the taking away (–) of the boring task is a negative reinforcement. And your hard work is also likely to increase.

When I make myself study before I let myself go to the movies, is this negative reinforcement? No, this is actually a form of positive reinforcement. Because you add “going to the movies” only after you study, this should increase (positively reinforce) your studying behaviors.

In this same example, you’re also using the Premack principle. Psychologist David Premack believes any naturally occurring, high-frequency response can be used to reinforce and increase low-frequency responses. Recognizing that you love to go to movies, you intuitively tied your less desirable low-frequency activity (studying) to your high-frequency or highly desirable behavior (going to the movies). You also can use the Premack principle in other aspects of your college life, such as making yourself write 4 pages on your term paper or read 20 pages before you allow yourself to call a friend or have a snack.

Should I use the Premack principle every time I want to go to the movies or just occasionally? The answer is complex and depends on your most desired outcome. To make this decision, you need to understand various schedules of reinforcement, rules that determine when a response will be rewarded and when it will not (Terry, 2003).

Schedules of Reinforcement

The term schedule of reinforcement refers to the rate or interval at which responses are reinforced. Although there are numerous schedules of reinforcement, the most important distinction is whether they are continuous or partial. When Skinner was training his animals, he found that learning was most rapid if the response was reinforced each time it occurred—a procedure called continuous reinforcement. However, real life seldom provides continuous reinforcement. You do not get an A each time you write a paper or a date each time you ask. But your behavior persists because your efforts are occasionally rewarded. Most everyday behavior is similarly rewarded on a partial (or intermittent) schedule of reinforcement, which involves reinforcing only some responses, not all of them (Sangha et al., 2002).

For effective use of these principles in your own life, remember that continuous reinforcement leads to faster learning than does partial reinforcement. For example, if children (or adults) are rewarded every time they blast an alien starship in a video game (continuous reinforcement), they will learn how to play faster than if they are rewarded for every third or fourth hit (partial reinforcement). On the other hand, imagine having to reward your children every morning for getting up, brushing their teeth, making their beds, dressing, and so on. You simply cannot reward someone constantly for every appropriate response. Although a continuous schedule of reinforcement leads to faster initial learning, it is not an efficient system for maintaining long-term behaviors.

It is therefore important to move to a partial schedule of reinforcement once a task is well learned. Why? Because under partial schedules, behavior is more resistant to extinction. Have you noticed that people spend long hours pushing buttons and pulling levers on slot machines in hopes of winning the jackpot? This high response rate and the compulsion to keep gambling in spite of significant losses are evidence of
the strong resistance to extinction with partial schedules of reinforcement. This type of partial, intermittent reinforcement also helps parents maintain behaviors like tooth brushing and bed making. After the child has initially learned these behaviors with continuous reinforcement, you should move on to occasional, partial reinforcement.

**Four Partial (Intermittent) Schedules of Reinforcement**

There are four partial schedules of reinforcement: **fixed ratio (FR), variable ratio (VR), fixed interval (FI), and variable interval (VI)**. Table 6.3 defines these terms and provides examples.

**Fixed Ratio (FR) Schedule**

Reinforcement occurs after a predetermined set of responses; the ratio (number or amount) is fixed.

**Variable Ratio (VR) Schedule**

Reinforcement occurs unpredictably; the ratio (number or amount) varies.

**Fixed Interval (FI) Schedule**

Reinforcement occurs after a predetermined time has elapsed; the interval (time) is fixed.

**Variable Interval (VI) Schedule**

Reinforcement occurs unpredictably; the interval (time) varies.

**Shaping**

Reinforcement delivered for successive approximations of the desired response.

**Positive Punishment**

Adding (or presenting) a stimulus that weakens a response and makes it less likely to recur.

**Negative Punishment**

Taking away (or removing) a stimulus that weakens a response and makes it less likely to recur.

**How do I know which schedule to choose?**

The type of partial schedule selected depends on the type of behavior being studied and on the speed of learning desired. For example, suppose you want to teach your dog to sit. Initially, you reinforce your dog with a cookie every time he sits (continuous reinforcement). To save on your cookie bill, and to make his training more resistant to extinction, you eventually switch to one of the partial reinforcement schedules. Using the **fixed ratio** schedule, you would give your dog a cookie after he sits a certain number of times. (The dog must make a fixed number of responses before he receives the reinforcement.) As you can see in Figure 6.9, a fixed ratio leads to the highest overall response rate. But each of the four types of partial schedules has different advantages and disadvantages (see Table 6.3).

**Shaping**

Each of the four schedules of partial reinforcement is important for maintaining behavior. But how do you teach new or complex behaviors like playing the piano or speaking a foreign language? **Shaping** teaches a desired response by reinforcing a series of successively improving steps leading to the final goal response. It is especially effective for teaching complex or novel behaviors that aren’t likely to occur naturally. Skinner believed that shaping explains a wide variety of skills and abilities that each of us possesses, from eating with a fork, to playing a musical instrument, to driving a stick-shift car.

Parents, athletic coaches, teachers, and animal trainers all use shaping techniques. For example, if you want to shape a child to make his bed, you could begin by reinforcing when he first gets the sheets and pillows on the bed—even if it’s sloppily done. Over time, you would stop reinforcing that level of behavior. You would only reinforce when he gets the bedspread on the bed and tucked over the pillows. Eventually, you would stop reinforcing unless he gets the bedspread on, tucked over the pillows, and most of the wrinkles removed. Each step in shaping moves slightly beyond the previously learned behavior. This allows the person to link the new step to the behavior previously learned.

**Punishment—Weakening a Response**

Now that you understand how to **strengthen** a response, we will examine ways to **weaken** undesirable behaviors. Like reinforcement, punishment affects behavior. But it has the opposite effect. Punishment **decreases** the strength of the response—that is, the likelihood that a behavior will be repeated again is weakened. Just as with reinforcement, there are two kinds of punishment, **positive and negative** (Gordon, 1989; Skinner, 1953). Also, as with reinforcement, remember to think in mathematical terms of adding and taking away, rather than good and bad (Table 6.4).

**Positive punishment** is the addition (+) of a stimulus that decreases (or weakens) the likelihood of the response occurring again. If a parent adds new chores each time the child is late getting home, the parent is applying positive punishment. **Negative punishment** is the taking away (–) of a stimulus that decreases (or weakens) the
### SUMMARY TABLE 6.3 FOUR SCHEDULES OF REINFORCEMENT

<table>
<thead>
<tr>
<th>Definitions</th>
<th>Response Rates</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fixed ratio (FR)</strong></td>
<td>Reinforcement occurs after a predetermined set of responses; the ratio (number or amount) is fixed</td>
<td>Produces a high rate of response, but a brief dropoff just after reinforcement</td>
</tr>
<tr>
<td><strong>Variable ratio (VR)</strong></td>
<td>Reinforcement occurs unpredictably; the ratio (number or amount) varies</td>
<td>High response rates, no pause after reinforcement, and very resistant to extinction</td>
</tr>
<tr>
<td><strong>Fixed interval (FI)</strong></td>
<td>Reinforcement occurs after a predetermined time has elapsed; the interval (time) is fixed</td>
<td>Responses tend to increase as the time for the next reinforcing is near, but drop off after reinforcement and during interval</td>
</tr>
<tr>
<td><strong>Variable interval (VI)</strong></td>
<td>Reinforcement occurs unpredictably; the interval (time) varies</td>
<td>Relatively low response rates, but they are steady because the nonhuman animal or person cannot predict when reward will come</td>
</tr>
</tbody>
</table>

### TABLE 6.4 HOW PUNISHMENT WEAKENS AND DECREASES BEHAVIORS

<table>
<thead>
<tr>
<th>Positive Punishment</th>
<th>Negative Punishment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Add stimulus (+) and weakens the behavior</strong></td>
<td><strong>Takes stimulus away (–) and weakens the behavior</strong></td>
</tr>
<tr>
<td>You must run 4 extra laps in your gym class because you were late.</td>
<td>You’re excluded from gym class because you were late.</td>
</tr>
<tr>
<td>A parent adds chores following a child’s poor report card.</td>
<td>A parent takes away a teen’s cell phone following a poor report card.</td>
</tr>
<tr>
<td>Your boss complains about your performance.</td>
<td>Your boss reduces your expense account after a poor performance.</td>
</tr>
</tbody>
</table>
likelihood of the response occurring again. Parents use negative punishment when they take the car keys away from a teen who doesn’t come home on time. Notice that in both positive and negative punishment, the behavior has been punished and the behavioral tendencies have been weakened.

The Tricky Business of Punishment

When we hear the word punishment, most people think of disciplinary procedures used by parents, teachers, and other authority figures. But punishment is much more than parents giving a child a time-out for misbehaving or teachers giving demerits. Any process that adds or takes away something and causes the behavior to decrease is punishment. By this definition, if parents ignore all the A’s on their child’s report card and ask repeated questions about the B’s and C’s, they may unintentionally punish and weaken the likelihood of future A’s. Dog owners who yell at or spank their dogs for finally coming to them after being called several times are actually punishing the desired behavior—coming when called. Similarly, college administrators who take away “leftover” money from a department’s budget because it wasn’t spent by the end of the year are punishing desired behavior—saving money. (Yes, I did add this last example as a subtle message to our college administrators!)

As you can see, punishment is a tricky business. But an advantage of studying psychology is that you now understand how positive and negative punishment (and positive and negative reinforcement) operate. You can use this knowledge to become a better parent, teacher, and authority figure, as well as a better friend and lover. To help you in these roles, consider the following general discussion and specific suggestions.

First, it’s important to acknowledge that punishment plays a significant and unavoidable role in our social world. In his book Walden Two (1948), Skinner described a utopian (ideal) world where reinforcers almost completely replaced punishment. Unfortunately, in our real world, reinforcement is not enough. Dangerous criminals must be stopped and, possibly, removed from society. Parents must stop their children from running into the street and their teenagers from drinking and driving. Teachers must stop disruptive students in the classroom and bullies on the playground.

There is an obvious need for punishment. But it can be problematic (Javo et al., 2004; Reis et al., 2004; Saadeh, Rizzo, & Roberts, 2002). To be effective, punishment should be immediate and consistent. However, in the real world, this is extremely hard to do. Police officers cannot immediately stop every driver every time he or she speeds.
To make matters worse, when punishment is not immediate, during the delay the undesirable behavior is likely to be reinforced, which unintentionally places it on a partial schedule of reinforcement. Sadly, this makes the undesirable behavior even more resistant to extinction. Think about gambling. For almost everyone, it should be a punishing situation—on most occasions, you lose far more money than you win. However, the fact that you occasionally win keeps you “hanging in there.”

Perhaps, most important, even if punishment immediately follows the misbehavior, the recipient may learn what not to do but not learn what he or she should do. Imagine trying to teach a child the word dog by only saying “No!” each time she said dog when it was inappropriate. The child (and you) would soon become very frustrated. It’s much more efficient to teach someone by giving him or her clear examples of correct behavior, such as showing a child pictures of dogs and saying dog after each photo. Punishment has several other serious side effects, as Table 6.5 shows.

### SUMMARY TABLE 6.5 SIDE EFFECTS OF PUNISHMENT

1. **Increased aggression.** Because punishment often produces a decrease in undesired behavior, at least for the moment, the punisher is in effect rewarded for applying punishment. Thus, a vicious circle may be established in which both the punisher and recipient are reinforced for inappropriate behavior—the punisher for punishing and the recipient for being fearful and submissive. This side effect partially explains the escalation of violence in family abuse and bullying (Javo et al., 2004; Larzelere & Johnson, 1999). In addition to fear and submissiveness, the recipient also might become depressed and/or respond with his or her own form of aggression.

2. **Passive aggressiveness.** For the recipient, punishment often leads to frustration, anger, and eventually aggression. But most of us have learned from experience that retaliatory aggression toward a punisher (especially one who is bigger and more powerful) is usually followed by more punishment. We therefore tend to control our impulse toward open aggression and instead resort to more subtle techniques, such as showing up late or forgetting to mail a letter for someone. This is known as passive aggressiveness (Gilbert, 2003; Stormshak, Bierman, McMahon, & Lengua, 2000).

3. **Avoidance behavior.** No one likes to be punished, so we naturally try to avoid the punisher. If every time you come home a parent or spouse starts yelling at you, you will delay coming home or find another place to go.

4. **Modeling.** Have you ever seen a parent spank or hit a child for hitting another child? The punishing parent may unintentionally serve as a “model” for the same behavior he or she is attempting to stop.

5. **Temporary suppression.** Do you notice that car drivers quickly slow down when they see a police car but quickly resume their previous speed once the police officer is out of sight? Punishment generally suppresses the behavior only temporarily during the presence of the punishing person or circumstances.

6. **Learned helplessness.** Why do some people stay in abusive homes or marital situations? Research shows that if you repeatedly fail in your attempts to control your environment, you acquire a general sense of powerlessness or learned helplessness and you may make no further attempts to escape (Alloy & Clements, 1998; Seligman, 1975; Shors, 2004; Zhukov & Vinogradova, 2002).
CHAPTER 6 LEARNING

Test Yourself

Is this positive reinforcement, negative reinforcement, positive punishment, or negative punishment? Check your understanding by reviewing this figure and filling in your answer in the space provided in each box.

VISUAL QUIZ

Answers: (a) positive reinforcement, (b) positive punishment, (c) negative reinforcement, (d) negative punishment.

Tips for Reinforcement and Punishment

After studying basic learning principles, can you effectively apply them in your own life? The best method seems to be a combination of the major principles: Reinforce appropriate behavior, extinguish inappropriate behavior, and save punishment for the most extreme cases (such as a 2-year-old running into the street). Here are additional tips:

1. **Feedback.** When using both reinforcement and punishment, be sure to provide immediate and clear feedback to the person or nonhuman animal whose behavior you wish to change. When using punishment, it is particularly important to make clear the desired response because punishment is merely an indication that the response is undesirable. In other words, give the participant an alternative response to the punished one.

2. **Timing.** Reinforcers and punishers should be presented as close in time to the response as possible. The old policy of “wait till your father gets home” is obviously inappropriate for many reasons. In this case, it is because the delayed punishment is no longer associated with the inappropriate response. The same is true for reinforcement. If you’re trying to lose weight, don’t say you’ll buy yourself a new wardrobe when you lose 30 pounds. Instead, reward yourself with a small treat (like a new blouse or shirt) after every few pounds.

3. **Consistency.** To be effective, both reinforcement and punishment must be consistent. Have you ever seen a child screaming for candy in a supermarket? Parents often begin by saying “no!” But when the child gets louder or throws a temper tantrum, the parents often give in and buy the candy. Although the parents are momentarily relieved (negatively reinforced) when the screaming stops, can you see how they’re creating bigger and longer lasting problems? First, the child is being positively reinforced for the screaming and temper tantrum, so this behavior will increase. To make matters worse, the parents’ inconsistency (saying “no!” and then occasionally giving in) places begging for candy on a partial schedule of reinforcement.
This makes temper tantrums highly resistant to extinction. Like a gambler who continues playing despite the odds, the child will continue the begging, screaming, and temper tantrums in hopes of the occasional payoff.

Because effective punishment requires constant surveillance and consistent responses, it’s almost impossible to be a “good punisher.” It’s best (and easiest) to use consistent reinforcement for good behavior and extinction for bad behavior. Praise the child for happy and cooperative behavior in the supermarket. Extinguish the temper tantrum by consistently refusing the request and ignoring the tantrum.

4. Order of presentation. As a teenager, did you ever ask for an extra few dollars as an advance on your allowance? Did you later “forget” your promise to mow the grass on Saturday? As a parent, have you ever made your teen come home much earlier than their friends because you know that “all teenagers get into trouble after midnight”? Can you see why the reward of extra money must come after the lawn mowing and why punishment that comes before the behavior may create frustration and resentment? Both reinforcement and punishment should come after the behavior, never before.

Summarizing and Comparing Classical and Operant Conditioning

Are you feeling overwhelmed with all the important (and seemingly overlapping) terms and concepts for both classical and operant conditioning? This is a good time to stop and carefully review Table 6.6, which summarizes all the key terms and compares the two major types of conditioning.

---

**SUMMARY TABLE 6.6 COMPARING CLASSICAL AND OPERANT CONDITIONING**

<table>
<thead>
<tr>
<th></th>
<th>Classical Conditioning</th>
<th>Operant Conditioning</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pioneers</strong></td>
<td>Ivan Pavlov</td>
<td>Edward Thorndike</td>
</tr>
<tr>
<td></td>
<td>John B. Watson</td>
<td>B. F. Skinner</td>
</tr>
<tr>
<td><strong>Major Terms</strong></td>
<td>Neutral stimulus (NS)</td>
<td>Reinforcers (primary and secondary)</td>
</tr>
<tr>
<td></td>
<td>Unconditioned stimulus (UCS)</td>
<td>Reinforcement (positive and negative)</td>
</tr>
<tr>
<td></td>
<td>Conditioned stimulus (CS)</td>
<td>Punishment (positive and negative)</td>
</tr>
<tr>
<td></td>
<td>Unconditioned response (UCR)</td>
<td>Shaping</td>
</tr>
<tr>
<td></td>
<td>Conditioned response (CR)</td>
<td>Reinforcement schedules (continuous and partial)</td>
</tr>
<tr>
<td></td>
<td>Conditioned emotional response (CER)</td>
<td></td>
</tr>
<tr>
<td><strong>Example</strong></td>
<td>Cringing at the sound of a dentist’s drill</td>
<td>A baby cries and you pick it up</td>
</tr>
<tr>
<td><strong>Shared Terms</strong></td>
<td>Generalization</td>
<td>Generalization</td>
</tr>
<tr>
<td></td>
<td>Discrimination</td>
<td>Discrimination</td>
</tr>
<tr>
<td></td>
<td>Extinction</td>
<td>Extinction</td>
</tr>
<tr>
<td></td>
<td>Spontaneous recovery</td>
<td>Spontaneous recovery</td>
</tr>
<tr>
<td><strong>Major Differences</strong></td>
<td>Learning based on paired associations</td>
<td>Learning based on consequences</td>
</tr>
<tr>
<td></td>
<td>Involuntary (subject is passive)</td>
<td>Voluntary (subject is active and “operates” on the environment)</td>
</tr>
<tr>
<td><strong>Order of Effects</strong></td>
<td>NS comes before the UCS</td>
<td>Reinforcement or punishment come after the behavior</td>
</tr>
</tbody>
</table>

www.wiley.com/college/huffman
As you can see, there are several areas of similarity in classical and operant conditioning. For example, in our earlier discussion of the principles of classical conditioning, you learned about stimulus generalization, stimulus discrimination, extinction, and spontaneous recovery. These same terms also are used in operant conditioning. Just as 11-month-old Albert generalized his fear of rats to rabbits and Santa Claus masks, operantly conditioned responses also generalize. After learning the word for Daddy (through the operant conditioning procedure of shaping), children often use this same word for all adult men. This would be a form of stimulus generalization (and potential embarrassment to the parents). After parents explain the distinction, the child learns to differentiate (stimulus discrimination) and to call only one man Daddy.

In both classical and operant conditioning, extinction occurs when the original source of the learning is removed. In classical conditioning, the CR (Albert’s fear of the rat) is extinguished if the CS (the rat) is repeatedly presented without the UCS (the loud noise). In operant conditioning, if the reinforcement (the rat’s food) is removed, the response (bar pressing) will gradually decline. Following extinction in either classical or operant conditioning, you also sometimes have spontaneous recovery. Just as the classically conditioned fear of rats may spontaneously return, the operantly conditioned bar-pressing behaviors may recur.

One final comparison: In classical conditioning, we talked about higher-order conditioning. This occurs when a neutral stimulus (NS) is paired with a conditioned stimulus (CS), which is another stimulus that already produces a learned response. We said that if you wanted to demonstrate higher-order conditioning in Pavlov’s dogs, you would first condition the dogs to salivate to the sound of the tone. Then you would pair the flash of light to the sound of the tone. Eventually, the dog would salivate only to the flash of light.

A similar process, with a different name, also occurs in operant conditioning. If a rat learns that bar pressing produces food only when a light is flashing, the rat will soon learn to respond only when the light is flashing. The light has become a discriminative stimulus, which signals whether or not a response will pay off. We depend on discriminative stimuli many times every day. We pick up the phone only when it rings. We look for the Women or Men signs on bathroom doors. And children quickly learn to ask grandparents for toys.
Using Learning Principles to Succeed in College

Psychological theory and research have taught us that an active approach to learning is rewarded by better grades. Active learning means using the SQ4R (Survey, Question, Read, Recite, Review, and wRite) study techniques discussed in the “Tools for Student Success” (pages 43–49). An active learner also rises above old, easy patterns of behavior and applies new knowledge to everyday situations.

When you transfer ideas or concepts you learn from class to your personal life, your insight grows. Now that you have studied the principles of learning, use the following activity to help you apply your new knowledge to achieve your education goals and have an enjoyable college experience:

1. List three ways you can positively reinforce yourself for studying, completing assignments, and attending class.
2. Discuss with friends how participating in club and campus activities can reinforce your commitment to education.
3. Examine the time and energy you spend studying for an exam in a course you like with your study effort in a course you don’t like. How could you apply the Premack principle to your advantage in this situation?
4. When you take exams, are you anxious? How might this be a classically conditioned response? Describe how you could use the principle of extinction to weaken this response.

CRITICAL THINKING

Operant Conditioning

In operant conditioning, humans and nonhuman animals learn by the consequences of their responses. Whether behavior is reinforced or punished (consequences) influences whether the response will occur again. Thorndike and Skinner are the two major contributors to operant conditioning. Thorndike’s law of effect states that rewarded behavior is more likely to recur. Skinner extended Thorndike’s work to more complex behaviors but emphasized only external, observable behaviors.

Operant conditioning involves several important terms and principles. Reinforcement is any procedure that strengthens or increases a response. Punishment is any procedure that results in a weakening or decrease. To strengthen a response, we use primary reinforcers. These reinforcers satisfy an unlearned biological need (e.g., hunger, thirst). We also use secondary reinforcers, which have learned value (e.g., money). Positive reinforcement (adding something) and negative reinforcement (taking something away) increase the likelihood the response will occur again. According to the Premack principle, activities or behaviors that are more common or probable in one’s life will act as reinforcers for activities that are less probable. Continuous reinforcement rewards each correct response. A partial (intermittent) schedule reinforces for some, not all, designated responses. The four partial reinforcement schedules are variable ratio (VR), variable interval (VI), fixed ratio (FR), and fixed interval (FI). Complex behaviors can be trained through shaping—reinforcing successive approximations of the desired behavior.

Positive punishment (adding something) and negative punishment (taking something away) decrease the likelihood the response will occur again. Although some punishment is essential, it has serious side effects.

Questions

1. Define operant conditioning and explain how it differs from classical conditioning.
2. Negative punishment ______ and negative reinforcement ______ the likelihood the response will continue. (a) decreases, decreases; (b) increases, decreases; (c) decreases, increases; (d) increases, increases
3. Partial reinforcement schedules make responses more ______ to extinction.
4. Marshall is very disruptive in class and his teacher uses various forms of punishment hoping to decrease his misbehavior. List five potential problems with this approach.

Check your answers in Appendix B.
COGNITIVE-SOCIAL LEARNING

So far, we have examined learning processes that involve associations between a stimulus and an observable behavior. Some behaviorists believe that almost all learning can be explained in such stimulus–response terms. Other psychologists feel there is more to learning than can be explained solely by operant and classical conditioning. Cognitive-social theory (also called cognitive-social learning or cognitive-behavioral theory) incorporates the general concepts of conditioning. But rather than a simple S–R (stimulus and response), this theory emphasizes the interpretation or thinking that occurs within the organism—S–O–R (stimulus–organism–response). According to this view, people (as well as rats, pigeons, and other nonhuman animals) have attitudes, beliefs, expectations, motivations, and emotions that affect learning. Furthermore, both human and nonhuman animals are social creatures capable of learning new behaviors through observation and imitation of others. We begin with a look at the cognitive part of cognitive-social theory, followed by an examination of the social aspects of learning.

Insight and Latent Learning: Where Are the Reinforcers?

As you’ll discover throughout this text, cognitive factors play a large role in human behavior and mental processes. Given that these factors are covered in several other chapters (such as those on memory and thinking/language/intelligence), our discussion here is limited to the classic research of Wolfgang Köhler and Edward Tolman and their studies of insight and latent learning.

Köhler’s Study of Insight

Early behaviorists likened the mind to a “black box,” whose workings could not be observed directly. German psychologist Wolfgang Köhler wanted to look inside the box. He believed there was more to learning—especially learning to solve a complex problem—than responding to stimuli in a trial-and-error fashion. In several experiments conducted during World War I, Köhler posed different types of problems to chimpanzees and apes to see how they learned to solve them. In one experiment, he placed a banana just outside the reach of a caged chimpanzee. To reach the banana, the chimp would have to use a stick placed near the cage to extend its reach. The chimp did not solve this problem in the random trial-and-error fashion of Thorndike’s cats or Skinner’s rats and pigeons. Köhler noticed that he seemed to sit and think about the situation for a while. Then, in a flash of insight (a sudden understanding), the chimp picked up the stick and maneuvered the banana within its grasp (Köhler, 1925).

Another one of Köhler’s chimps, an intelligent fellow named Sultan, was put in a similar situation. However, this time two sticks were made available to him and the banana was placed even farther away, too far to reach with a single stick. Sultan seemingly lost interest in the banana but continued to play with the sticks. When he later discovered that the two sticks could be interlocked, he instantly used the now-longer stick to pull the banana within reach. Köhler designated this type of learning insight learning. Some internal mental event that we can only describe as “insight” went on between the presentation of the banana and the use of the stick to retrieve it.

Tolman’s Study of Latent Learning

Previous researchers suggested that rats learned mazes through trial-and-error and rewards. Edward C. Tolman (1898–1956) believed they underestimated the rat’s cognitive processes and cognitive learning. He noted that rats placed in experimental
mazes seemed to pause at certain intersections, almost as if they were deciding which route to take. When allowed to roam aimlessly in a maze with no food reward at the end, the rats also seemed to develop a cognitive map, or mental representation, of the maze.

To test the idea of cognitive learning, Tolman allowed one group of rats to explore a maze in an aimless fashion with no reinforcement. A second group was always reinforced with food whenever they reached the end of the maze. The third group was not rewarded initially (during the first 10 days of the trial). But starting on day 11 they found food at the end of the maze. As expected from simple operant conditioning, the first and third groups were slow to learn the maze. The second group, which had reinforcement, showed fast, steady improvement. However, when the third group started receiving reinforcement (on the 11th day), their learning of the maze quickly matched the performance of the group that had been reinforced every time (Tolman & Honzik, 1930). For Tolman, this was significant. It proved that the nonreinforced rats had been thinking and building cognitive maps of the area during their aimless wandering. Their hidden latent learning only showed up when there was a reason to display it (the food reward).

Cognitive learning is not limited to rats. If a new log is placed in its territory, a chipmunk will explore it for a time. But will soon move on if no food is found. When a predator comes into the same territory, however, the chipmunk heads directly for and hides beneath the log. Similarly, as a child you may have casually ridden a bike around your neighborhood with no particular reason or destination in mind. You only demonstrated your hidden knowledge of the area when your dad was later searching for the closest mailbox. The fact that Tolman’s nonreinforced rats quickly caught up to the reinforced ones, that the chipmunk knew about the hiding place under the log, that you knew the location of the mailbox, and recent experimental evidence (Burgdorf, Knutson, & Panksepp, 2000) all provide clear evidence of latent learning and the existence of internal cognitive maps.

### Observational Learning: What We See Is What We Do

After watching her first presidential debate, my friend’s 5-year-old daughter asked, “Do we like him, Mommy?” What form of learning is this? In addition to classical and operant conditioning and cognitive processes (such as insight and latent learning), this child’s question shows that we also learn many things through observation and imitation of others—thus the name observational learning (or social learning or modeling). From birth to death, observational learning is very important to our biological, psychological, and social survival (the biopsychosocial model). Watching others helps us avoid dangerous stimuli in our environment, teaches us how to think and feel, and shows us how to act and interact in social situations.

Some of the most compelling examples of observational learning come from the work of Albert Bandura and his colleagues (Bandura, 2003; Bandura, Ross, & Ross, 1961; Bandura & Walters, 1963). Wanting to know whether children learn to be aggressive by watching others be aggressive, Bandura and his colleagues set up several experiments. They allowed children to watch a live or televised adult model kick, punch, and shout at a large inflated Bobo doll. Later, the children were allowed to play in the same room with the same toys (see the photo on this page). As Bandura hypothesized, children who had seen the live or televised aggressive model were much more aggressive with the Bobo doll than children who had not seen the aggression. In other words, “Monkey see, monkey do.”

We obviously don’t copy or model everything we see, however. According to Bandura, learning by observation requires at least four separate processes:

1. **Attention.** Observational learning requires attention. This is why teachers insist on students watching their demonstrations.
2. **Retention.** To learn a complex new dance step, we need to carefully note and remember the instructor’s directions and demonstrations.

3. **Motor reproduction.** Observational learning cannot occur if we lack the motor skills necessary to imitate the model. One of the worst arguments I’ve ever had with my husband was during his attempts to teach me to downhill ski. Although I paid close attention and remembered his instructions, I repeatedly failed at even the most basic skills—like standing up! Because he was an expert skier of many years, he had forgotten several important steps in the initial learning process. My beginner’s motor skills were not up to the task of starting beyond the basics. Our argument was stopped (and our marriage saved) by the arrival of the professional ski instructor. (Did you note the way I emphasized “professional”?)

4. **Reinforcement.** We also decide whether we want to repeat the modeled behavior based on whether the model was reinforced. If we see a large number of people making lots of money in the stock market, we’re likely to copy their behavior. We’re less likely to do so when the market collapses.

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**Observational learning and modeling.** Note how the bicep circumference of the G.I. Joe action figure has more than doubled since 1964. Can you see how this type of modeling might help explain why men today worry more about their chest and bicep size? Or why they sometimes use steroids to increase their muscle development? [Source: As G.I. Joe bulks up, concern for the 98-pound weakling (May 30, 1999, New York Times, p. D2)]

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**Application**

**“The Theory Heard Round the World.”**

*(Contributed by Thomas Frangicetto)*

Bandura’s “Bobo doll” study is considered a classic in social psychology. It proved that children will imitate models they observe on television. Why is this new or important? Parents, educators, and politicians have long complained about all the negative things children learn from television. But what about the positive effects? Around the world, billions of people spend a large portion of their lives watching television. Could these hours of observational learning be put to good use?

Yes! According to a recent article, researchers working with television producers have created long-running, entertaining, serial dramas that feature attractive characters who model positive behaviors and good outcomes *(Putting the power of television to good use, 2005)*. Fortunately, these “soap operas” have had a dramatic effect on social problems like illiteracy, HIV, overpopulation, and gender discrimination. Consider the following:

- In 1975, Mexican television executive Miguel Sabido produced the soap opera *Ven Conmigo* (“Come with Me”) to entertain and advocate for adult literacy. The show was incredibly successful. The attendance in adult literacy classes was nine times higher than the year before.
- In the early 1990s, in the African country of Tanzania, life-threatening myths and misinformation were abundant. According to one report, Tanzanians believed that HIV “was transmitted through mosquitoes and having sex with a condom could cause the virus” *(Smith, 2002)*. In 1993 an educational radio program aired in the Swahili language, *Twende na Wakati* (“Let’s Go With the Time”), began broadcasting twice a week. Again, the results were spectacularly successful.
Interestingly, the social cognitive theory of Albert Bandura played a pivotal role—not just in Mexico and Tanzania, but also in China and areas in the Caribbean (Smith, 2002). According to Smith, Bandura’s theory “is the foundation of television and radio shows that have changed the lives of millions.” How do we know this?

“Sabido contacted Bandura,” Smith writes, “explaining that he was using Bandura’s work on modeling and social learning to produce Ven Conmigo and then showed him episodes of the drama.” Bandura was duly impressed, “I thought this is a remarkably creative implementation of theory into practice,” he told Smith. “I was amazed at the ingenuity.” Sabido was not officially trained in psychology, but was able to “apply Bandura’s theories to the real world” (Smith, 2002, p. 30).

But how can we be sure that the outcomes reported in Mexico and Tanzania were really the result of cause and effect and not correlational? How do we know, for example, that the changes in Tanzania—more Tanzanians knowing that unprotected sex could result in HIV infection, and decreasing their sexual partners while increasing condom use—were directly caused by observational learning and the radio soap opera Twende na Wakati? Could other factors have been involved? Would the changes have occurred without the soap opera?

“The challenge,” according to researcher Peter Vaughan (2004), “is to know how much of the change was caused by the program (cause and effect) and how much of the change was caused by other things that were going on in the country at the same time (correlation).” Vaughan, the director of Population Communication International (PCI), an agency that produces educational soap operas globally, admitted the difficulty of constructing a control group in these mass media studies. However, “in Tanzania we were actually able to do that.” PCI divided a map of Tanzania into two areas. One group could hear the broadcasts of Twende na Wakati and the other could not. Increases in positive behavioral and attitudinal changes were much higher where Twende was aired. A full explanation of their findings can be found at PCI’s website http://www.population.org/entsummit/transcript04_vaughan.shtml.

On this same website, PCI also explains that its “methodology” is based on “a theory of social learning developed by Professor Albert Bandura of Stanford University.” In the spirit of Bandura’s model, PCI trains their creative teams to “…include positive characters who are rewarded, negative characters who are punished, and transitional characters whose experiences embody the difficult choices we all face in life.” And the crucial connection between “art and audience” that must take place if change is to occur does so here because “audience members tend to bond with the transitional characters who move to more positive behaviors, whether protecting themselves against HIV/AIDS, pursuing education, or keeping their children in school” (PCI, 2005). That is truly “psychology in action” and it is a legacy of which Albert Bandura can be justly proud.

Active Learning Questions
1. What role has observational learning played in your life? Can you think of specific examples of learning from the behavior of role models? Who were they and what qualities did they have that were worth emulating? Have you experienced negative role modeling? Does observational learning contradict good critical thinking? For example, does learning from observing the behaviors of others violate being an independent thinker?
2. Consider the PCI research described by Peter Vaughan. Identify the following terms in this study: hypothesis, experimental group, control group, independent variable, and dependent variable. Do you find PCIs conclusions convincing? Do you have any problem with PCI doing the research on the effectiveness of their own dramatic productions? Explain.
3. A recent American Psychological Association (APA) press release highlighted the prevalence of self-destructive behaviors such as “smoking, alcohol abuse, and a sedentary lifestyle” (Winerman, 2005) in the United States. One major problem, according to psychologist James Prochaska, is that “the American health-care system has yet to fully integrate behavior change into treatment.” He encourages “psychologists to work to change that.” Given what we know about the power of stories to engage the emotions of people (Giles, 2004), do you think that an American version of Twende na Wakati or Ven Conmigo would be effective? Explain.

Achievement
Gender & Cultural Diversity

Scaffolding as a Teaching Technique in Different Cultures

Learning in the real world is often a combination of classical conditioning, operant conditioning, and cognitive-social learning. This is especially evident in informal situations in which an individual acquires new skills under the supervision of a master teacher. The ideal process used by teachers in these situations is known as scaffolding.
(Wood, Bruner, & Ross, 1976). Like the temporary platform on which construction workers stand, a cognitive scaffold provides temporary assistance while a learner acquires new skills. During this type of cognitive scaffolding, a more experienced person adjusts the amount of guidance to fit the student's current performance level. In most cases, scaffolding also combines shaping and modeling. The teacher selectively reinforces successes of the student and models more difficult parts of the task.

Patricia Marks Greenfield (1984, 2004) has described how scaffolding helps young girls learn to weave in Zinacantán, Mexico. Weaving is an important part of the culture of the Zinacantecos, who live in the highlands of southern Mexico. Greenfield videotaped 14 girls at different levels of learning to weave. Each girl was allowed to complete what she was able to do with ease. A more experienced weaver then created a scaffold by reinforcing correct weaving and modeling more difficult techniques. Interestingly, the teachers appear oblivious of their teaching methods or of the fact that they are teaching at all. Most of the Zinacanteco women believe that girls learn to weave by themselves. Similarly, in our Western culture, many believe that children learn to talk by themselves, ignoring how often children are reinforced (or scaffolded) by others.

Cognitive-Social Learning

Cognitive-social theory incorporates concepts of conditioning but emphasizes thought processes, or cognitions, and social learning. According to this perspective, people learn through insight, latent learning, observation, and modeling.

Wolfgang Köhler, in working with chimpanzees, demonstrated that learning could occur with a sudden flash of insight. Tolman demonstrated that latent learning takes place in the absence of reward and remains hidden until some future time when it can be retrieved as needed. A cognitive map is a mental image of an area that a person or nonhuman animal has navigated.

According to Albert Bandura, observational learning is the process of learning how to do something by watching others and performing the same behavior in the future. To imitate the behavior of others, we must pay attention, remember, be able to reproduce the behavior, and be motivated by some reinforcement.

Questions

1. _____ were influential in early studies of cognitive learning. (a) William James and Ivan Pavlov; (b) B. F. Skinner and Edward Thorndike; (c) Wolfgang Köhler and Edward Tolman; (d) Albert Bandura and R. H. Walters

2. Learning that occurs in the absence of a reward and remains hidden until some future time when it can be retrieved is called _____.

3. Mental images of an area that an organism has navigated are known as _____.

4. Bandura’s observational learning studies focused on how _____.
   (a) rats learn cognitive maps through exploration; (b) children learn aggressive behaviors by observing aggressive models; (c) cats learn problem solving through trial and error; (d) chimpanzees learn problem solving through reasoning

Check your answers in Appendix B.

The Biology of Learning

As you recall, learning is defined as a relatively permanent change in behavior and mental processes resulting from practice or experience. For this change in behavior to persist over time, lasting biological changes must occur within the organism. In this section, we will examine the neurological changes that occur during and after learning. We also will explore the evolutionary advantages of learning.
Neuroscience and Learning: The Adaptive Brain

Each time we learn something, either consciously or unconsciously, that experience changes our brains. We create new synaptic connections and alterations in a wide network of brain structures, including the cortex, cerebellum, hypothalamus, thalamus, and amygdala (Debaere et al., 2004; Fanselow & Poulos, 2005; Pelletier & Paré, 2004; Thompson, 2005).

Evidence that our brains change in structure because of experience first began to accumulate in the 1960s with studies of enriched and deprived environments. Research on this topic generally involves raising one group of rats in large cages with other rats and many objects to explore. This rat “Disneyland” is colorfully decorated, and each cage has ladders, platforms, and cubbyholes to investigate. In contrast, rats in the second group are raised in stimulus-poor, deprived environments. They live alone and have no objects to explore except food and water dispensers. After weeks in these environments, the brains of these two groups of rats are significantly different. The rats in the enriched environment typically develop a thicker cortex, increased nerve growth factor (NGF), more fully developed synapses, more dendritic branching, and improved performance on many tests of learning (Guilarte et al., 2003; Pham, Winblad, Granholm, & Mohammed, 2002; Rosenzweig & Bennett, 1996).

Admittedly, it is a big leap from rats to humans. But research suggests that the human brain also responds to environmental conditions. For example, older adults exposed to stimulating environments generally perform better on intellectual and perceptual tasks than those who are in restricted environments (Schaie, 1994).

Evolution and Learning: Biological Preparedness and Instinctive Drift

So far, we have emphasized the learned aspects of behavior. But humans and other nonhuman animals are born with other innate, biological tendencies that help ensure their survival. When your fingers touch a hot object, you immediately pull your hand away. When a foreign object approaches your eye, you automatically blink. These simple reflexes involve making a specific automatic reaction to a particular stimulus. In addition to reflexes, many species also have a second set of adaptive responses called instincts, or species-specific behaviors. For example, the weaverbird is known to tie a particular grass knot to hold its nest together. Even when these birds are raised in total isolation for several generations, they will still tie the same knot.

Although these inborn, innate abilities are important to our evolutionary survival, they are inadequate for coping with a constantly changing environment. Reflexively withdrawing your fingers from a hot object is certainly to your advantage. But what if you saw a sign showing that the hot object was an unusual door handle that would allow you to escape a burning building? Numerous important stimuli in our environment require a flexible approach. Only through learning are we able to react to spoken words, written symbols, and other important environmental stimuli. From an evolutionary perspective, learning is an adaptation that enables organisms to survive and prosper in a constantly changing world. In this section, we will explore how our biological heritage helps us learn some associations more easily than others (biological preparedness), while also restricting us from learning in other situations (biological constraints).

Classical Conditioning and Taste Aversions

Years ago, Rebecca (a student in my psychology class) was walking to class as she absentmindedly unwrapped a Butterfinger candy bar. Expecting the sweet chocolate taste and crunch of her favorite candy, she was momentarily confused by its unexpected bitter taste and wet, slimy texture. Her confusion was quickly replaced by horror—her candy bar was filled with small, wiggling maggots!
Are you feeling slightly sick after reading this? Can you imagine how Rebecca felt? You’re probably not surprised that many years later she still feels nauseated when she sees a Butterfinger candy bar. But can you explain why she doesn’t feel similarly nauseated by the sight of her boyfriend, who bought her the candy?

I use Rebecca’s graphic (and true!) story to illustrate an important evolutionary process. When a food or drink is associated with nausea or vomiting, that particular food or drink can become a conditioned stimulus (CS) that triggers a conditioned taste aversion. Like other classically conditioned responses, taste aversions develop involuntarily.

Can you see why this automatic response would be adaptive? If our cave-dwelling ancestors became ill after eating a new plant, it would increase their chances for survival if they immediately developed an aversion to that plant—but not to other family members who might have been present at the time. Similarly, people tend to develop phobias to snakes, darkness, spiders, and heights more easily than to guns, knives, and electric outlets. We apparently inherit a built-in (innate) readiness to form associations between certain stimuli and responses, known as biological preparedness.

Laboratory experiments have provided general support for both taste aversion and biological preparedness. For example, Garcia and his colleagues (1966) produced taste aversion in lab rats by pairing flavored water (NS) and a drug (UCS) that produced gastrointestinal distress (UCR). After being conditioned and recovering from the illness, the rats refused to drink the flavored water (CS) because of the conditioned taste aversion. Remarkably, however, Garcia discovered that only certain neutral stimuli could produce the nausea. Pairings of a noise (NS) or a shock (NS) with the nausea-producing drug (UCS) produced no taste aversion. Garcia suggested that when we are sick to our stomachs, we have a natural, evolutionary tendency to attribute it to food or drink. Being biologically prepared to quickly associate nausea with food or drink is adaptive. It helps us avoid that or similar food or drink in the future (Cooper et al., 2002; Domjan, 2005; Garcia, 2003).

This research calls into question early learning theorists who believed they could condition virtually any stimulus and any response—as long as the organism was physically capable of performing the behavior. In his research, however, Garcia found that taste–nausea associations were almost impossible to prevent. Other associations (noise–nausea and shock–nausea) were virtually impossible to produce!

Garcia’s findings on taste aversion are important for at least two reasons. First, identifying exceptions to classical conditioning leads to a better understanding of biological preparedness. Second, he and his colleagues used their basic research to help solve an economic problem for western ranchers. Coyotes were killing sheep and the ranchers wanted to kill the coyotes. But this “solution” would have created a larger ecological problem because coyotes eat rabbits and small rodents.

In a form of applied research, Garcia and his colleagues used classical conditioning to teach the coyotes not to eat sheep (Gustavson & Garcia, 1974). The researchers began by lacing freshly killed sheep with a chemical that causes extreme nausea and vomiting in coyotes that eat the tainted meat. The conditioning worked so well that the coyotes would voluntarily run away from the mere sight and smell of sheep. Taste aversion research has since been widely tested and applied both in the wild and in the laboratory (Aubert & Dantzer, 2005; Cooper et al., 2002; Domjan, 2005; Nakajima & Masaki, 2004).

**Operant Conditioning and Instinctive Drift**

As we’ve just seen, behavior is influenced by an organism’s evolutionary history. This history, in turn places limits, or biological constraints, on learning. Just as Garcia couldn’t produce noise–nausea associations, other researchers have found that an animal’s natural behavior pattern can interfere with operant conditioning. For example,
the Brelands (1961) tried to teach a chicken to play baseball. Through shaping and reinforcement, the chicken first learned to pull a loop that activated a swinging bat. It later learned to actually hit the ball. But instead of running to first base, it would chase the ball as though it were food. Regardless of the lack of reinforcement for chasing the ball, the chicken’s natural behavior took precedence. This biological constraint is known as **instinctive drift**, when an animal’s conditioned responses tend to shift (or drift) toward innate response patterns.

Human and nonhuman animals can be operantly conditioned to perform a variety of novel behaviors (like jumping through hoops, turning in circles, and even water skiing). However, reinforcement alone does not determine behavior. There is a biological tendency to favor natural inborn actions. In addition, learning theorists initially believed that the fundamental laws of conditioning would apply to almost all species and all behaviors. However, later researchers have identified several constraints (such as biological preparedness and instinctive drift) that limit the generality of conditioning principles. As you discovered in Chapter 1, scientific inquiry is a constantly changing and evolving process.

**Instinctive Drift**

Conditioned responses shift (or drift) back toward innate response patterns.

**CHECK & REVIEW**

**The Biology of Learning**

Learning and conditioning produce relatively permanent changes in biochemistry and various parts of the brain. But not all behaviors are learned. At least some behavior is innate, or inborn, in the form of either reflexes or instincts. Apparently, animals are programmed to engage in certain innate behaviors that have evolutionary survival benefits.

Through **biological preparedness** an organism is innately predisposed to form associations between certain stimuli and responses. **Taste aversions** are classically conditioned associations of food to illness that are rapidly learned, often in a single pairing. These aversions offer a protective survival mechanism for a species. Findings on **instinctive drift** show there are biological constraints on operant conditioning.

**Questions**

1. From a(n) ____ perspective, learning is an adaptation that enables organisms to survive and prosper in a constantly changing world.
2. How did Garcia condition a taste aversion in coyotes?
3. What is biological preparedness?
4. ____ occurs when an animal’s learned responses tend to shift toward innate response patterns.

Check your answers in Appendix B.

**USING CONDITIONING AND LEARNING PRINCIPLES**

Do you remember what I “promised” in the “Why Study Psychology” box at the start of this chapter? I claimed that studying this chapter would expand your understanding and control of behavior, improve the predictability of your life, enhance your enjoyment of life, and even help you change the world! I sincerely believe each of these claims. Unfortunately, many introductory psychology students focus only on studying all the terms and concepts. They fail to see “the forest for the trees.” I don’t want this to happen to you. To help you understand and appreciate the profound (and practical) benefits of this material, let’s examine several applications for classical conditioning, operant conditioning, and cognitive-social learning.

**Achievement**

What are the practical applications of conditioning principles?
Classical Conditioning—From Marketing to Medical Treatments

Do you know that advertisers, politicians, film producers, music artists, and others routinely and deliberately use classical conditioning to market their products and manipulate our purchases, votes, emotions, and motivation? Classical conditioning also helps explain how (and why) we learn to be prejudiced and experience problems with phobias and certain medical procedures.

Marketing

Beginning with John B. Watson’s academic firing and subsequent career in advertising in the 1920s, marketers have employed numerous classical conditioning principles to promote their products. For example, TV commercials, magazine ads, and business promotions often pair their products or company logo (the neutral stimulus/NS) with pleasant images, such as attractive models and celebrities (the conditioned stimulus/CS). Through higher-order conditioning, these attractive models then trigger favorable responses (the conditioned response/CR). Advertisers know that after repeated viewings, the previously neutral stimulus (their products or logo) will become a conditioned stimulus that elicits favorable responses (CR)—purchasing their products. Psychologists caution that these ads also help produce visual stimuli that trigger conditioned responses such as urges to smoke, overeat, and drink alcohol (Dols, Willems, van den Hout, & Bittoun, 2000; Martin et al., 2002; Tirodkar & Jain, 2003; Wakfield et al., 2003).

Prejudice

Are children born with prejudice? Or are they the victims of classical conditioning? In a classic study in the 1930s, Kenneth Clark and Mamie P. Clark (1939) studied children’s reactions to black dolls and to white dolls. They found that given a choice, both black and white children preferred the white dolls. When asked which doll was good and which was bad, both groups of children also responded that the white doll was good and nice. The black doll was seen as bad, dirty, and ugly. The Clarks reasoned that the children, as well as many others in the United States, had learned to associate inferior qualities with darker skin and positive qualities with light skin. The Clark study exemplifies the negative effects of classical conditioning. In addition, their findings played a pivotal role in the famous Brown v. Board of Education of Topeka decision in 1954, which ruled that segregation of public facilities was unconstitutional. (Interestingly, this was the first time social science research was formally cited in a U.S. Supreme Court case to support a legal argument.)

If you’re thinking this 1930 study no longer applies, follow-up research in the late 1980s found that 65 percent of the African-American children and 74 percent of the white children still preferred the white doll (Powell-Hopson & Hopson, 1988).

The Clark study provided important insights into the negative effects of prejudice on the victims—African-American children. But what about the white children who also strongly preferred the white doll? Was their preference also due to classical conditioning? And did a similar type of classical conditioning contribute to the vicious murder of James Byrd? We can’t be sure how the hatred and racism that took James
Byrd’s life originally started. However, prejudice of many types (racism, ageism, sexism, homophobia, and religious intolerance) can be classically conditioned, as Figure 6.10 shows.

**Medical Treatments**

Examples of classical conditioning are also found in the medical field. For example, a program conducted by several hospitals in California gives an *emetic* (a nausea-producing drug) to their alcohol-addicted patients. But before the nausea begins, the patient gaggles with his or her preferred alcoholic beverage to maximize the taste and odor cues paired with nausea. As a form of classical conditioning, the smell and taste of various alcoholic drinks (neutral stimulus/NS) are paired with the nausea-producing drug (the unconditioned stimulus/UCS). The drug then makes the patient vomit or feel sick (the unconditioned response/UCR). Afterward, just the smell or taste of alcohol (the conditioned stimulus/CS) makes the person sick (the conditioned response/CR). Some patients have found this treatment successful, but not all (Chapter 15).

Nausea is deliberately produced in this treatment for alcoholism. Unfortunately, it is an unintended side effect of many cancer treatments. The nausea and vomiting produced by chemotherapy increase the patient’s discomfort and often generalize to other environmental cues, such as the hospital room color or odor (Stockhorst et al., 2000). Using their knowledge of classical conditioning to change associations, therapists can help cancer patients control their nausea and vomiting response.

**Phobias**

Do you know someone who “freaks out” at the sight of a cockroach? At some time during his or her lifetime, this person probably learned to associate the NS (cockroach) with a UCS (perhaps hearing a parent scream at the sight of a cockroach) until a CR (fear at the sight of a cockroach) was conditioned. Researchers have found that most everyday fears are classically conditioned emotional responses. As you’ll see in Chapter 15, classical conditioning also produces most *phobias*, exaggerated and irrational fears of a specific object or situation (Rauhut, Thomas, & Ayres, 2001; Ressler & Davis, 2003). The good news is that extreme fear of cockroaches, hypodermic needles, spiders, closets, and even snakes can be effectively treated with *behavior modification* (Chapter 15).

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**Discovering Classical Conditioning in Your Own Life**

To appreciate the influences of classical conditioning on your own life, try this:

1. Look through a popular magazine and examine several advertisements. What images are used as the unconditioned stimulus (UCS) or conditioned stimulus (CS)? Note how you react to these images.

2. While watching a movie or a favorite TV show, identify what sounds and images are serving as conditioned stimuli (CS). (Hint: Certain types of music are used to set the stage for happy stories, sad events, and fearful situations.) What are your conditioned emotional responses (CERs)?

3. Read the words below and pay attention to your emotional response. Your reactions—positive, negative, or neutral—are a result of your own personal classical conditioning history. Can you trace back to the UCS for each of these stimuli?

   father  final exams  spinach  Santa Claus  beer  mother
Figure 6.10 How prejudice may be acquired through classical conditioning. As described in the chapter opener, James Byrd was viciously murdered because of his skin color. How did this prejudice develop? (a) Before children are conditioned to be prejudiced, they show no response to a member of a different group. (b) Given that children are naturally upset and fearful when they see their parents upset, they can learn to be upset and fearful (UCR) if they see their parents respond negatively (UCS) to a member of a disliked group (NS). (c) After several pairings of the person from this group with their parents’ negative reactions, the sight of the other person becomes a conditioned stimulus (CS). Being upset and fearful becomes the conditioned response (CR). (d) A previously unbiased child has now learned to be prejudiced.
Operant Conditioning—Prejudice, Biofeedback, and Superstition

Operant conditioning has numerous and important applications in everyday life. Here we talk about prejudice, biofeedback, and superstitious behavior.

Prejudice
Consider again the murder of James Byrd. What might have reinforced such behavior? Could it have been attention, notoriety, or something else? As you discovered earlier, people can learn prejudice through classical conditioning. We also can learn prejudice through operant conditioning. Demeaning others gains attention and sometimes approval from others, as well as increasing one’s self-esteem (at the victim’s expense) (Fein & Spencer, 1997; Hayes et al., 2002). People also may have a single punishing experience with a specific member of a group. They then generalize and apply it to all members of the group (Vidmar, 1997). Can you see how this is another example of stimulus generalization?

But the men who killed James Byrd were sentenced to death or life imprisonment. Why would people do something that they know could bring the death penalty? Punishment does weaken and suppress behavior. But, as mentioned earlier, to be effective it must be consistent and immediate. Unfortunately, this seldom happens. Even worse, when punishment is inconsistent and the criminal gets away with one or more crimes, that criminal behavior is put on a partial (intermittent) schedule of reinforcement. Thus making it more likely to be repeated and to become more resistant to extinction.

Biofeedback
Sit quietly for a moment and try to determine your blood pressure. Is it high or low? Is it different from what it was a few minutes ago? You can’t tell, can you? For most people, it is impossible to learn to control blood pressure consciously. But if you were hooked up to a monitor that recorded, amplified, and displayed this information to you by visual or auditory means, you could learn to control it (Figure 6.11). In this type of biofeedback (short for biological feedback and sometimes called neurofeedback), information about some biological function, such as heart rate, is conveyed to the individual through some type of signal.

Researchers have successfully used biofeedback to treat hypertension and anxiety by lowering blood pressure and muscle tension. It’s also used to treat epilepsy by changing brain-wave patterns; urinary incontinence by gaining better pelvic muscle control; and cognitive functioning, chronic pain, and headache by redirecting blood flow (Hammond, 2005; Moss, 2004; Penzien, Rains, & Andrasik, 2002; Stetter & Kupper, 2002; Tatrow, Blanchard, & Silverman, 2003).

Biofeedback involves several operant conditioning principles. Something is added (feedback) that increases the likelihood that the behavior will be repeated—positive reinforcement. The biofeedback itself is a secondary reinforcer.
because of the learned value of the relief from pain or other aversive stimuli (primary reinforcer). Finally, biofeedback involves shaping. The person watches a monitor screen (or other instrument) that provides graphs or numbers indicating his or her blood pressure (or other bodily states). Like a mirror, the biofeedback reflects back the results of the various strategies the participant uses to gain control. Through trial and error, the participant gets progressively better at lowering heart rate (or making other desired changes). Biofeedback techniques are limited, however. They are most successful when used in conjunction with other techniques, such as behavior modification (Chapter 15).

**Accidental Reinforcement and Superstitious Behavior**

B. F. Skinner (1948, 1992) conducted a fascinating experiment to show how accidental reinforcement could lead to superstitious behaviors. He set the feeding mechanism in the cages of eight pigeons to release food once every 15 seconds. No matter what the birds did, they were reinforced at 15-second intervals. Interestingly, six of the pigeons acquired behaviors that they repeated over and over, even though the behaviors were not necessary to receive the food. For example, one pigeon kept turning in counterclockwise circles and another kept making jerking movements with its head.

Why did the pigeons engage in such repetitive and unnecessary behavior? Recall that a reinforcer increases the probability that a response just performed will be repeated. Skinner was not using the food to reinforce any particular behavior. However, the pigeons associated the food with whatever behavior they were engaged in when the food was randomly dropped into the cage. Thus, if the bird was circling counterclockwise when the food was presented, it would repeat that motion to receive more food.

Like Skinner’s pigeons, we humans also believe in many superstitions that may have developed from accidental reinforcement. In addition to the superstitions shown in Table 6.7, professional and Olympic-level athletes sometimes carry lucky charms or

<table>
<thead>
<tr>
<th>Behavior</th>
<th>Superstition</th>
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<tbody>
<tr>
<td><strong>Wedding plans:</strong> <em>Why do brides wear something old and something borrowed?</em></td>
<td>The something old is usually clothing that belongs to an older woman who is happily married. Thus, the bride will supposedly transfer that good fortune to herself. Something borrowed is often a relative’s jewelry. This item should be golden, because gold represents the sun, which was once thought to be the source of life.</td>
</tr>
<tr>
<td><strong>Spilling salt:</strong> <em>Why do some people throw a pinch of salt over their left shoulder?</em></td>
<td>Years ago, people believed good spirits lived on the right side of the body and bad spirits on the left. When a man spilled salt, he believed his guardian spirit had caused the accident to warn him of evil nearby. At the time, salt was scarce and precious. Therefore, to bribe the spirits who were planning to harm him, he would quickly throw a pinch of salt over his left shoulder.</td>
</tr>
<tr>
<td><strong>Boasting, making a prediction, or speaking of good fortune:</strong> <em>Why do some people knock on wood?</em></td>
<td>Down through the ages, people have believed that trees were homes of gods, who were kind and generous if approached in the right way. A person who wanted to ask a favor of the tree god would touch the bark. After the favor was granted, the person would return to knock on the tree as a sign of thanks.</td>
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perform a particular ritual before every competition. Phil Esposito, a hockey player with the Boston Bruins and the New York Rangers for 18 years, always wore the same black turtleneck and drove through the same tollbooth on his way to a game. In the locker room, he put on all his clothes in the same order and laid out his equipment in exactly the same way he had for every other game. All this because once when he had behaved that way years before, he had been the team’s high scorer. Alas, the power of accidental reinforcement.

Figure 6.12 John William “Bill” King. King was sentenced to death for the murder of James Byrd. Note the tattoos on his arm. They include a Satanic image of the Virgin Mary holding a horned baby Jesus, Nazi and racist prison gang insignias, Ku Klux Klan symbols, and the figure of a lynched black man (Galloway, 1999).

Cognitive-Social Learning—We See, We Do?

We use cognitive-social learning in many ways in our everyday lives. Two of the most powerful examples are frequently overlooked—prejudice and media influences. As you can see in Figure 6.12, one of James Byrd’s murderers, Bill King, had numerous tattoos on his body that proudly proclaimed his various prejudices. Did King and his two accomplices learn some of their hatred and prejudice through observation and modeling? King’s family and friends insist that he was pleasant and quiet until he began serving an eight-year prison sentence for burglary (Galloway, 1999). What did he learn about prejudice during his prison sentence? Did he model his killing of Byrd after his uncle’s well-known killing of a gay traveling salesman a number of years earlier? Or did he learn his prejudices during his numerous years of active membership with the KKK?

Some forms of prejudice are developed and maintained through the media. Experimental and correlational research clearly show that when we watch television, go to movies, and read books and magazines that portray minorities, women, and other groups in demeaning and stereotypical roles, we often learn to expect these behaviors and to accept them as “natural.” Exposure of this kind initiates and reinforces the learning of prejudice (Blaine & McElroy, 2002; Neto & Furnham, 2005).

The media also can teach us what to eat, what toys to buy, what homes and clothes are most fashionable, and what constitutes “the good life.” When a TV commercial shows children enjoying a particular cereal and beaming at their Mom in gratitude (and Mom is smiling back), both children and parents in the audience are participating in a form of observational learning. They learn that they, too, will be rewarded for buying the advertised brand (with happy children) or punished (with unhappy children who won’t eat) for buying a competitor’s product.

Unfortunately, observational learning also encourages destructive behaviors. Correlational evidence from more than 50 studies indicates that observing violent behavior is related to later desensitization and increased aggression (Anderson, 2004; Coyne, 2004; Kronenberger et al., 2005). As a critical thinker, you may be automatically noting that correlation is not causation. However, over 100 experimental studies have shown a causal link between observing violence and later performing it (Primavera & Herron, 1996).

What about video games? How do they affect behavior? Researchers are just beginning to study these questions. For example, studies have found that students who played more violent video games in junior high and high school engage in more aggressive behaviors (Anderson & Bushman, 2001; Bartholow & Anderson, 2002; Carnagey & Anderson, 2004). Craig Anderson and Karen Dill (2000) also experimentally assigned 210 students to first play either a violent or a nonviolent video game and later allowed them to punish their opponent with a loud sound blast. Those who played the violent game punished the opponent not only for a longer period of time but also with greater intensity. The researchers hypothesize that video games are more likely to model aggressive behavior because, unlike TV and other media, they

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www.wiley.com/college/huffman
are interactive, engaging, and require the player to identify with the aggressor. Virtual reality games are of particular concern (Unsworth & Ward, 2001).

A Final Note
I began this chapter with the story of James Byrd because prejudice is a worthy (but unusual) topic for a learning chapter. And his story deserved retelling. The death of James Byrd shocked many Americans into facing the terrible hatred and racism that still exist in our country. Sadly, his death (like others) is too quickly forgotten. The good news is that little (if anything) about prejudice is biologically driven. It is learned.

Using the biopsychosocial model, you can see that the psychological component of prejudice (thoughts, values, and beliefs) and sociocultural forces (modeling, TV, and other media) are the result of experience and exposure (learning). Fortunately, what we learn can be unlearned through retraining, counseling, and self-reflection.

CHECK & REVIEW

Using Conditioning and Learning Principles

Classical conditioning has many applications in everyday life. It explains how people market their products, how we sometimes learn negative attitudes toward groups of people (prejudice), and how we sometimes have problems with certain medical treatments and phobias.

Operant conditioning has similar applications. It helps explain how we learn prejudice through positive reinforcement and stimulus generalization.

Biofeedback, another application, is the feeding back of biological information, such as heart rate or blood pressure, which a person uses to control normally automatic functions of the body. Operant conditioning also helps explain many superstitions, which involve accidentally reinforced behaviors that are continually repeated because they are believed to cause desired effects.

Cognitive-social theory helps to further explain prejudice and media influences. People often learn their prejudices by imitating what they’ve seen modeled by friends, family, and the media. The media affect our purchasing behaviors as well as our aggressive tendencies. Video games may have a particularly strong influence.

Questions
1. Politicians often depict their opponent as immoral and irresponsible because they know it helps create a ___ toward their rival. (a) classically conditioned phobia; (b) negative social-learning cue; (c) conditioned aversive response; (d) negative conditioned emotional response

2. Biofeedback reinforces desired physiological changes that have beneficial results. This makes it a(n) ___. (a) operant conditioner; (b) primary reinforcer; (c) secondary reinforcer; (d) biological marker

3. You insist on wearing a red sweater each time you take an exam because you believe it helps you get higher scores. This is an example of ___. (a) classical conditioning; (b) secondary reinforcement; (c) superstition; (d) redophilia reinforcement

4. Explain why video games may increase aggressive tendencies.

Check your answers in Appendix B.

Click & Review
for additional assessment options:
www.wiley.com/college/huffman
To assess your understanding of the Key Terms in Chapter 6, write a definition for each (in your own words), and then compare your definitions with those in the text.

conditioning (p. 209)
learning (p. 208)

Classical Conditioning
classical conditioning (p. 210)
conditioned emotional response (CER) (p. 212)
conditioned response (CR) (p. 210)
conditioned stimulus (CS) (p. 210)
extinction (p. 214)
higher-order conditioning (p. 214)
negative punishment (p. 220)
negative reinforcement (p. 218)
operant conditioning (p. 216)
partial (intermittent) reinforcement (p. 219)
positive punishment (p. 220)
positive reinforcement (p. 218)
premack principle (p. 219)
primary reinforcers (p. 218)
punishment (p. 216)
reinforcement (p. 216)
secondary reinforcers (p. 218)
shaping (p. 220)

Operant Conditioning
continuous reinforcement (p. 219)
discriminative stimulus (p. 226)
fixed interval (FI) schedule (p. 220)
fixed ratio (FR) schedule (p. 220)
law of effect (p. 216)
negative reinforcement (p. 218)
one negative (p. 220)
operant conditioning (p. 216)
positive punishment (p. 220)
positive reinforcement (p. 218)
primary reinforcers (p. 218)
punishment (p. 216)
reinforcement (p. 216)
variable interval (VI) schedule (p. 220)
variable ratio (VR) schedule (p. 220)

Cognitive-Social Learning
cognitive map (p. 229)
cognitive-social theory (p. 228)
insight (p. 228)
latent learning (p. 229)
observational learning (p. 229)

The Biology of Learning
biological preparedness (p. 234)
instinctive drift (p. 235)
taste aversion (p. 234)

Using Conditioning and Learning Principles
biofeedback (p. 239)

Huffman Book Companion Site
http://www.wiley.com/college/huffman
This site is loaded with free Interactive Self-Tests, Internet Exercises, Glossary and Flashcards for key terms, web links, Handbook for Non-Native Speakers, and other activities designed to improve your mastery of the material in this chapter.

Want to learn more about classical conditioning?
http://www.brembs.net/classical/classical.html
Introduces principles of classical conditioning and links to additional sites with important applications of learning techniques.

Interested in Ivan Pavlov?
A Nobel Prize Internet Archive providing extensive links and background information on the life and accomplishments of Ivan Petrovich Pavlov.

Want more information about operant conditioning?
http://chiron.valdosta.edu/whuitt/col/behsys/_operant.html
Provides an overview of operant conditioning, including a brief history, general principles, schedules of reinforcement, examples, and applications.

Interested in biofeedback?
http://www.questia.com/Index.jsp?CRID=behavior_modification&OFFID=se1
In addition to background information and related links on the use of biofeedback, offers information and links to other complementary therapies.

Animal training at Sea World
http://www.seaworld.org/infobooks/training/home.html
Gives a fascinating look at how operant conditioning, including positive reinforcers, and observational learning are used to train marine animals.

Want more information on cognitive-social learning or observational learning?
Provides an overview of the field, including a brief summary of Bandura's work, research findings, and some general principles.

Interested in the use of taste aversion and wildlife management?
http://www.conditionedtasteaversion.net/
Provides a wealth of fascinating information and links related to the use of conditioned taste aversion (CTA) in wildlife.

AU: This link doesn't work.
CHAPTER 6

Visual Summary

Classical Conditioning

Pavlov and Watson’s Contributions

Process: Involuntary

1) Before conditioning, originally neutral stimulus (NS) causes no relevant response, whereas unconditioned stimulus (UCS) causes unconditioned response (UCR).
2) During conditioning, NS is paired with UCS that elicits the UCR.
3) After conditioning, previous NS becomes conditioned stimulus (CS), which now causes a conditioned response (CR) or conditioned emotional response (CER).

Principles of Classical Conditioning

- **Stimulus generalization**: Stimuli similar to original CS elicit CR.
- **Stimulus discrimination**: Only the CS elicits the CR.
- **Extinction**: Gradual suppression of a learned behavior by repeatedly presenting the CS without the UCS.
- **Spontaneous recovery**: Sudden reappearance of a previously extinguished CR.
- **Higher order conditioning**: The NS is paired with the CS to which the organism has already been conditioned.

Operant Conditioning

Thorndike and Skinner’s Contributions

Process: Voluntary

Organisms learn through consequences of their behavior. When responses are reinforced, they are strengthened and likely to increase; when punished, they are weakened and likely to decrease.

Principles of Operant Conditioning

*Strengthening a response occurs through:*

1) Primary and secondary reinforcers: **Primary reinforcers**, like food, satisfy a biological need. The value of **secondary reinforcers**, such as money, is learned.
2) Positive and negative reinforcement: **Positive reinforcement** adds something that increases the likelihood of the response. **Negative reinforcement** takes away something that increases the likelihood of the response.

*Additional concepts:*

In a **continuous schedule of reinforcement**, every correct response is reinforced. In a **partial** (or **intermittent**) schedule only some responses are reinforced. Partial schedules include **fixed ratio (FR)**, **variable ratio (VR)**, **fixed interval (FI)**, and **variable interval (VI)**.

**Shaping** involves reinforcement for successive approximations of the desired response.

*Weakening a response occurs through:*

1) **Positive punishment** — adds something that decreases the likelihood of the response.
2) **Negative punishment** — takes away something that decreases the likelihood of the response.
Learning and conditioning produce relatively permanent changes in neural connections and various parts of the brain. Evolutionary theorists believe some behavior is unlearned (e.g., reflexes or instincts), and that learning and conditioning are further adaptations that enable organisms to survive and prosper in a constantly changing world.

Insight and Latent Learning

- Köhler: Learning can occur with a sudden flash of understanding (insight).
- Tolman: Learning can happen without reinforcement and remain hidden until needed (latent learning). After navigating their environments, people and nonhuman animals create cognitive maps.

Observational Learning

- Bandura: Learning occurs after watching and imitating others.

Using Conditioning Principles

Applying Classical Conditioning to Everyday Life

- Marketing: Products (NS) are repeatedly paired with pleasant images (UCS) until they become a (CS).
- Prejudice: Negative perceptions of others acquired through classical conditioning processes.
- Medical treatments: Using nausea producing drugs, alcoholics learn to pair alcohol (CS) with nausea (CR).
- Phobias: Irrational fears developed through association of a feared object with the UCS.

Applying Operant Conditioning to Everyday Life

- Prejudice: Negative perceptions of others acquired through operant conditioning.
- Biofeedback: “Feeding back” biological information (heart rate or blood pressure) for control of normally automatic body functions.
- Superstitious behavior: Develops from accidental rewarding of specific behaviors.

Applying Cognitive-Social Learning to Everyday Life

- Prejudice: Learned by imitating and modeling prejudiced behavior of others.
- Media influences: Consumerism, aggression, and other behaviors are partially learned from media models.