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Chapter Seven

Learning

Chapter Outline

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Psychological Applications: *Learning How to Exercise Self-Control in Your Academic and Personal Life*

Dear Frederic,

Your very interesting letter has been read and discussed by mother and me. We naturally are deeply interested in your future… . In no circumstances would we want to say or do anything to discourage you in following out your ambition. …

On the other hand, we want to give you the benefit of our observations and experience. You will find that the world is not standing with outstretched arms to greet you just because you are emerging from a college—that the real rough and tumble world is not the world pictured by college professors who are constantly dealing with the theoretical and not the practical affairs of life. I am yet to be convinced that it is possible for you to make a living as a writer of fiction.

… Let's go slow and sure. … Let us arrange some plan whereby you can support yourself, get married when the fever strikes you, have a good home life, and when these things are provided for then go to it and if your talents enable you to do something big and startle the world no one of course will rejoice more than your mother and I who have our whole life centered in you and your success.

With love,
Father

What do you want to do when you graduate? Fred wanted to be a famous writer. Following this letter from his father, Fred spent a year after college working on his writing skills. He even submitted samples of his writing to the poet Robert Frost, asking whether he should persevere in his chosen profession. Frost replied that the young man had twice as much talent as anyone else he had read that year, but that only Fred himself could know whether his future lay in writing. At the end of this yearlong odyssey, which he later called his "dark year," Fred was frustrated with writing and began casting about in search of an alternative career path. But what path should he choose?

The year was 1927. In his searching, Fred read psychologist John Watson's (1924) recently published book, *Behaviorism.* Watson presented a perspective on learning and the future of the young science of psychology that was novel for the time, in that he focused not on people's internal states and unconscious drives but on the outward behavior that people exhibit. Fred had always been interested in observing the behavior of people, a useful talent for a writer; this approach to the human condition appealed to him. He applied and was accepted to Harvard University for graduate studies in psychology, where his own personal journey of discovery quickly became wedded to psychology's scientific discovery journey.

Although Fred never "startled the world" with his fiction writing, his subsequent extensions and refinements of Watson's behaviorism rocked the field of psychology and made Fred one of the best-known psychologists of all time. Outside his circle of family and friends, people knew and referred to Fred by his formal name: Burrhus Frederick ("B. F.") Skinner. Throughout his career, Skinner looked for ways in which his operant conditioning principles of learning (discussed in Section 7.2) could be used to improve daily life (Vargas, 2003).

B. F. Skinner, 1904–1990

In this segment of our journey of discovery, we will focus our attention on the psychology of **learning**, which psychologists define as a relatively permanent change in behavior that results from experience. Learning can occur in a variety of ways (Klein, 2012). For instance, in Chapter 4 (Section 4.2a) we discussed *imprinting*, which is a rapid and innate learning of specific attachment behaviors observed in many species of birds and mammals. Imprinting studies demonstrate that some types of learning have a *sensitivity period*, meaning that there is a particular time period in an animal's life when a particular type of learning occurs very readily if the animal is exposed to a particular stimulus or situation. The animal's brain is genetically primed during this sensitive period to learn a specific set of behavior patterns. Once the animal matures past this sensitivity period, it becomes much more difficult, if not impossible, to learn these same behavioral skills. While imprinting is an important form of learning in many birds and mammals, it plays no identifiable role in human learning. As such, in this chapter we will examine three basic forms of learning that do play an important role in people's everyday lives: *classical conditioning*, *operant conditioning*, and *observational learning*. Classical conditioning is a type of learning in which one stimulus comes to serve as a signal for the occurrence of a second stimulus. Operant conditioning, the name for the type of conditioning Skinner investigated, is a form of learning in which we discover the consequences of behavior. Finally, observational learning deals with how we learn by observing the behaviors—and the behavioral consequences—of those around us.

Learning A relatively permanent change in behavior that results from experience

Learning is a treasure that will follow its owner everywhere.

—Chinese proverb

7.1 Classical Conditioning

PREVIEW

- *How do you anticipate events through classical conditioning?*
- *How does a neutral stimulus become a conditioned stimulus?*
- *Are conditioned responses immediately learned?*
- What is higher-order conditioning?
- What are "stimulus generalization" and "stimulus discrimination"?
- *Can some responses be conditioned more easily than others?*

In science, as in other areas of life, researchers sometimes need time to realize that they have discovered a new scientific principle. Would you believe that one discovery that profoundly shaped the course of psychology was initially only viewed as an annoyance?

7.1a Pavlov Stumbled upon Classical Conditioning.

In 1904, the Russian physiologist Ivan Pavlov (1849–1936) won the Nobel Prize for his research on digestion in dogs (Pavlov, 1897/1997). In conducting his studies, Pavlov placed meat powder on a dog's tongue to elicit reflexive salivation. One thing he noticed was that, over time, dogs began salivating before any food reached their mouths and even before they smelled the food. For example, they might salivate simply by seeing the food dish or by merely hearing the feeder's approaching footsteps. At first, Pavlov considered this phenomenon, which he called "conditional responses," an irritating development in his research because he could no longer control the beginning of the dog's salivation. However, this annoyance turned into excitement when he realized that he had stumbled upon a simple but important form of learning, which came to be known as classical conditioning.


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Ivan Pavlov, 1849–1936

Classical conditioning is a type of learning in which a neutral stimulus acquires the capacity to elicit a response after being paired with another stimulus that naturally elicits that response. In his experiments investigating classical conditioning, Pavlov placed a hungry dog in an apparatus similar to the one depicted in Figure 7-1. Just before injecting meat powder into the dog's mouth, Pavlov presented an initially neutral stimulus to the dog, such as the ticking of a metronome. At first, this ticking produced no response in the dog. However, the food powder presented right after the ticking sound naturally triggered the dog's salivary reflex. Because this act of salivating was unlearned, Pavlov called it an **unconditioned response (UCR)**, and he called the food that elicited this automatic response an **unconditioned stimulus (UCS)**.

Although the neutral stimulus initially had no effect on the dog, after several pairings of metronome and food, the dog began to salivate in response to the ticking alone. The dog had learned to associate the ticking with the presentation of the food powder (see Figure 7-2). This learned response was called the **conditioned response (CR)**, and the previously neutral stimulus that now triggered the CR was called the **conditioned stimulus (CS)**. One way to remember the difference between stimuli and responses that are either unconditioned or conditioned is to think of these two terms in the following manner: *un*conditioned = *un*learned; conditioned = learned. Before moving on to Section 7.1b, complete Explore It Exercise 7.1, which provides you an opportunity to experience classical conditioning yourself.

Classical conditioning A type of learning in which a neutral stimulus acquires the capacity to elicit a response after being paired with another stimulus that naturally elicits that response

Unconditioned response (UCR) In classical conditioning, the unlearned, automatic response to an unconditioned stimulus

Unconditioned stimulus (UCS) In classical conditioning, a stimulus that naturally and automatically elicits an unconditioned response

Conditioned response (CR) In classical conditioning, the learned response to a previously neutral conditioned stimulus

Conditioned stimulus (CS) In classical conditioning, a previously neutral stimulus that, after repeated pairings with an unconditioned stimulus, comes to elicit a conditioned response

FIGURE 7-1

Pavlov's Apparatus for Studying Classical Conditioning in Dogs

Pavlov used a device similar to this in his experiments in classical conditioning. He restrained the dog in a harness and attached a tube to its salivary gland in order to accurately measure its salivation response. A ticking metronome often served as the conditioned stimulus (CS), and the meat powder was the unconditioned stimulus (UCS). In classical conditioning terms, what type of response did the salivation represent when it occurred due to the presentation of the meat powder? What type of response did the saliva represent when the metronome triggered it?

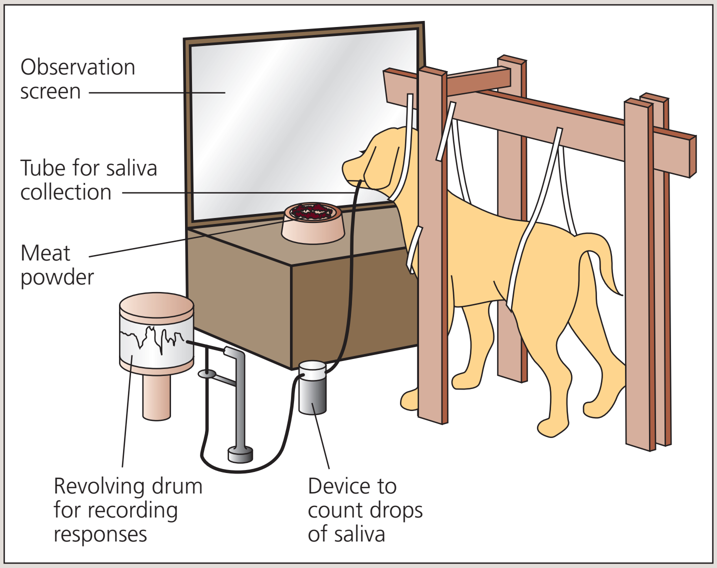
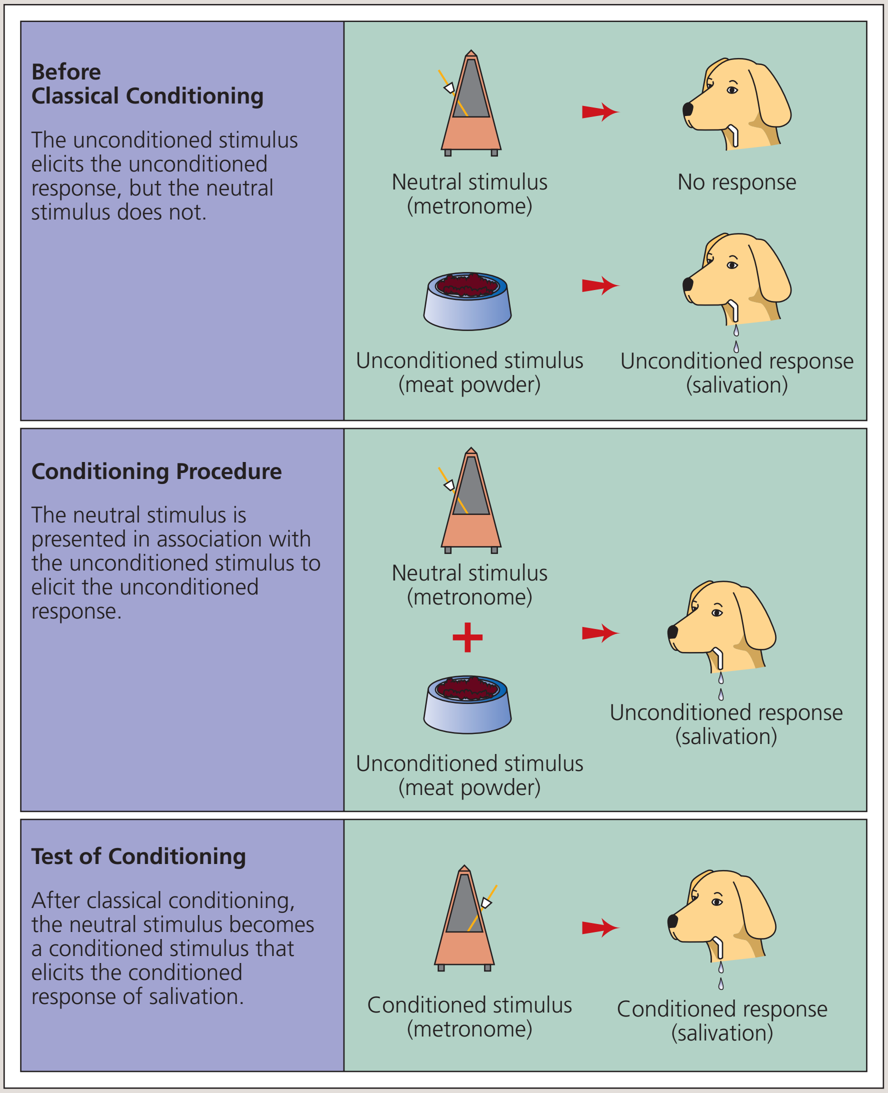


FIGURE 7-2

Classical Conditioning

Before classical conditioning, the neutral stimulus of the ticking metronome presented just before the unconditioned stimulus of the meat powder does not trigger salivation. Instead, the unconditioned response of salivation occurs only when the unconditioned stimulus is presented. However, during conditioning, through repeated pairings of the neutral stimulus and the unconditioned stimulus, the neutral stimulus becomes a conditioned stimulus. Now this conditioned stimulus produces a conditioned response.



Explore It EXERCISE 7.1

Can You Classically Condition Your Own Pupil Dilation and Eye Blinking?

Figzoi

To experience classical conditioning, try this exercise. First, look in a mirror under bright light conditions and notice the size of your pupils. Now, turn out the light for 30 seconds and then flick it back on while gazing into a mirror. Notice how much larger your pupils have become in response to the lack of light. This pupillary response to light is an example of an unconditioned response. Now do the same demonstration, but just before turning out the light, ring a bell. Repeat the pairing of the neutral stimulus (the bell) with the unconditioned stimulus (the darkness) at least 20 times. Then, with the lights on, ring the bell while watching your eyes closely in the mirror. You should see your eyes dilate slightly, even though the unconditioned stimulus is not present. The previously neutral bell sound has become the conditioned stimulus, and your resulting pupil dilation is the conditioned response. Now you can truly say that classical conditioning does indeed ring a bell!

You can also classically condition your own eye blinking. As you may already know, a puff of air directed at your eye is an unconditioned stimulus that causes the reflexive unconditioned response of eye blinking. If you flash a light just before each puff of air, the light will soon become a conditioned stimulus that will cause eye blinking on its own (Lavond & Steinmetz, 2003). Following hundreds of studies investigating human and mice classical eye-blink conditioning, scientists have discovered that the hippocampus in the brain is involved in the development of this conditioned response (Green & Woodruff-Pak, 2000; Orsini et al., 2011). They have also discovered that this same brain structure is damaged in the early stages of Alzheimer's disease and in the brain disorder known as autism. This knowledge is now being used to help diagnose autism and to identify individuals who might be at high risk for Alzheimer's disease. Early diagnosis of such serious medical disorders allows for more effective treatment that, in the case of Alzheimer's disease, can delay onset of the disease.

Classical conditioning may not be what you think of as learning. For instance, you are not using classical conditioning principles to understand the important points in this chapter. The type of learning that goes on in classical conditioning is often considered unintentional and automatic—that is, you do not usually set out to learn an association, and you do not usually consciously elicit the conditioned response. Neither your pleasure (CR) upon seeing a good friend (CS) nor your anxiety (CR) upon hearing a dentist's drill (CS) is an intentionally learned response. They develop with no apparent effort on your part because both your friend's image and the drill noise have become associated with other stimuli that naturally evoke pleasure or pain. Similar effortless learning permeates our lives and profoundly affects our everyday behavior, but we often do not notice it because it is so automatic. Yet, is that all there is to classical conditioning?

7.1b Classical Conditioning Helps Animals Learn to Predict Events

Although Pavlov asserted that classical conditioning was an essentially "mindless" process, most contemporary learning theorists believe it often involves quite a bit of "mindfulness," because through the conditioning process, humans and other animals are learning to reliably predict upcoming events (Timberlake, 2004). First proposed by Robert Rescorla and Allan Wagner (1972), this general rule of classical conditioning states that a previously neutral stimulus will lead to a conditioned response whenever it provides the organism with *information* about the upcoming unconditioned stimulus. In other words, classical conditioning is a process by which organisms learn to expect the unconditioned stimulus based on the presentation of the conditioned stimulus. For example, in the original Pavlovian conditioning studies, if a metronome always ticked (CS) just before the presentation of food (UCS), the dog later began salivating (CR) whenever the metronome ticked (CS). Conditioning occurred because the ticking provided the dog with the information that food would soon be delivered. The conditioned stimulus became a *signal* that the unconditioned stimulus would soon appear. Similarly, whenever our dog Maizy hears the rustling of her food bag in our utility room, she becomes excited because she has learned that this sound predicts the appearance of food in her bowl.

This idea that classical conditioning involves a learning process by which humans and other animals acquire conditioned responses when one event reliably predicts, or signals, the appearance of another event greatly expands upon Pavlov's initial understanding of this type of learning. Instead of simply explaining basic, reflexlike responses, this revised conception of classical conditioning assumes that it often involves predicting the likely occurrence or nonoccurrence of future events (Asli & Flaten, 2012; Domjan, 2005).

Acquisition

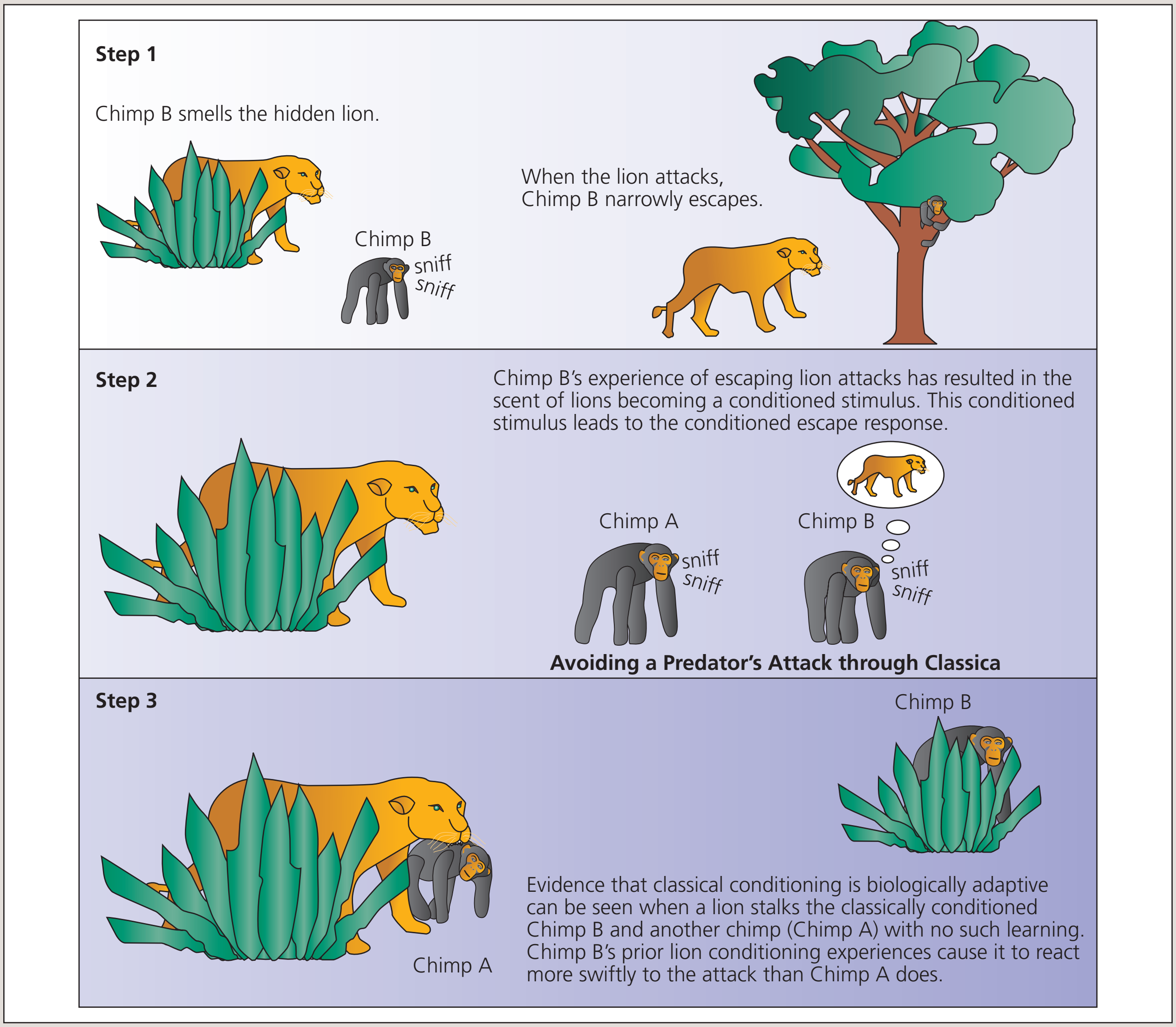
Acquisition The initial stage of classical conditioning, during which a previously neutral stimulus begins to acquire the ability to elicit a conditioned response

The learned ability to predict what events might follow other events certainly helps an individual survive in its environment. Yet how quickly and in what manner does the **acquisition**, or initial learning, of a conditioned response occur? Pavlov discovered that conditioned responses seldom occur at full strength right away (a phenomenon known as *one-trial learning*), but rather gradually build up over a series of trials. Based on this finding, psychologists initially believed that the key to acquiring a conditioned response was the sheer *number* of CS-UCS pairings. However, subsequent research in other laboratories indicated that the *order* and *timing* of the CS-UCS pairings are also very important because they provide the animal with valuable information about the upcoming occurrence of the unconditioned stimulus (Buhusi & Schmajuk, 1999; Wasserman & Miller, 1997).

Regarding order of presentation, learning seldom occurs when the CS comes after the UCS (*backward conditioning*) or at the same time as the UCS (*simultaneous conditioning*). Instead, conditioning generally occurs only when the CS comes before the UCS (*forward conditioning*). This finding is consistent with the hypothesis that classical conditioning is biologically adaptive because it prepares the organism for good or bad events in the immediate future. As mentioned, the CS becomes a signal that a UCS is about to be presented. Prior to conditioning, the organism's response is dictated by the UCS appearing. However, after conditioning, the organism responds more quickly because it is now reacting to the earlier-occurring CS, not to the later-occurring UCS. These quicker conditioned responses often spell the difference between life and death. For example, as depicted in Figure 7-3, classical conditioning

FIGURE 7-3 Avoiding a Predator's Attack Through Classical Conditioning

As a learning technique, classical conditioning is biologically adaptive because it prepares the animal for good or bad events in the immediate future. Such prior conditioning helps animals respond more quickly to events. For example, when reacting to a lion attack, chimp B's prior experiences with lions provided it with a quicker response than that of chimp A.



can help an animal react swiftly to a predator's impending attack. Animals having prior experience with predators are more likely to quickly respond when stimuli associated with the predator (its sight, sound, or smell, for instance) are presented. Through experience, the animals that have been conditioned to respond to stimuli preceding the UCS are most likely to survive. Can you think of instances in your own life when conditioned responses may foster your survival?

Besides presentation order, in most cases the UCS must follow the CS closely in time. In animal research, the most efficient CS-UCS interval is between 0.2 and 2 seconds. If the interval is longer, the CR is more difficult to establish because animals have difficulty recognizing it as a signal for the appearance of the UCS.

In addition to the presentation order and timing of the CS-UCS pairings, the *accuracy* with which the CS can predict the appearance of the UCS also determines whether a conditioned response is formed. If the UCS reliably follows the CS but also occurs when the CS is not present, a conditioned response is unlikely to develop. For example, in one experiment (Rescorla, 1968), rats were presented with a tone (CS), followed by a mild electric shock (UCS) that caused them to jump (UCR). In one condition, the shock was given only after the tone. Very quickly, these rats began displaying a fear response—freezing (CR)—after hearing the tone. In another condition, however, the shock was given both after the tone and during times when the tone had not been presented. These rats displayed little, if any, freezing in anticipation of the coming shock. Why do you think this group of rats did not become conditioned to the tone? No conditioning occurred because their ability to prepare for the UCS could not be accurately predicted by the sound of the tone. In other words, the tone was a poor signal of the coming shock, and thus the rats did not use it to predict the appearance of the shock. These findings are consistent with the previously stated rule that a stimulus will become "conditioned" whenever it signals to the organism that an unconditioned stimulus is about to occur.

Once a particular stimulus is recognized as a poor signal for an upcoming event, an animal can have difficulty learning a new association between the two stimuli. In a study similar to the one just discussed, researchers first presented tones and shocks to rats in a random order, so that the tone did not serve as a signal of an upcoming shock (Nakajima et al., 2000). Then the researchers changed the order of presentation so that a shock always followed the tone. Because the tone was now a signal, wouldn't you expect the rats to learn the association and freeze when they heard the tone? Interestingly, they did not. Having once learned that the tone provided no information, the animals had difficulty later detecting a real association, a phenomenon called *general learned irrelevance*.

Overall, research on the acquisition of conditioned responses tells us that organisms are not passive in this process. They actively seek information in their environment to establish when certain events (CS) predict the occurrence of other events (UCS).

Extinction and Spontaneous Recovery

The general rule of classical conditioning states that a CS develops whenever it provides the organism with information about the impending occurrence of the UCS. If this is true, what do you think happens when the CS no longer provides accurate information about the appearance of the UCS? In other words, what happens when the CS occurs repeatedly without the UCS? The answer is **extinction**, which is the gradual weakening and disappearance of the conditioned response (Kalmbach & Mauk, 2012). In Pavlov's experiments, when the ticking metronome (CS) was repeatedly presented to the dog without the delivery of food (UCS), the metronome gradually lost its ability to elicit salivation (CR). In cognitive terms, the dog learned that the CS was no longer useful in predicting the UCS (Lovibond, 2004).

Extinction In classical conditioning, the gradual weakening and disappearance of the conditioned response when the conditioned stimulus is repeatedly presented without being paired with the unconditioned stimulus

Can we use the principle of extinction in treating specific social problems? Consider the abuse of cocaine, a stimulant drug (UCS) that naturally induces a sense of euphoria (UCR) in users (see Chapter 6, Section 6.3g). Research indicates that one of the problems recovering drug users must overcome is the familiar reminders associated with their addiction. Anything that has been repeatedly associated with their past drug use—such as certain locations, smells, or objects—becomes a conditioned stimulus that can elicit a craving for the drug (Bonson et al., 2002; Miguens et al., 2008). Because drug addicts use money to obtain cocaine, in one treatment program researchers attempted to weaken the conditioned link between money and cocaine-induced euphoria by asking addicts to engage in one of two activities under the guise of a "budgetary task" (Hamilton et al., 1997). One group of addicts was given $500 in cash to hold in their hands as they explained how they would spend it, while the other group was asked to merely imagine that they had the money. Those addicts who held the actual cash initially reported a stronger craving for cocaine after handling the money than did the group who imagined the money. However, repeated exposure to the cash without it being associated with cocaine use gradually reduced drug craving, as would be expected due to extinction. These results suggest that applying the principle of extinction in drug treatment programs can enhance their effectiveness.

Although you undoubtedly remember instances when conditioned responses have become extinct in your own life, have you also noticed that occasionally a response that you thought was extinguished long ago reappears spontaneously when you happen to encounter the conditioned stimulus? This phenomenon, known as **spontaneous recovery**, is the reappearance of an extinguished response after a period of nonexposure to the conditioned stimulus (Thanellou & Green, 2011). For example, former soldiers who long ago overcame the panic attacks they experienced during combat may reexperience acute anxiety while viewing a movie containing graphic war scenes. The practical importance of spontaneous recovery is that, even if you succeed in ridding yourself of a conditioned response, it may surprise you by reappearing later (Schmajuk & Larrauri, 2006).

Spontaneous recovery The reappearance of an extinguished response after a period of nonexposure to the conditioned stimulus

7.1c Following Acquisition, Other Stimuli Can Produce the Conditioned Response.

One observation Pavlov made while conditioning his dogs to salivate was that salivation triggered by the conditioned stimulus often generalized to other, similar stimuli. Pavlov called this phenomenon **stimulus generalization**. Such generalization often fosters an organism's survival, as when a bird that becomes sick after eating a poisonous monarch butterfly avoids eating other orange and black insects. This reaction makes good adaptive sense. Things that look, taste, feel, or sound the same often share other important characteristics. The more similar the new stimuli are to the original conditioned stimulus, the greater the likelihood of generalization. Stimulus generalization may explain why you sometimes respond very warmly or coldly to strangers who look like people for whom you previously developed either positive or negative conditioned responses. In such instances, you may not realize that your emotional response is caused by the power of stimulus generalization, but it nonetheless has an impact on your social life.

Stimulus generalization In classical conditioning, the tendency for a conditioned response to be elicited by stimuli similar to the conditioned stimulus

While performing their conditioning studies, Pavlov and his coworkers also noticed that the dogs sometimes did not exhibit a conditioned response when presented with stimuli that were somewhat similar to the conditioned stimulus. When an animal gives a conditioned response to the conditioned stimulus but not to stimuli that are

Stimulus discrimination In classical conditioning, the tendency for a conditioned response not to be elicited by stimuli similar to the conditioned stimulus

similar to it, the opposite of stimulus generalization occurring—namely, **stimulus discrimination**. Like generalization, discrimination has survival value because slightly different stimuli can have very different consequences (Ryan et al., 2011).

The Famous "Little Albert B."

In 1920, John Watson, the founder of behaviorism (see Chapter 1, Section 1.2d), and his colleague, Rosalie Rayner, conducted the best-known study of stimulus generalization. Their subject was an eight-month-old orphan boy whom they identified as "Little Albert B." During initial testing, Watson and Rayner presented Albert with a white rat, a rabbit, a monkey, a dog, masks with and without hair, and some white cotton wool. The boy reacted with interest but no fear. Two months later, while Albert sat on a mattress placed on a table, the researchers presented him with the white rat. Just as Albert touched the rat, however, Watson made a loud noise behind Albert by striking a 4-foot steel bar with a hammer. This noise (the UCS) startled and frightened (the UCR) the toddler. During two sessions, spaced one week apart, this procedure was repeated a total of seven times. Each time, the pairing of the rat and the noise resulted in a fear response.

Next, the rat alone was presented to Albert, without the noise. As I'm sure you've guessed, he reacted to the rat (the CS) with extreme fear (the CR). He cried, turned away, rolled over on one side away from the rat, and began crawling away so fast that he almost went over the edge of the table before the researchers caught hold of him! Five days later, Albert showed stimulus generalization to a white rabbit:

> Negative responses began at once. He leaned as far away from the animal as possible, whimpered, then burst into tears. When the rabbit was placed in contact with him, he buried his face in the mattress, then got up on all fours and crawled away, crying as he went. (Watson & Rayner, 1920, p. 6)

Besides to the rabbit, Albert's fear response generalized to a dog, a white fur coat, Watson's own head of gray hair, and even a Santa Claus mask! These fear responses also occurred outside the room in which the conditioned response had initially been learned. Two months later, just prior to being adopted, Albert was tested one last time and again expressed considerable fear toward the same objects.

For the most part, our natural tendency is to generalize, and we need experience to teach us to discriminate. This greater tendency to generalize explains why Albert reacted to the other furry objects in the same way he had been conditioned to react to the white rat. If he had somehow been encouraged to directly experience the fact that the unconditioned stimulus did not follow the presentation of these other objects, he would have developed stimulus discrimination.

In addition to demonstrating how a fear response can generalize to other objects, an equally important reason this study is still widely discussed today is the serious ethical issues it raises. Essentially, Watson and Rayner induced a phobia in Albert (see Section 7.1d), a practice that would not be tolerated by current ethical standards of psychological research. Further, the researchers made no attempt to recondition their young subject, despite knowing a month in advance that Albert's adoptive mother would be leaving the area with him. Later attempts to locate Albert to determine the long-lasting effects of his experience failed (Harris, 2002); and as far as anyone knows, no reconditioning ever took place.

Photo courtesy of Dr. Ben Harris

John Watson and Rosalie Rayner classically conditioned Little Albert B. to fear white rats. Due to stimulus generalization, he also became fearful of other furry-looking objects. How does this research provide insight into the development of phobias? What are the ethical concerns raised by this study?

Journey of Discovery

Every year, thousands of drug users die from overdoses. Those who have narrowly survived such overdoses tend to report that the setting in which they took too much of the drug was different from their normal drug-taking environment (Siegel, 1984). How might classical conditioning principles explain why these different settings were more likely to be associated with drug overdoses?

Higher-Order Conditioning

Beyond discovering the principles of stimulus generalization and stimulus discrimination, Pavlov (1927) also learned that a conditioned stimulus can condition another neutral stimulus. This procedure is known as **higher-order conditioning** (or second-order conditioning), and it greatly increases the number of situations in which classical conditioning explains behavior. For example, do you know people who become so anxious upon entering a classroom to take an exam that their ability to concentrate is affected? Such anxiety is often due to higher-order conditioning (Mineka & Oehlberg, 2008). Early in their schooling, academic performance may have been a neutral event for these people. However, somehow it became associated with criticism (the UCS) from parents or teachers, which elicited anxiety (the UCR). Through conditioning, then, academic performance (the CS) acquired the ability to trigger a stress response (the CR). As these people continued taking exams, this conditioned stimulus began functioning like a UCS through higher-order conditioning. That is, the kinds of neutral stimuli that immediately precede test-taking—such as walking into a testing room or hearing test booklets being passed out—became conditioned stimuli that also elicited test anxiety. The "Psychological Applications" section in Chapter 11 discusses how to break this unpleasant kind of higher-order conditioning.

Higher-order conditioning A classical conditioning procedure in which a neutral stimulus becomes a conditional stimulus after being paired with an existing conditioned stimulus

Fortunately, higher-order conditioning is equally effective at eliciting pleasant responses as it is at eliciting negative ones. For example, your cologne may spark romantic feelings in those who associate that fragrance with past loves. Likewise, complete strangers may respond warmly upon discovering that you are from their hometown. In both instances, a previously neutral stimulus (you) becomes a conditioned stimulus after being paired with an existing conditioned stimulus (cologne and hometown). As you can see, higher-order conditioning has a role in shaping a variety of advantageous—and disadvantageous—responses (Till et al., 2008). With this knowledge, are you developing a greater appreciation—perhaps even affection—for classical conditioning principles?

7.1d Animals Differ in What Responses Can Be Classically Conditioned.

Pavlov and other early learning theorists assumed that the principles of conditioning were similar across all species, and thus, that psychologists could just as easily study rats and pigeons as people. They further assumed that associations could be conditioned between any stimulus an organism could perceive and any response it could make. However, research conducted during the past 35 years indicates that neither of these assumptions is correct. Not only do animals often differ in what responses can be conditioned, but in addition, some responses can be conditioned much more readily to certain stimuli than to others. The essential insight gained from this research is that an animal's biology steers it toward certain kinds of conditioning that enhance its survival (Hollis, 1997).

Taste Aversion

One of the most dramatic examples of a behavior being more easily conditioned by certain stimuli than by others is *taste aversion*. If you have ever experienced food poisoning, you are undoubtedly familiar with this concept. When you consumed the food that ultimately made you sick, there were probably many things going on around you besides the taste of that food. But if you are like most people, the lesson you learned was to avoid whatever food you had eaten, and not (for example) the people you were talking to or the show you were watching on TV. Why is this so? Let us consider the results of an animal study that helped us better understand this behavior.

In a classic study of taste aversion in rats, John Garcia and Robert Koelling (1966) presented groups of rats with either flavored or plain water; however, drinking the plain water triggered a light flash and a loud click, which the researchers referred to as "bright-noisy water." After drinking, the rats received a UCS: Group A received electrical shocks to their feet that immediately produced pain, while Group B received radiation in X rays that made them nauseated about an hour later. According to traditional classical conditioning principles, a conditioned response occurs only if the unconditioned stimulus follows the conditioned stimulus within a very short interval. Based on this knowledge, wouldn't you predict that the Group A rats that drank the flavored water would learn to avoid it because drinking this water immediately preceded their literally shocking UCS? Wouldn't you also predict that the Group B rats should not learn to avoid drinking either kinds of water because the effects of their UCS--the radiation--were not felt until much later? As depicted in Figure 6-4, something different happened. Garcia and Koelling found that the rats exposed to the immediately painful shocks (Group A) learned to avoid the bright-noisy water, but not the flavored water. In contrast, rats exposed to the delayed nausea of the radiation (Group B) learned to avoid the flavored water but not the bright-noisy water. If you were the researchers, how would you explain these findings? Why would the rats have been conditioned to associate the shocks with the bright-noisy water but not with the flavored water? Why would nausea become associated with *any* stimulus that preceded it so far in advance? Why did the rats learn to associate the nausea with the flavored water but not with the bright-noisy water?

Garcia and Koelling argued that these constraints on learning were by-products of the rats' evolutionary history. Through the process of adapting to their environment, rats—like all other creatures—have evolved to readily learn those things crucial to their survival. The sudden pain of a shock is more likely to be caused by an external stimulus than by something the rat ingests, so it is not surprising that rats are predisposed to associate shock with a sight or a sound. Similarly, nausea is more likely to be caused by something the rat drinks or eats than by some external stimulus, such as a noise or a light. Thus, it makes evolutionary sense that rats are born with this tendency to associate nausea with taste. It is also adaptive for rats to be able to associate taste with a feeling of nausea, even after a long delay between the taste (the CS) and the nausea (the UCS). Animals biologically

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For cancer patients who have been undergoing outpatient chemotherapy at this hospital, how might the simple action of entering this setting for treatment weaken their immune system? What is the UCS? What is the UCR? What is the CS? What is the CR?

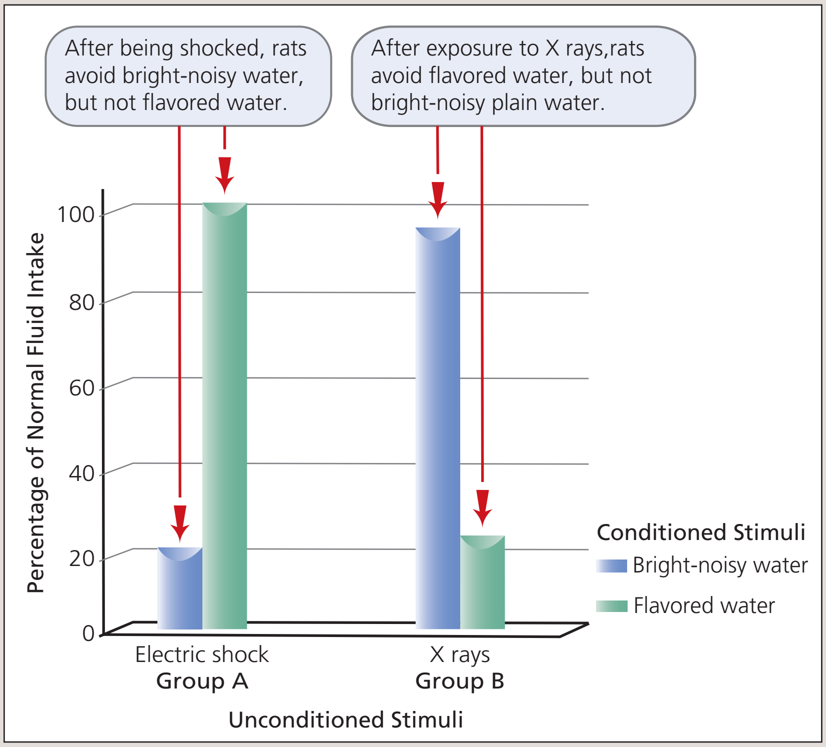

FIGURE 7-4

Biological Constraints on Taste Aversion in Rats

Rats learned to avoid plain water that was associated with a light-noise combination when it was followed by electrical shock, but not when it was followed by X-rays that made the rats nauseated. In contrast, rats quickly learned to avoid flavored water when it was followed by X-rays, but they did not readily acquire an aversion to this same water when it was followed by shock. How might these constraints on learning be by-products of the rats' evolutionary history?

equipped to associate taste stimuli with illness that occurs minutes or even hours later are more likely to survive and pass their genes on to the next generation (Seligman, 1970).

Garcia decided to apply this newfound insight into conditioned taste aversion to a practical problem: controlling predators' attacks on ranchers' livestock (Garcia et al., 1977; Gustafson et al., 1974). In one study, captured wolves were fed sheep carcasses containing lithium chloride (the UCS), a chemical that causes severe nausea and vomiting (the UCR). After recovering from this very unpleasant experience, these same hungry predators were placed in a pen with a live sheep. At first, the wolves moved toward the sheep (the CS) in attack postures. However, as soon as they smelled their prey, they backed off and avoided further contact (the CR). Based on this research, many ranchers today condition potential predators to avoid their herds by depositing lithium chloride-injected livestock carcasses near their herds. This same strategy is used to both condition predators to avoid killing endangered species and to condition free-grazing livestock not to eat toxic yet tasty plants (Gorniak et al., 2008; Nicolaus & Nellis, 1987). The flexibility of animals' aversive learning ability was recently demonstrated in a study of honeybees that learned to avoid pheromones to which they are innately attracted, when those pheromones were paired with an electrical shock (Roussel et al., 2012). In other words, aversive learning in honeybees is strong enough to override genetically preprogrammed responses.

Conditioning the Immune System

Chemotherapy drugs are given to cancer patients to inhibit the growth of new cancer cells, but these drugs also inhibit the growth of immune cells, thereby weakening the body's ability to fight off illnesses. Chemotherapy drugs typically are given to patients each time in the same room in the same hospital. Thus, is it possible that these patients' immune systems become classically conditioned to negatively react in advance to stimuli in the hospital? Apparently, yes. In a study of women undergoing treatment for ovarian cancer, researchers found that, following several chemotherapy sessions, the patients' immune systems were weakened as soon as they entered the hospital—in anticipation of the treatment (Bovbjerg et al., 1990). The hospital setting had become a conditioned stimulus, causing an inhibition of cellular activity.

Armed with this knowledge, researchers developed techniques of strengthening the immune system through classical conditioning (Schachtman, 2004; Schedlowski & Pacheco-Lopez, 2010). For example, after repeatedly pairing the taste of sherbet with shots of adrenaline—which naturally increases activity and growth in certain immune cells—researchers found that the presentation of the sherbet alone later caused an increase in people's immune response (Buske-Kirschbaum et al., 1994). These findings raise the encouraging possibility that the medical profession may be able to use classical conditioning to help fight immune-related diseases such as cancer and AIDS.

Phobias

People who have been injured in car accidents sometimes develop an intense fear of riding in all cars. These exaggerated and irrational fears of objects or situations are known as *phobias*, and they are discussed more extensively in Chapter 13, Section 13.3a. Such intense fear reactions often develop through classical conditioning (Ohman & Ruck, 2007).

Although we can develop a phobia toward anything, there is evidence that some objects or situations elicit phobic reactions more easily than others. Researchers have noticed, for instance, that people tend to develop phobias for snakes and heights quite easily; however, they seldom develop phobias for knives and electrical outlets, even though these objects are often associated with painful experiences (Kleinknecht, 1991; LoLordo & Droungas, 1989). In a series of studies investigating the development of classically conditioned fear reactions, Arne Öhman and Joaquim Soares found that when photos of various animals and plants were paired with an electric shock, participants more readily acquired fear responses to pictures of snakes and spiders than to pictures of flowers and mushrooms (Öhman & Soares, 1994). They also found that conditioned fear responses to snakes and spiders were much more resistant to extinction (Soares & Öhman, 1993).

Evolutionary theorists contend that people more easily develop phobias for certain objects or situations because those stimuli once posed a real danger to our ancestors (Buss, 1995; Seligman, 1971). During the time in which our ancestors lived, those individuals whose genetic makeup allowed them to quickly learn to avoid hazards were most likely to survive and reproduce. According to this perspective, then, snakes and heights make many of us unduly anxious in our modern world because the genes that trigger such anxiety are still part of our genetic makeup.

Further support for this view that we have evolved to fear certain objects and situations more

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Different species are biologically prepared to develop fear and avoidance responses toward different stimuli. Humans evolutionary history may predispose us to be apprehensive and even fearful toward snakes. In contrast, eagles hunt and eat snakes as part of their regular diet and exhibit no such anxiety.

than others comes from a perceptual experiment conducted by Öhman and his coworkers (2001). In this study, participants were either shown images of a few snakes and spiders placed within a much larger environmental scene of many flowers and mushrooms, or they were shown a few flowers and mushrooms placed within a larger scene of many snakes and spiders. Their task was to quickly identify the embedded images in the larger environmental scene (similar to a *Where's Waldo?* picture). Participants were significantly faster at finding snakes and spiders against a background of mushrooms and flowers than they were at finding mushrooms and flowers against a snake and spider background. This finding is consistent with the hypothesis that humans have developed specialized neural circuitry that quickly and automatically identifies stimuli associated with threat and danger in our evolutionary past (Öhman et al., 2001; Öhman & Mineka, 2003). This evolved neural mechanism for threat detection and fear activation appears to be located in the amygdala of the brain, and the fear response occurs before conscious cognitive analysis of the stimulus takes place (Man et al., 2012; Mineka & Öhman, 2002). Further discussion of how the brain coordinates these intense emotional responses can be found in Chapter 11, Section 11.5e.

Does the fear of snakes and spiders still make evolutionary sense? Right now, such fear serves very little adaptive function because few of us are at risk of dying from poisonous snake or spider bites. Yet we still carry the tendency to fear these creatures. Why? Two issues are involved. One reason is the timescale of evolution. Evolutionary changes are noticeable not in a single generation or a few generations, but over hundreds of generations. Further, even in the most modern societies, we are not that far removed from possible encounters with dangerous snakes and spiders. The other issue is that evolutionary pressures will not work to remove human fear of snakes and spiders until, over the long term, such a fear becomes an actual disadvantage. If the fear is merely neutral—an annoying holdover from prehistoric times, with no effect on reproductive success—it may remain part of the human condition. In other words, the fact that a tendency is passed on through the generations implies nothing about its value in current society.

Section REVIEW

- Classical conditioning explains how organisms learn that certain events signal the presence or absence of other events; such knowledge helps the organisms prepare for future events.
- A neutral stimulus will lead to a conditioned response whenever it provides information about the upcoming occurrence of the unconditioned stimulus.
- Conditioned responses usually develop gradually over a series of presentations.
- In higher-order conditioning, a conditioned stimulus is used to condition a neutral stimulus.
- Stimulus generalization is when a conditioned response is elicited by stimuli similar to the conditioned stimulus, while stimulus discrimination is a conditioned response not elicited by other stimuli.
- An animal's biology steers it toward certain kinds of conditioning that enhance its survival.

7.2 Operant Conditioning

PREVIEW

- *What is the law of effect, and how is it related to operant conditioning?*
- *What is a reinforcer, and what is its opposite consequence called?*
- *What is the difference between a positive and a negative punisher?*
- *Is punishment an effective tool in learning?*
- *What reinforcement schedule leads to the fastest learning, and which one is most resistant to extinction?*
- *How do you "shape" behavior?*
- *How can operant conditioning explain superstitious behavior?*
- *Can an animal learn anything through operant conditioning?*
- *Is cognition part of the conditioning process?*

The type of learning that occurs due to classical conditioning helps you prepare for future events, but it seldom allows you to *change* those events. Thus, when Little Albert saw a white furry animal (the CS), he began crying (the CR) in anticipation of hearing a frightening sound (the UCS); his crying, however, could not control the presentation of either the CS or the UCS. Now let us examine another type of learning, in which you *do* learn that your actions, rather than conditioned stimuli, produce consequences.

7.2a Operant Behavior Is Largely Voluntary, Goal Directed, and Controlled by Consequences.

A few years before Pavlov began watching hungry dogs salivate after being presented with food and a ticking metronome, the American psychologist Edward L. Thorndike (1898)—a student of William James—was observing hungry cats trying to escape from a "puzzle box" to reach a bowl of food. To escape, the cats had to press a lever (the response), which in turn lifted a gate that allowed access to the food (the stimulus). At first, the cats usually engaged in a number of incorrect behaviors while attempting to escape from their confinement. However, after about 10 minutes, the cats would accidentally press the lever, and the door would open. Thorndike would then return the cats to the box and repeat the trial. In subsequent trials, Thorndike's cats took less time to escape and soon learned the correct behavior to reach the food.

The Law of Effect

Experience is the best teacher.

—American proverb

Experience is a good school, but the fees are high.

—Heinrich Heine, German poet, 1797–1856

How was the learning of Thorndike's cats different from the learning of Pavlov's dogs? First, in classical conditioning, an organism's behavior is largely determined by stimuli that precede it. Thus, in Pavlov's experiments, food caused the dogs to salivate. However, in Thorndike's research, behavior was influenced by stimuli that followed it. Second, classical conditioning involves learning associations between *stimuli*, and the organism exerts little influence over the environment; in contrast, Thorndike's cats learned an association between *behavior* and its *consequences*, and actively created a change in the environment. The cats learned to associate a response (lever pressing) with a subsequent desirable consequence (food). Gradually, the behavior that produced these desirable consequences increased in frequency and became the dominant response when the cats were placed in the puzzle box. Thorndike (1911) called this relationship between behavior and its consequences the **law of effect**, because behavior becomes more or less likely based on its *effect* in producing desirable or undesirable consequences.

Law of effect A basic principle of learning that states that a behavior becomes more or less likely based on its effect in producing desirable or undesirable consequences

You can see how the law of effect would be very useful to survival. Evolution works by selecting those individuals whose behavior best promotes survival in their given environment. Animals that repeat behavior followed by desirable consequences and terminate behavior followed by undesirable consequences (if the consequences didn't terminate the animals first) would be most likely to profit from experience with their environment and, thus, to survive and reproduce.

What Is Operant Conditioning?

Today the law of effect is considered a fundamental learning principle, but the scientific community did not accept it at first. Indeed, John Watson, the founder of behaviorism, dismissed Thorndike's findings as due to "kind fairies" (Iversen, 1992). Then, in the 1930s, former frustrated writer and, at that time, new psychologist B. F. Skinner elaborated on the law of effect and made it the cornerstone for his influential theory of learning, which he called **operant conditioning**. Skinner used the term *operant conditioning* because the organism's behavior is *operating* on the environment to achieve some desired goal. Operant behavior is largely *voluntary* and *goal directed* and is controlled by its *consequences*. Thus, when a rat presses a bar in a Skinner box (see Figure 7-5), it does so because it has learned that bar pressing will lead to food pellets. Likewise, when my daughters clean their rooms, they choose to engage in this behavior because they have learned that it will provide them with something highly valued—namely, permission to play with friends.

Operant conditioning A type of learning in which behavior is strengthened if followed by reinforcement and weakened if followed by punishment

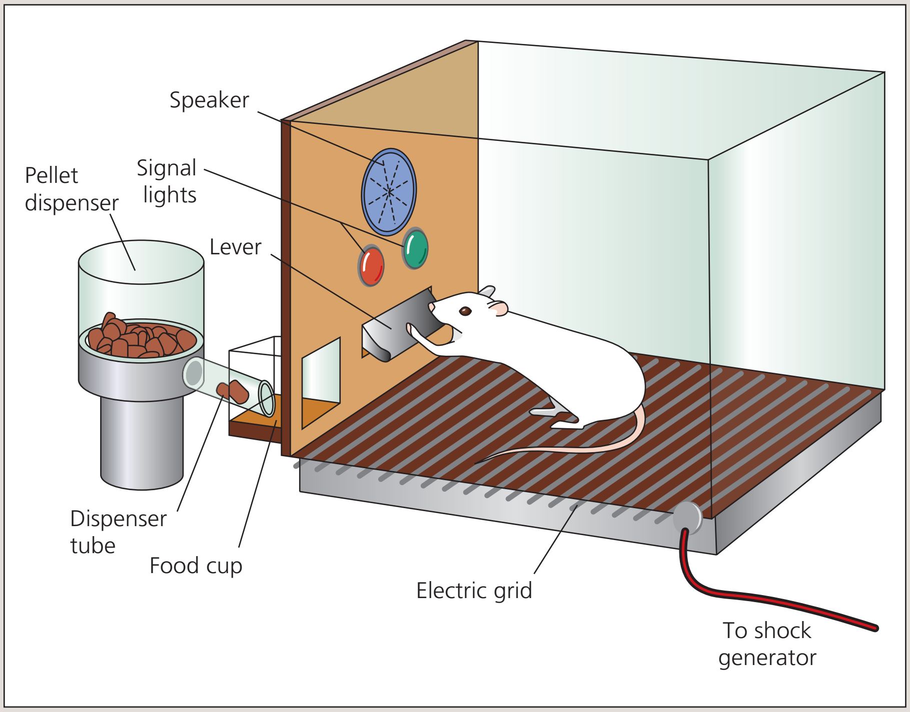


FIGURE 7-5 **Skinner Box** Skinner designed an apparatus called a "Skinner box" in which animals learned to obtain food or to avoid shocks by operating on their environment within the box. In a Skinner box, the animal learns to press the bar to obtain food pellets, which are delivered into the box down the pellet tube. If the delivery of food pellets increases the frequency of bar pressing, what is the technical term for these pellets? The speaker and light allow the experimenter to manipulate visual and auditory stimuli, while the electric floor grid allows the experimenter to control aversive consequences (shock).

7.2b Reinforcement Increases the Probability of Behavior.

Reinforcement The process by which a stimulus increases the probability of the behavior that it follows

Reinforcer Any stimulus or event that increases the likelihood that the behavior preceding it will be repeated

As you have seen, people and other animals tend to repeat behaviors that are followed by desirable consequences. This fundamental principle of behaviorism—that rewarded behavior is likely to be repeated—is known as **reinforcement**. A **reinforcer** is any stimulus or event that increases the likelihood that the behavior preceding it will be repeated. A reinforcer may be a concrete reward, such as food, money, or attention. For example, if people laugh and pay attention to you when you tell a joke, their response is likely to encourage you to tell more jokes in the future. A reinforcer could also be an activity, such as allowing children to play with friends after they clean their rooms.

How do you know whether something is a reinforcer? Simple. Observe whether it increases the behavior it follows. While "friend play" reinforces my daughters' room cleaning, I have learned that allowing them to watch a football game on television with me is not a reinforcer. Sometimes the same stimulus is a reinforcer in one situation but not in another. For example, whereas laughter may reinforce joke-telling, my sister's laughter while teaching me to dance years ago certainly did not increase my desire to get on the dance floor! Likewise, a stimulus may be a reinforcer for one animal but not for another. Would the food pellets the rats in a Skinner box work so hard to obtain be a reinforcer for you? The lesson to be learned here is that something is a reinforcer not because of what it is, but rather because of what it *does*.

Primary versus Secondary Reinforcers

Primary reinforcer Stimulus that is naturally reinforcing because it satisfies a biological need.

Secondary reinforcer Stimuli that is learned and become reinforcing by being associated with primary reinforce(s)

How does a stimulus become a reinforcer? Actually, some stimuli are innately reinforcing, whereas others become reinforcing through learning. A **primary reinforcer** is naturally reinforcing because it satisfies a biological need. Food, water, warmth, sexual contact, physical activity, novel stimulation, and sleep are all examples of primary reinforcers. In contrast, a **secondary reinforcer**—also called a *conditional reinforcer*—is learned and becomes reinforcing by being associated with a primary reinforcer.

Does this sound familiar? It should, because this learning involves classical conditioning. Through classical conditioning, a neutral stimulus becomes a conditioned stimulus (in our case, a secondary reinforcer) by being repeatedly paired with an unconditioned stimulus (the primary reinforcer) that naturally evokes an unconditioned response. An example of a secondary reinforcer is money. You value money because it has been repeatedly associated with a host of primary reinforcers, such as food, shelter, and entertainment. Likewise, attention becomes a secondary reinforcer for children because it is paired with primary reinforcers from adults, such as protection, warmth, food, and water. Other powerful secondary reinforcers are praise and success. Thus, an important element in operant conditioning—namely, secondary reinforcers—comes into existence not through operant conditioning but through classical conditioning.

Positive and Negative Reinforcers

Positive reinforcer Stimulus that strengthens a response by presenting a pleasant or desired stimulus after a response

Negative reinforcer Stimulus that strengthens a response by removing an aversive or unpleasant stimulus after a response

The examples used thus far to describe reinforcers are known as positive reinforcers. A **positive reinforcer** strengthens a response by presenting a pleasant or desired stimulus after a response. Another type of reinforcer is a **negative reinforcer**, which strengthens a response by removing an aversive or unpleasant stimulus after a response. Although negative reinforcement sounds like it means reinforcing behavior with a negative consequence, in fact it refers to removing something from the environment. (Negative consequences are a form of punishment, which is discussed in Section 7.2c.) In a Skinner box, a moderate electric shock administered through

Praise becomes a secondary reinforcer because it is associated with primary reinforcers, such as gentle physical contact and warmth. Can you think of other secondary reinforcers in your own life?

the floor grid often serves as a negative reinforcer. When the rat presses the bar, the shock is turned off. The removal of the shock strengthens the bar-pressing behavior.

Just as the rat learns that it can end an unpleasant sensation by responding in a specific way, you too have learned certain responses to escape negative reinforcers. The cold weather you avoid by going indoors is a negative reinforcer. Your parents nagging you to take out the garbage or to turn down the stereo are negative reinforcers. When you respond in the correct fashion, the noxious stimulus (the cold temperature or the nagging) is terminated. Similarly, when you clean your smelly refrigerator, the removal of the foul odor is also a negative reinforcer: It strengthens refrigerator-cleaning behavior in the future.

The Relativity of Reinforcers

Many parents frequently resort to bribery to persuade their children to clean their plates:

"If you eat your potatoes, you may have some ice cream."

"You may not go out and play until you eat all your carrots."

Can the effectiveness of these inducements be explained by operant conditioning principles? According to research conducted by David Premack (1959, 1962), the answer is yes. Engaging in a less-valued activity—such as eating potatoes or carrots—becomes more likely because it leads to the opportunity to engage in a more-valued activity—such as eating ice cream or playing with friends. In other words, more-preferred activities can act as reinforcers for less-preferred activities. This **Premack principle**, as it is known, is widely employed not only by parents but also by employers and educators to motivate workers and students to engage in less desirable tasks so they then can do something they more highly value (Nunes et al., 2007). Thus, bosses tell employees they will be promoted after they show their ability to successfully carry out less-demanding tasks in their current jobs. Likewise, teachers tell students they cannot go out for recess until they quiet down, clean their desks, finish their assignments, and so on. In all facets of our lives, we have a wealth of experience with the

Premack principle The principle stating that more preferred activities act as reinforcers for less preferred activities

Explore It EXERCISE 7.2

Can You Identify Your Personal Reinforcers?

B. F. Skinner's research demonstrated that humans and other animals tend to repeat those responses that are followed by favorable consequences, or reinforcers. He further believed that people can gain greater control over their own behavior the more they can identify what kinds of environmental stimuli serve as personal reinforcers for them. In this spirit of discovery, think about the significant behavior you have engaged in during the past 24 hours (that is, behavior you consider personally important), and then list at least five of these behaviors below. Next, identify and list either positive and/or negative reinforcers that influenced these behaviors.

	Behavior	Positive Reinforcement	Negative Reinforcement	Combination
1	________	________________	________________	__________
2	________	________________	________________	__________
3	________	________________	________________	__________
4	________	________________	________________	__________
5	________	________________	________________	__________

Based on this exercise, are your important daily behaviors influenced more by positive or negative reinforcement? Are your behaviors that are primarily influenced by one type of reinforcement generally more enjoyable than those behaviors primarily influenced by the other type of reinforcement? Can you identify why this might be the case for you? Did this exercise provide you with any self-insights that might prove useful in the future?

Premack principle. Before reading further, spend a few minutes completing Explore It Exercise 7.2 to identify personal reinforcers in your own life.

7.2c Punishment Decreases the Probability of Behavior.

Punishment The process by which a stimulus decreases the probability of the behavior it follows

Positive punisher Stimulus that weakens a response by presenting an aversive stimulus after a response

Negative punisher Stimulus that weakens a response by removing a positive stimulus after a response

The opposite consequence of reinforcement is **punishment**. While reinforcement always *increases* the probability of a response—either by presenting a desirable stimulus or by removing or avoiding an aversive stimulus—punishment always *decreases* the probability of whatever response it follows.

Like reinforcement, there are two types of punishment. A **positive punisher** weakens a response by presenting an aversive stimulus after a response. Shocking a rat in a Skinner box for pressing a food bar and scolding a child for eating candy before dinner are examples of the use of positive punishment to reduce the future likelihood of unwanted behavior. In contrast, a **negative punisher** weakens a response by removing a positive stimulus after a response. Grounding a teenager for impolite behavior and denying an end-of-year bonus to a lazy worker are examples of negative punishment.

Do not confuse positive punishment with *negative reinforcement* (see Section 7.2b). Although both involve an aversive stimulus, remember that a reinforcer strengthens behavior. Negative reinforcement strengthens behavior by *removing* an aversive stimulus, while positive punishment weakens behavior by *presenting* an aversive stimulus. Table 7-1 distinguishes between the two types of reinforcement and the two types of punishment.

Skinner, who was enthusiastic about using reinforcement to shape behavior, was equally adamant in opposing punishment. Why do you think he preached against its

TABLE 7-1 What Are the Differences between Types of Reinforcement and Punishment?

		Effect on Behavior	
	Procedure	Strengthens	Weakens
Positive reinforcement	Presentation of stimulus.	X	
Positive punishment	Presentation of stimulus		X
Negative reinforcement	Removal of stimulus	X	
Negative punishment	Removal of stimulus		X

use? After all, punishment is a common method of controlling behavior. Parents use it to curb undesirable behavior in their children, teachers use it to control unruly students, employers use it to keep workers in line, and our courts use it to reduce crime. Why would Skinner advocate using only reinforcement and not punishment to shape behavior?

Guidelines for Using Punishment

One reason Skinner did not recommend the use of punishment to shape behavior is that, in most instances, its implementation must conform to some very narrow guidelines. In order for punishment to have a chance of effectively reducing unwanted behaviors, three conditions must be met. First, the punishment must be *prompt*, administered quickly after the unwanted action. Second, it must be *relatively strong*, so that the offender duly notes its aversive qualities. Third, it must be *consistently applied*, so the responder knows that punishment is highly likely to follow future unwanted actions.

The Drawbacks of Punishment

Even if the conditions for administering punishment are met, reduction of the undesirable behavior is not guaranteed. For instance, punishment is often used to curb aggressive behavior. But if potential aggressors are extremely angry, threats of punishment *preceding* an attack frequently fail to inhibit aggression. Here, the strength of the anger overrides any concerns about the negative consequences of aggression. Likewise, the use of punishment *following* aggression may actually provoke counteraggression in the aggressor-turned-victim, because such punishment may be frustrating and anger-producing. If the frustration and anger following punishment doesn't lead to direct aggression, it can cause *passive aggressiveness*, which is a subtle and indirect form of aggression (Vaillancourt & Sharma, 2011).

Using physical punishments, such as spankings, to reduce unwanted behavior is an especially questionable practice (Boutwell et al., 2011). As you will learn in Section 7.3, research indicates that employing physical punishment as a remedy for aggression and other undesirable behaviors may simply teach and encourage observers to copy these aggressive actions. That is, the person using physical punishment may serve as an aggressive model. This is exactly the process underlying the continuing cycle of family violence found in many societies—observing adult aggression appears to encourage rather than discourage aggression in children. For this reason, a growing number of countries are moving to enacting legal bans against spankings and other forms of physical punishment (Gershoff & Bitensky, 2007).

Taking these factors into account, we see that even though punishment may reduce unwanted behaviors under certain circumstances, it does not teach the recipient new desirable forms of behavior. The unwanted behaviors are not being replaced by more productive kinds of actions but are most likely only being temporarily suppressed. For this reason, punishment by itself is unlikely to result in long-term changes in behavior.

Finally, one other unfortunate consequence of punishment is that it may unexpectedly shape a behavior other than the target behavior. For example, the repeated rejections young Skinner received from publishers during his "dark year" not only sharply reduced the amount of time he subsequently spent writing fiction but also had an unintended effect. He stopped *reading* fiction and poetry, and even avoided the theater for three years! As he put it, "Literature had been the great love of my high school and college years, but when I risked a year after college to test myself as a writer and failed, I turned rather bitterly against it" (Skinner, 1979, p. 90). Although the editors who "punished" young Skinner with their rejections may well have intended to stop his manuscript submissions, they would not have wanted him to give up reading the works they were publishing for their own profit. The lesson to be learned here is that, although you can use punishment to reduce a targeted response, you may "throw the baby out with the bathwater" by also reducing desirable behavior.

Violence and injury enclose in their net all that do such things, and generally return upon him who began.

—Lucretius, Roman philosopher and poet, 99–55 B.C.

One alternative to punishment proposed by Skinner is to allow undesirable actions (such as a child's temper tantrums) to continue without either positive or negative consequences until they are extinguished. In other words, ignore the unwanted behavior—but immediately reinforce desirable responses when they occur. Another useful extinction technique is the "time-out," in which misbehaving children are removed for a short period of time from sources of positive reinforcement. Have you ever used these techniques? Were they effective?

7.2d Different Reinforcement Schedules Lead to Different Learning and Performance Rates.

Thus far my description of the learning that occurs in operant conditioning, the underlying assumption has been that every response is followed by a reinforcer. Although a **continuous reinforcement schedule** leads to the fastest learning, in most instances of daily living we are not reinforced for every response. For example, consider avid golfers. Not all their shots lead to desirable consequences, yet most golfers wholeheartedly enjoy this activity. Similarly, you are probably not reinforced every time you go to a movie, visit friends, or go out to eat.

Continuous reinforcement schedule A schedule of reinforcement in which every correct response is followed by a reinforcer

The biggest problem with continuous reinforcement is that, when it ends, extinction occurs rapidly. For example, what happens when you put money into a vending machine and do not receive a soda? You might respond by inserting more coins. But if doing so does not lead to the desired beverage, you do not continue to pump money into the machine, do you? That is unlikely, because behavior regulated by continuous reinforcement is easily extinguished. The same is not true for responses that are reinforced only some of the time. Did you stop going to movies, visiting friends, or eating food because you had a few unrewarding experiences? You persist in many activities even though you are reinforced only intermittently. Thus, although continuous reinforcement allows you to *acquire* responses most quickly, once responses have been learned, a **partial reinforcement schedule** has an important effect

Partial reinforcement schedule A schedule of reinforcement in which correct responses are followed by reinforcers only part of the time

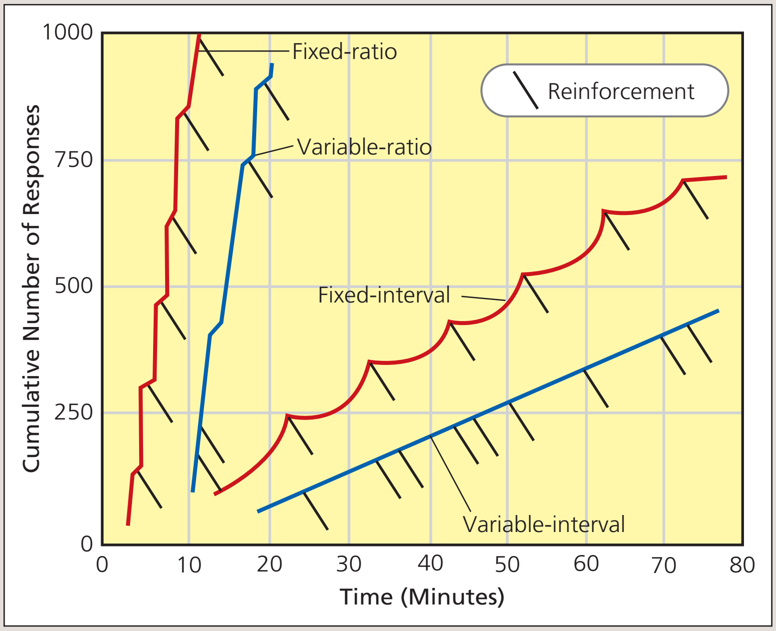


FIGURE 7-6

Schedules of Reinforcement

The predictability of fixed-ratio schedules leads to a high rate of responding, with brief pauses after each reinforcer. The unpredictability of variable-ratio schedules leads to high, steady rates of responding, with few pauses between reinforcers. The predictability of fixed-interval schedules leads to a low rate of responding until the fixed interval of time approaches, and then the rate of responding increases rapidly until the reinforcer is delivered; after that, a low rate of responding resumes. The unpredictability of variable-interval schedules produces a moderate, but steady, rate of responding.

on your continued performance. Being reinforced only once in a while keeps you responding vigorously for longer periods of time than does continuous reinforcement (Poling, 2010).

Skinner and his colleagues identified and studied several partial reinforcement schedules (Ferster & Skinner, 1957; Skinner, 1938). *Partial schedules* are defined in terms of number of responses or the passage of time. *Ratio schedules* mean that the first response after a specified number of responses is reinforced. *Interval schedules* mean that the first response after a specified time period is reinforced. In addition, some partial schedules are strictly *fixed*, while others are unpredictably *variable*.

A **fixed-ratio reinforcement schedule** reinforces behavior after a specified number of responses. For example, students may be given a prize after reading 20 books, or factory workers may be paid a certain amount of money for every 40 machinery pieces they assemble (a system known as "piecework"). The students read their first 19 books without reinforcement, as do the workers assembling their first 39 machinery pieces, because they know the payoff will occur when the last book or piece is completed in the ratio. When people and animals are placed on a fixed-ratio reinforcement schedule, response rates are high, with only brief pauses following reinforcement (see Figure 7-6).

Fixed-ratio reinforcement schedule A partial reinforcement schedule that reinforces a response after a specified number of nonreinforced responses

Why do you think people and animals on fixed-ratio schedules take such short breaks before working again on their tasks? The answer is that resting reduces rewards. In industry, this schedule is popular with management because it leads to high productivity. However, it is unpopular with workers because it produces stress and fatigue. You might wonder why these employees do not exercise some self-restraint and simply slow down. According to behaviorists, that response is unlikely because the source of control over their actions lies largely in the environment, not in the individual. Employees work themselves to exhaustion simply and solely because the fixed-ratio schedule reinforces energetic responding. The only way to reduce fatigue is to somehow turn off the reinforcement schedule eliciting these high response rates. Fortunately for workers, many employee unions in the United States, Canada, and Europe have done just that. They have pressured management to replace the fixed-ratio piecework pay with a fixed-interval hourly wage.

Animals also try to escape fixed-ratio schedules. If a pigeon in a Skinner box is pecking a lit key for food on a fixed-ratio schedule, when given the opportunity, it will periodically peck another lit key that briefly turns off the ratio key light. With the light off, the pigeon's environment is now conducive to rest and relaxation. Interestingly, although the pigeon could simply take a break or slow down by refraining from pecking the lit ratio key or by pecking it at a slower rate, like the pieceworker, it does not do so. When the ratio key is lit, the pigeon's responding remains high. What this research tells us is that, although it is difficult to change the pattern of responding generated by a reinforcement schedule, you can change the schedule and thereby change the response pattern.

Although fixed-ratio schedules are more resistant to extinction than is continuous reinforcement, the person or animal will stop responding soon after reinforcement stops. Why? Because when the reinforcer is not delivered after the required number of responses, it quickly becomes apparent that something about the schedule has changed.

What happens when a ratio schedule is not fixed, but varies? That is, a reinforcer may be delivered after the first response on trial 1, after the fourth response on trial 2, after the ninth response on trial 3, and so on. The average ratio may be one reinforcer after every six trials, but the responder never knows how many responses are needed to obtain the reinforcer on any given trial. This type of schedule, which reinforces a response after a variable number of nonreinforced responses, is known as a **variable-ratio reinforcement schedule**.

Variable-ratio reinforcement schedule A partial reinforcement schedule that reinforces a response after a variable number of nonreinforced responses

As you can see in Figure 7-6, of all the types of reinforcement schedules, variable-ratio schedules lead to the highest rates of responding, the shortest pauses following reinforcement, and the greatest resistance to extinction. Golfing and most other sports activities are reinforced on variable-ratio schedules. Even after golfers hit balls into sand traps and overshoot the green all day, it only takes a few good (reinforced) shots to get most of them excited about playing again. Most games of chance are also based on variable-ratio schedules. For example, the intermittent and unpredictable nature of the reinforcement is why people continue pumping money into slot machines. Their concern is that as soon as they leave, someone else will win all the money.

Fixed-interval reinforcement schedule A partial reinforcement schedule that reinforces the first response after a fixed time interval has elapsed

In a **fixed-interval reinforcement schedule**, reinforcement occurs for the first response after a fixed time interval has elapsed. As you can see in Figure 7-6, this schedule produces a pattern of behavior in which very few responses are made until the fixed interval of time approaches, and then the rate of responding increases rapidly. If your mail consistently arrives at about the same time each day, attending to your mailbox is a good example of a behavior controlled by a fixed-interval schedule. From my window, I can see my own mailbox while typing this sentence, but I have not looked in that direction for hours. Why? Because the mail is delivered at around noon, and it is now midnight. Yet, 12 hours from now, I will be frequently glancing in that direction as I anticipate the reinforcing correspondence that will soon arrive.

Researchers investigating the study patterns of college students found that they followed a fixed-interval behavior pattern when professors gave exams separated by a few weeks (Mawhinney et al., 1971). That is, when exams were given every three weeks, students began studying a few days before each exam, stopped studying immediately after the test, and began studying again as the next exam approached. In contrast, when professors gave daily quizzes, studying did not taper off after testing.

Variable-interval reinforcement schedule A partial reinforcement schedule that reinforces the first response after a variable time interval has elapsed

Unlike the predictability of fixed-interval reinforcement, a **variable-interval reinforcement schedule** reinforces the first response after a variable time interval has elapsed. As you can see in Figure 7-6, this type of schedule produces relatively steady rates of responding. Have you ever taken a course in which your grade was

What type of reinforcement schedule does the U.S. Postal Service have you on regarding your daily mail delivery?

based on surprise exams that were given after a varying number of days or weeks? Because you did not know when you would be tested, you probably studied on a more regular basis in this sort of course than when exams were spread out in a fixed-interval pattern (Ruscio, 2001). Similarly, have you ever tried to connect to your Internet server but received a busy signal or a message saying that it was unavailable due to temporary maintenance? You know that sometime in the near future your attempt to connect will be reinforced, but you are unsure when that moment will arrive. So you periodically dial up your server. You are on a variable-interval schedule of reinforcement!

7.2e Accidental Reinforcement Can Cause Superstitious Behavior.

As a teenager, when I first began asking girls out for dates, I used the phone so I could read what I wanted to say from a prepared script. One day I received a phone acceptance right after I had sunk 10 consecutive free throws on my parents' driveway basketball court. For a few months after the coincidental juxtaposition of these two events, I rarely phoned another girl for a date without first shooting 10 baskets in a row. This **superstitious behavior** was learned simply because it happened to be followed by a reinforcer (the girl accepting my offer!), even though my free throw shooting was not the cause of the accepted offer.

Superstitious behavior A behavior learned simply because it happened to be followed by a reinforcer, even though this behavior was not the cause of the reinforcer

In 1948, Skinner (1948b) was able to train superstitious responding in hungry pigeons by reinforcing them with food every 15 seconds, regardless of what they were doing. Skinner reasoned that when reinforcement occurred, it would be paired with whatever response the pigeons had just performed. Although this response had not caused the reinforcer, the fact that the reinforcer was delivered after the response would be sufficient to strengthen the response. Then, the next time food was delivered, the pigeons would be more likely than before to be engaging in that particular behavior, thereby strengthening it even further. This chain of events would continue until each individual pigeon would be spending most of its time engaging in its own particular superstitious behavior. This is exactly what happened for six out of eight pigeons. One pigeon repeatedly pecked at the floor, another turned counterclockwise, another tossed its head about, and so on. Subsequent research has found that some of the behaviors Skinner observed in the pigeons are instinctive responses that pigeons make in preparation for food, and thus are not examples of superstitious behavior. Nevertheless, Skinner's initial reasoning bears repeating: When you are accidentally reinforced after engaging in a particular behavior, you may come to associate that desirable outcome with the preceding behavior and thus begin performing superstitious actions in the belief that this will help you receive another reinforcer.

Athletes and sports fans often engage in superstitious behavior during athletic events. For example, athletes wear lucky socks, avoid unlucky numbers, and engage in other forms of superstitious behavior in the hopes of gaining a competitive edge (Valeo & Beyerstein, 2008). Likewise, fans that sit in particular seats just before a game-winning play may seek out that chair while watching future sporting events to "help" their team win. In all these instances, none of these actions did anything to cause the favorable outcomes; the rewards followed them purely by chance. Such instances of *accidental reinforcement* function as a partial reinforcement schedule for these people, strengthening the behavior preceding their rewards. In their minds, these actions may have caused the rewards, so it makes sense to engage in these rituals whenever they want to secure the same rewards.

Although superstitious actions do not directly influence the delivery of a reinforcer, they may sometimes have the indirect benefit of helping the superstitious person cope with anxiety and stress (Matute, 1995; Schippers & Van Lange, 2006). That is, by engaging in a ritual that you believe increases your chance of achieving success, you may gain a sense of personal control over the situation, which may help you perform better. For example, although shooting 10 consecutive free throws did not magically cause girls to go out with me, it may have lowered my anxiety level to the point where I could read my prepared script without stammering and thus come across as more poised than desperate!

The calming effect of superstitious behavior may partly explain why nearly 70 percent of college students admit to engaging in some type of superstitious action before taking an exam (Gallagher & Lewis, 2001). I was one of those "70 percent" in college. On the day of an exam, I would not take a shower lest I "wash off" the knowledge gained while studying. I usually did well on those exams, which reinforced my nonshowering behavior. Can you think of any of your own past or present behaviors that might fit Skinner's definition of superstitious behavior? Does this behavior serve a useful function for you, or does it hinder your daily routine?

7.2f Shaping Reinforces Closer Approximations to Desired Behavior.

The reinforcement techniques discussed thus far describe how you can increase the frequency of behaviors once they occur. Suppose, however, you want to train a dog to stand on its hind legs and dance, or teach a child to write the alphabet or play the piano. These behaviors are unlikely to occur spontaneously, so instead you must employ an operant conditioning procedure that Skinner called **shaping**, or the *method of successive approximations*.

Shaping In operant conditioning, the process of teaching a new behavior by reinforcing closer and closer approximations to the desired behavior; also known as the *method of successive approximations*

In shaping, you teach a new behavior by reinforcing behaviors that are closer and closer approximations to the desired behavior (see Table 7-2). For example, when my brother Randy taught his son Spencer to write the letter *Q*, he first identified what

TABLE 7-2 How to Shape Behavior

1. Identify what the respondent can do now.
2. Identify the desired behavior.
3. Identify potential reinforcers in the respondent's environment.
4. Break the desired behavior into small substeps to be mastered sequentially.
5. Move the respondent from the entry behavior to the desired behavior by successively reinforcing each approximation to the desired behavior.

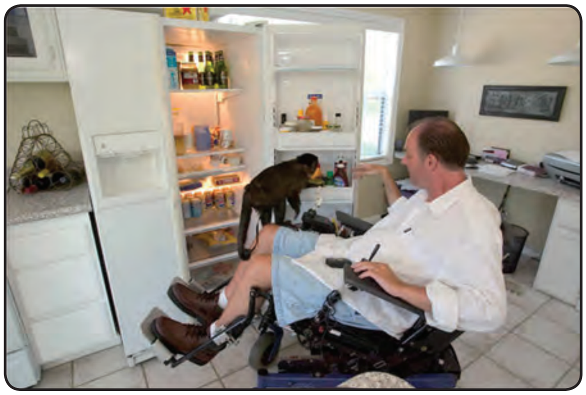
Source: Adapted from Galanter, 1962.

Spencer was capable of writing. Spencer's first attempt at the letter *Q* was a circular scrawl. Randy reinforced this response with praise. After several similar reinforced responses, Randy next raised the criterion for reinforcement to a circle with any straight line, then to a circle with an intersecting straight line placed anywhere; and finally, he reinforced Spencer only when he drew the correct *Q* letter. During this shaping process, when Spencer encountered difficulty at any point, Randy lowered the criterion for reinforcement to a level at which his son could perform successfully. Like Randy, all of us use praise and other reinforcers to shape successively closer approximations of desirable behavior in others. Whether it is teaching people to correct their tennis serve or to improve their grammar, shaping figures prominently in the learning process. In Chapter 14, we will examine how shaping is used in therapy to change maladaptive thoughts and behavior, thus allowing people to lead happier and more normal lives.

Using shaping techniques, Skinner trained pigeons to play Ping-Pong with their beaks and to bowl in a miniature alley. During World War II, he even devised a plan to train pigeons to guide missiles toward enemy targets! Thankfully for the pigeons, this plan was never implemented. However, the U.S. Coast Guard has successfully trained pigeons to find people lost at sea who are wearing the standard bright orange life jackets. Pigeons have much better eyesight than humans. They are first trained in the laboratory to search for an orange disk and then peck a button with their beaks. After training, the pigeons are taken on rescue missions to search for the orange vests in the water. While helicopter pilots notice bobbing orange vests in the water only 35 percent of the time, pigeons' success rate is close to 90 percent.

Former students of Skinner, Keller and Marion Breland went into business training animals for advertising and entertainment purposes. "Priscilla, the Fastidious Pig," for example, was trained to push a shopping cart past a display case and place the sponsor's product into her cart. Today, when you go to a circus or marine park and see elephants balancing on one leg or sea lions waving "hello" to you with their flippers, you are seeing the results of shaping.

Behavioral psychologists also use shaping to train monkeys to provide live-in help for people who are paralyzed, blind, or have some other physical disability. These specially trained monkeys can perform a variety of activities, including combing a person's hair, turning on lights and electronic devices, and retrieving food from the refrigerator.



Helping Hands: Monkey Helpers for the Disabled www.monkeyhelpers.org.

The operant conditioning technique of shaping is used to train monkeys to help people with disabilities live in their own homes. Here is monkey-helper Minnie assisting Craig with opening the fridge and fetching items Craig asks for. These species of monkeys are used because they have high intelligence and form a strong emotional bond with their human companions. It often takes up to two years of training for these monkeys to reliably perform the necessary help.

7.2g Operant Conditioning Theory Overlooks Genetic and Cognitive Influences.

As a traditional behaviorist, Skinner focused solely on observable stimulus-response relationships and overlooked the impact that genetic predispositions and cognitive processes might have on learning (Kirsch et al., 2004). Therefore, it became the task of other investigators to test and revise aspects of operant conditioning related to these two factors.

Biological Constraints on Learning

One of the early assumptions underlying operant conditioning was that animals could be trained to emit any response they were physically capable of making. However, as with classical conditioning, researchers soon learned that an animal's biology could restrict its capacity for operant conditioning. Remember the animal trainers Keller and Marion Breland? Although they could train pigs to push shopping carts past display cases and raccoons to dunk basketballs in a hoop, they could not train these animals to reliably deposit silver dollars into a piggy bank (Breland & Breland, 1961). Instead, the pigs threw the coins onto the ground and pushed them about, while the raccoons in the experiment continually rubbed the coins between their paws. Both behaviors illustrate how species-specific behavior patterns can interfere with operant conditioning, a biological constraint that the Brelands called **instinctive drift** (Breland & Breland, 1961). Through evolution, pigs have developed a foraging behavior pattern of rooting for food in the ground with their snouts, whereas raccoons' foraging behavior involves washing food objects with their paws before eating them. These instincts inhibit learning new operant responses. Thus, just as certain species can be classically conditioned to learn certain responses more easily than others, operant learning is similarly constrained by an animal's evolutionary heritage.

Instinctive drift Species-specific behavior patterns that interfere with operant conditioning

Latent Learning

In the journey of discovery chronicled in this book, psychologists sometimes head down wrong paths due to misguided assumptions or failure to take notice of the discoveries of others. Such was the case with Skinner. Despite evidence to the contrary, he died refusing to admit that an understanding of cognitive processes was necessary to fully understand human and animal behavior (Baars, 2003; Skinner, 1990). Yet, even as Skinner was developing his learning theory in the 1930s based on reinforced behavior, Edward Tolman's research (1922, 1932) with rats indicated that learning could occur without any reinforcement, something that the theory of operant conditioning assumed was not possible.

In one of Tolman's experiments, a group of rats wandered through a maze once a day for 10 days without being reinforced (Tolman & Honzik, 1930). Meanwhile, another group of rats spent the same amount of time in the maze but were reinforced with food at the "goal box" in each of their 10 trials. These reinforced rats quickly learned to accurately run the maze to reach the food reward, but the nonreinforced rats made many errors, suggesting little maze learning. On the 11th day, the nonreinforced rats were suddenly rewarded with food at the goal box, and they immediately thereafter made as few errors as the other rats. A third group of control rats that still received no food reward continued to make many errors (see Figure 7-7).

How would you explain these findings using operant conditioning theory? You could not, because you would have to discuss cognition. However, not being

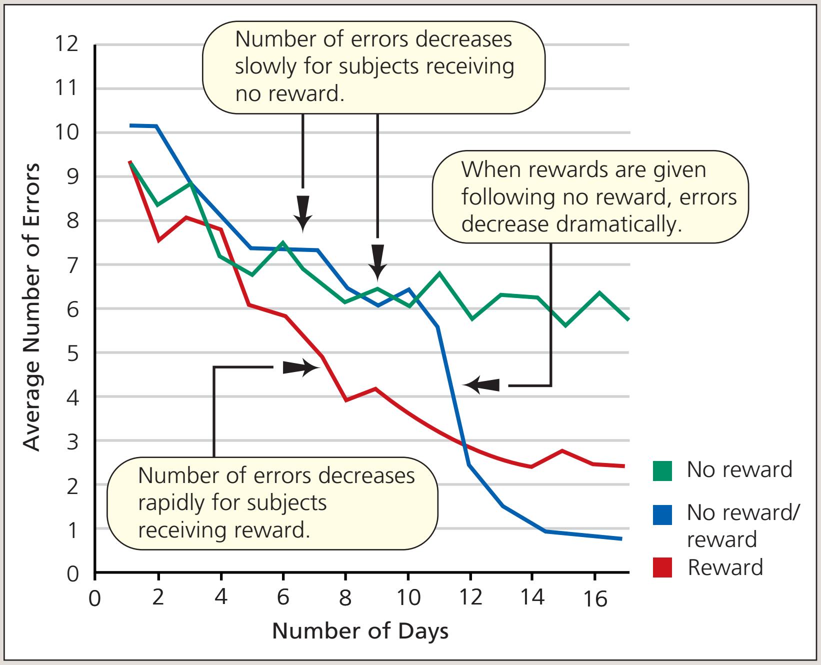


FIGURE 7-7

Latent Learning

Rats that were rewarded for their maze running made fewer errors than rats that were not rewarded. However, on day 11, when these previously unrewarded rats were rewarded, they immediately made as few errors as the other rats. This experiment demonstrated the principle of latent learning. Can you think of examples of latent learning in your own life?

constrained in this manner, Tolman suggested that, through experience, even the rats that had received no reinforcement had formed a *cognitive map*, or mental image, of the maze. They formed these maps prior to being conditioned, which meant that learning could occur without reinforcement. The learning of these rats remained hidden, or *latent*, because they had no incentive to engage in the behavior that would demonstrate the learning until that behavior was reinforced. Tolman called such learning that is not currently manifest in behavior and occurs without apparent reinforcement **latent learning**. Based on this research and later studies, it is now clear that internal cognitive processes must be considered when explaining human, as well as animal, learning (Diaz & De la Casa, 2002; (Smith, 1994). Thus, despite Skinner's denials, operant conditioning is now thought to involve the cognitive *expectancy* that a given consequence will follow a given behavior.

Latent learning Learning that occurs without apparent reinforcement and is not demonstrated until sufficient reinforcement is provided

Learned Helplessness

In the 1960s, a group of researchers were studying *avoidance learning*—that is, learning caused by negative reinforcers—when they stumbled upon an interesting and puzzling phenomenon. In these experiments, a dog was placed on one side of a box with a wire grid floor. Next, a light came on, signaling that the animal's feet would be shocked in 10 seconds unless it jumped a hurdle and crossed to the other side of the box. This jumping response to the light was the avoidance learning, and the animals quickly learned to avoid the electrical shock by jumping the hurdle. In one experiment, prior to placing dogs in the box, the researchers first strapped them down in a harness and then classically conditioned them to fear the light by repeatedly pairing it with a mild electrical shock. To the researchers' surprise, when these dogs were later placed in the box, they did not learn the simple escape response—but instead passively lay down, whimpered, and accepted the shock (Overmier & Leaf, 1965).

Journey of Discovery

Many of the studies that have explored the principles of classical conditioning and operant conditioning were performed on animals, such as rats and pigeons. How can scientists make generalizations about the way people behave based on these studies? Why not just study people?

Why do you think exposure to inescapable shock later caused the dogs not to learn a very simple escape response? Two young graduate students, Martin Seligman and Steven Maier, offered an answer (Maier et al., 1969; Seligman & Maier, 1967). When shock is inescapable, dogs learn that they are helpless to exert control over the shock by means of any voluntary behaviors, and they expect this to be the case in the future. Because the dogs developed the *expectation* that their behavior had no effect on the outcome in the situation, they simply gave up trying to change the outcome. Seligman and Maier called this reaction **learned helplessness**. Here again, in contradiction to behaviorist theory, research demonstrated that mental processes play a significant role in learning.

Learned helplessness The passive resignation produced by repeated exposure to aversive events that cannot be avoided

In human studies, people exposed to uncontrollable bad events at first feel angry and anxious that their goals are being thwarted. However, after repeated exposure to these uncontrollable events, people begin to feel helpless; and their anger and anxiety are replaced with depression (Bargai et al., 2007; Waschbusch et al., 2003). They have learned to think of themselves as helpless victims who are controlled by external forces. This type of learning explains why many unemployed workers who are repeatedly passed over for new jobs eventually give up. Unfortunately, by concluding that there is nothing they can do to change their job status, these individuals often overlook real employment possibilities. In Chapters 12 and 15, we will examine the role that learned helplessness plays in depression.

Section REVIEW

- The law of effect states that behavior becomes more or less likely based on the effect it has in producing desirable or undesirable consequences.
- Primary reinforcers are innately reinforcing because they satisfy some biological need, whereas secondary reinforcers are learned through classical conditioning.
- Positive reinforcers strengthen a response by presenting a positive stimulus, whereas negative reinforcers strengthen a response by removing an aversive stimulus.
- The opposite consequence of reinforcement is punishment.
- Positive punishers weaken a response by presenting an aversive stimulus, whereas negative punishers weaken a response by removing a positive stimulus.
- To effectively shape behavior, punishment must be promptly administered, relatively strong, and consistently applied.
- Continuous reinforcement results in the fastest learning, whereas partial reinforcement maintains vigorous responding for longer periods of time.

- Partial reinforcement schedules are defined in terms of the number of responses (ratio) or the passage of time (interval): fixed-ratio, variable-ratio, fixed-interval, or variable-interval.
- Shaping involves reinforcing behaviors that are closer and closer approximations to the desired behavior.
- Accidental reinforcement can cause superstitious behavior.
- As with classical conditioning, learning in operant conditioning is limited by an animal's evolutionary heritage.
- Cognitive processes must be taken into account in order to fully understand operant conditioning principles.

7.3 Observational Learning

PREVIEW

- *What is observational learning?*
- *How is observational learning related to role models?*
- *Does watching TV violence increase aggression in children?*
- *Can negative effects of observational learning be controlled?*

Both classical and operant conditioning involve direct experience with desirable and undesirable outcomes. Yet, what about learning without direct experience? People and many animals learn by watching and imitating others. For example, by observing their mothers, jaguar cubs learn basic hunting techniques, as well as which prey are easiest to kill. Various bird species have also demonstrated their ability to learn by watching other birds perform specific actions (Akins et al., 2002; Baker, 2004). Similarly, while shopping one day, I couldn't help but notice a mother with her son, who looked about four years of age. She was yelling at the top of her lungs, "How many times have I told you not to yell at people?!!! I've told you, YOU HAVE TO BE POLITE!!!" Where do you think the child had learned his misbehavior?

7.3a Learning Often Occurs by Observing Others' Behavior.

Just as nonreinforced learning cannot be explained within the framework of either classical or operant conditioning, neither can the fact that people and other animals learn simply through observing the behavior of others. Instead, a third form of learning, observational learning, must be introduced. **Observational learning** is learning by observing and imitating the behavior of others. These others whom we observe and imitate are called *role models* because they teach us how to play social roles. Observational learning helps children learn how to behave in their families and in their cultures, and it also helps adults learn the skills necessary for career success. An example of behavior learned through observation is cigarette smoking. Research suggests that adolescents often decide to start smoking after observing their peers smoke (Hawkins et al., 1992). Which teens do you think are most susceptible to such influence? The answer is, those who are "outsiders," meaning that they have not yet been accepted into a teen group they desire to join. If the members of the group smoke, the outsiders imitate these teens and begin smoking.

Observational learning
Learning a behavior by observing and imitating the behavior of others (models)

Can you think of ways that this knowledge could be used in developing effective antismoking ads for teenagers?

Social learning theory A theory contending that people learn social behaviors mainly though observation and cognitive processing of information

Observational learning is the central feature of Albert Bandura's (1986) **social learning theory**, which contends that people learn social behaviors mainly through observation and cognitive processing of information, rather than through direct experience. According to this theory, when you watch others engage in an activity with which you are not familiar, a great deal of cognitive learning takes place before you yourself perform the behavior. For instance, consistent with the law of effect discussed earlier, you are most likely to imitate a model whose actions you see rewarded, and you are least likely to imitate behavior that is punished. This observational learning mechanism—in which you learn the consequences of an action by observing its consequences for someone else—is known as *vicarious conditioning*. As you can see, the only difference between this and the conditioning that occurs in operant learning is that, here, the behavior of others is being reinforced or punished rather than your own.

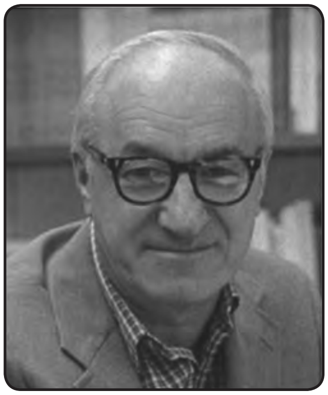


Photo courtesy of Albert Bandura

Albert Bandura, b. 1925.

A survey of 750 teenagers in Los Angeles indicated that having a role model or a mentor has a positive influence on the lives of adolescents (Yancey et al., 2002). In this study, a little over half the respondents reported that they had a role model whom they wanted to be like, with White teens (64 percent) being more likely to have role models than African American (53 percent) or Latino teens (54 percent). The most popular role models were parents and other relatives (32 percent); yet almost as many teenagers identified media figures such as athletes, singers, or musicians as their role models (28 percent). Girls most often identified people whom they personally knew as role models, whereas boys were more likely to identify sports stars and other media figures.

The teenagers who identified one or more important role models in their lives earned higher grades in school and had more positive self-esteem than those who did not have a role model. Among the minority adolescents, those who had no role models had the lowest levels of ethnic identity development, whereas those who had role models they personally knew had the highest levels of ethnic identity development. As previously discussed in Chapter 4, Section 4.5d, higher levels of ethnic identity development not only promote a strong sense of ethnic pride that protects minority youth from internalizing negative ethnic stereotypes into their self-concepts, but also help people pursue mainstream goals and participate in mainstream life. These findings, along with those of other studies (Bryant & Zimmerman, 2003; Flouri & Buchanan, 2003), demonstrate the important "role" that role models play in shaping the behavior and self-esteem of children and adolescents.

7.3b Mirror Neurons Play a Role in Observational Learning.

As we will discuss more fully in Chapter 9, humans have an inborn tendency to imitate one another; such imitation helps to form emotional bonds as well as to facilitate learning. PET scan and EEG recordings of people's brains while they observe another person performing an action find that similar neural circuits are firing in the observers' brains as those that are firing in the brains of those who are carrying out the action (Iacoboni, 2007). These specialized neural circuits located in the frontal lobes of the cerebral cortex are called *mirror neurons* (Gallese et al., 2007; Oberman et al., 2007). The firing of these mirror neurons probably does not directly cause imitative behavior, but they may serve as the basis of imitation learning. Adults and children with autism have trouble imitating other people's actions, and research suggests that they may have deficits in their mirror neuron circuits (Aamodt & Wang, 2008; Bernier & Dawson, 2009).

Mirror neurons not only play a role in imitating others' actions but also appear to play a role in *understanding* those actions—that is, in inferring the intentions of actions (Rizzolatti, 2005). Understanding other people's actions greatly facilitates learning because it informs the observer *why* others are doing what they are doing. Such understanding makes it easier for people to later transfer what they have learned in one context to another context.

Mirror neurons in the frontal lobes of the cerebral cortex appear to play a critical role in observational learning.

7.3c We Often Learn Aggressive Behavior Through Observation.

Research suggests that widespread media coverage of a violent incident is often followed by a sudden increase in similar violent crimes (Berkowitz & Macaulay, 1971; Phillips, 1983, 1986). Apparently, reading and watching news accounts of violence can trigger some people to "copy" the aggression. This dangerous manifestation of observational learning was dramatically illustrated following the 1999 shootings and bombings at Columbine High School in Littleton, Colorado, which left 17 people dead and many wounded. Over the next year, copycat threats and actions occurred in schools throughout the United States and Canada. What insights can psychology bring to bear on this type of learning?

Bandura (1979) believes children observe and learn aggression through many avenues, but the three principal ones are the family, the culture, and the media. First, in families where adults use violence, children grow up much more likely to use it themselves (Herrenkohl et al., 1983; Hunter & Kilstrom, 1979). Second, in communities where aggression is considered a sign of manhood, learned aggressive behaviors are eagerly and consciously transmitted from generation to generation, especially among males (Cohen & Nisbett, 1977; Rosenberg & Mercy, 1991). Finally, the media—principally television and the movies—unceasingly convey images of violence and mayhem to virtually all segments of society on a daily basis (Gerbner & Signorielli, 1990). Given the fact that children and teenagers often adopt figures from popular culture as role models, do you think they might imitate the antisocial behavior these individuals sometimes engage in? Let's examine some of the research that has analyzed the conditions under which the media and popular culture might influence aggressive behavior, especially in children and adolescents.

Violence Depicted on Television and in Films

The first set of experiments demonstrating the power of observational learning in eliciting aggression were the famous *Bobo doll studies* (Bandura et al., 1961), described in Chapter 2, Section 2.3c. Likewise, in another classic study conducted by Albert Bandura and his coworkers (1963), young children watched a short film in which an aggressive adult model named Rocky takes food and toys from someone named Johnny. In one condition, children saw Johnny respond by punishing Rocky, while in another condition, children saw Rocky sing "Hi ho, hi ho, it's off to play I go," as he pranced off with Johnny's belongings in a sack. Not surprisingly, those children who saw Rocky rewarded for his aggression behaved more aggressively than those who saw Rocky punished. The children who had observed Rocky's rewarded aggression often expressed disapproval of his actions, but many of them still directly imitated him, even down to incidental details. At the end of one session, for instance, a girl first strongly condemned Rocky's behavior and then turned to an experimenter and asked, "Do you have a sack?"

Although these findings might leave you with the impression that aggressive models that are punished have little negative impact on children's later behavior, this is not really the case. The research demonstrates that children are less likely to imitate the actions of punished aggressors. Does this mean these children fail to learn the aggressive behavior, or does it mean they simply inhibit the expression of these behaviors?

To answer this question, in one study, Bandura (1965) offered children a reward if they could imitate the aggressive behavior of the model they had previously observed. Every single one of the participants could mimic the model's aggressive actions, even those who had seen the punished model. Thus, simply observing someone being punished for aggression does not prevent the *learning* of aggression—it simply inhibits its *expression* in certain circumstances.

Numerous experimental studies indicate that exposure to media violence significantly enhances the aggression of children and adolescents in their interactions with strangers, classmates, and friends (Anderson et al., 2003a; Johnson et al., 2002). Further, longitudinal research conducted in a number of countries, including the United States, indicates that the early TV habits of children significantly predict their later aggressive behavior, even after statistically controlling for their initial aggressiveness. Consistent with our previous discussion of the importance of role models, what appears to significantly influence children's later aggressiveness is their *identification* with aggressive TV and movie characters. That is, children who watch a lot of media violence when they are young and identify with aggressive media characters are most likely to become highly aggressive later in life (Huesmann & Hasbrouck, 1996; Huesmann & Miller, 1994).

Violence Depicted in Music Lyrics and Music Videos

Is there any scientific evidence that the violence often depicted in music videos and in music lyrics increases aggressive tendencies and behavior? Several studies have examined this question. In one study involving young African American men, exposure to violent rap music videos increased endorsement of violent behavior in response to a hypothetical conflict situation (Johnson et al., 1995). Similarly, college students shown rock music videos containing violence subsequently displayed a greater acceptance of antisocial behavior compared with students in a control group (Hansen & Hansen, 1990). Regarding the effects of music lyrics, numerous studies have found consistent evidence that songs with violent lyrics increase aggression-related thoughts and feelings of hostility in listeners (Anderson et al., 2003b; Brummert-Lennings & Warburton, 2011). Overall, the implication of these findings is that watching and/or listening to violent music causes people to not only be more accepting of antisocial behavior, it also creates an emotional mindset for them that makes aggressive responses more likely.

Does exposure to violent music lyrics actually increase aggressive behavior? Peter Fischer and Tobias Greitemeyer (2006) addressed this question in a series of studies in which male and female participants in Germany listened to popular songs containing men-hating lyrics, women-hating lyrics, or neutral song lyrics. After listening to the selected songs, participants completed various psychological tasks, including some that measured aggressive attitudes and cognitions. When the study was supposedly completed, participants were asked to briefly help assign instructions to people in an unrelated study. The experimenter explained that this other study required people to stick their left hand in freezing cold ice water while they completed intellectual tasks, and they were further told that keeping the hand in ice water could be very painful, especially when this procedure lasted longer than 25 seconds. The participants' task was to decide how long two specific individuals—one female and one male—would hold their hand in the ice water. The assigned times given to the female and male were the dependent measures of aggression in the study.

Results indicated that male participants who listened to women-hating song lyrics not only reported more aggressive thoughts but also later behaved more aggressively to the female target person, assigning her significantly longer times of ice water treatment than did men who listened to neutral or men-hating lyrics. Similarly, women who listened to men-hating song lyrics reported more aggressive cognitions and later assigned significantly longer times of ice water treatment to the male target person than did women who listened to neutral or women-hating lyrics. Overall, these findings provide some evidence that exposure to violent music provokes aggressive thoughts in listeners and increases their aggressive responses toward people who are similar to the targeted victims in the music lyrics.

BVT Lab

Visit www.BVTLab.com to explore the student resources available for this chapter.

Media Violence and Emotional Desensitization

Beyond the learning of aggressive behavior through the repeated observation of violence, another possible negative effect of such observation is emotional blunting or *desensitization*, which means simply becoming indifferent to aggressive outbursts. For example, in a series of experiments, children who had just watched a violent movie were less concerned when they observed other youngsters fighting and were slower to stop the fight than a control group of children who had not seen the movie. Similar desensitization effects were also observed in college students who watched a lot of violent TV programs. When their physiological responses were monitored, the heavy consumers had the lowest levels of arousal when observing both fictional and realistic aggression (Bartholow et al., 2006; Thomas et al., 1977). These findings suggest that people who are exposed to a lot of media violence become habituated to violence in other areas of their lives (Carnagey et al., 2007; Krahé et al., 2011). Being less anxious and bothered by aggressive behavior, these individuals may be less inhibited than others in responding aggressively when facing social confrontations.

Of course, in examining all this research, it must be kept in mind that these findings do not mean that most people who regularly view or listen to media violence will begin terrorizing their schools, neighborhoods, and work settings. The relationship between viewing media violence and behaving aggressively is by no means perfect. It also does not mean that media violence is a primary cause of aggression in society. However, while exposure to such staged violence is not the primary cause of aggression, it may be the one factor that is easiest to control and reduce.

7.3d Positive Social Modeling Can Counteract the Negative Influence of Aggressive Models.

Living in a culture in which violent images saturate the media, what can you do as an individual to teach children not to imitate such behavior? First, remember that just as destructive models can teach people how to act aggressively, social learning theorists contend that nonaggressive models can urge observers to exercise restraint in the face of provocation. In an experiment supporting this claim, research participants who watched a nonaggressive model exhibit restraint in administering shocks to a "victim" in a learning experiment were subsequently less aggressive than those who had observed an aggressive model (Baron & Kepner, 1970).

Besides being reduced by nonaggressive models, aggression also can be controlled if an authority figure condemns the behavior of aggressive individuals. For example, research demonstrates that when a child watches violence on television in the presence of an adult who condemns the violence, the child is less likely to later imitate this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Research demonstrates that the negative effects of television violence can be reduced if adults condemn the violence when it occurs. However, for this strategy to work, adults must monitor children's television viewing and take the time to watch the shows with the children.

aggression (Hicks, 1968; Horton & Santogrossi, 1978). This bit of knowledge has not been lost on my wife and me in raising our own children. On more than one occasion while watching television with our daughters, the screen has suddenly erupted with violent images so quickly that we have not had time to change the channel. Each time this happened, we condemned the violence; and I can now tell you that our efforts paid off. A few years ago while we were watching a Looney Toons cartoon, Elmer Fudd pulled out a shotgun and blew the head off Daffy Duck. Without missing a beat, Lillian, who was four years old at the time, turned to us and said, "Boy, that wasn't very nice, was it? People shouldn't be so mean."

Finally, an essential ingredient in reducing aggressive responses is to diminish exposure to violence. Research indicates that aggressive behavior in children is significantly reduced when they spend less time watching violent television shows and playing violent videogames. One such study examined third- and fourth-grade students at two comparable schools over a six-month period (Robinson et al., 2001). In one of the schools, TV and videogame exposure was reduced by one-third when students and parents were encouraged to engage in alternative forms of home entertainment, while in the other school no effort was made to reduce exposure. The researchers found that children at the intervention school were subsequently less aggressive on the playground than students at the control school, especially those students who had been initially rated as most aggressive by their classmates.

Journey of Discovery

Why are the studies on observational learning now mostly based on human populations? Why does observational learning make evolutionary sense for human beings?

Section REVIEW

- Observational learning refers to learning by observing and imitating the behavior of others.
- Mirror neurons in the brain provide humans with an inborn tendency to imitate one another, and such imitation helps to form emotional bonds as well as to facilitate learning.
- Adolescents who have role models are more academically successful and have more positive self-esteem than those who have no role models.
- Watching violence on television may encourage children to become more aggressive, but they are less likely to imitate the actions of aggressors who are punished.
- The negative effects of observing aggression can be controlled by having an authority figure condemn the aggression.

PSYCHOLOGICAL applications

Learning How to Exercise Self-Control in Your Academic and Personal Life

- Do you have trouble getting out of bed in the morning to attend an early class?
- Do you procrastinate in studying for exams and end up cramming the night before?
- Do you tend to spend money quickly, thereby having little left to live on until your next paycheck?
- Are you having difficulty exercising on a regular basis?
- Would you like to stop smoking or cut down on your consumption of alcohol?

If you answered yes to any of these questions, the bad news is that you are struggling with issues of self-control. The good news, however, is that what you have learned in this chapter can help you regain control over those troubled aspects of your academic and personal life. In most self-control issues, problems arise because we choose *short-term reinforcers* that provide immediate gratification instead of choosing *long-term reinforcers* that provide delayed gratification. For instance, we sacrifice a chance at getting a good grade at the end of the semester for the luxury of getting an extra hour's sleep each class day. Likewise, we choose to continue smoking because doing so gives us an immediate nicotine high, even though smoking significantly lowers our life expectancy. Why do short-term reinforcers have greater incentive value than long-term reinforcers?

The Relative Value of Short-Term and Long-Term Reinforcers

Let's consider this question by examining the problem of early-morning class attendance. When resolving to change your habit of skipping class, you consider the incentive value of both the short-term and long-term reinforcers. In most cases, such resolutions are made when both reinforcers are relatively distant, such as just before you go to bed the night before class. At that time, the incentive value of getting a good grade is usually greater than the value of getting extra sleep, so you set your alarm for an early rising. However, as the availability of a reinforcer gets closer, its incentive value increases (Ainslie, 1975). Thus, when the alarm interrupts your sleep in the morning, the short-term reinforcer—extra sleep—is now immediately available, while the long-term reinforcer—a good grade—is still distant. Now it will be much harder to maintain your resolve and forgo the short-term reinforcement of extra sleep. If the thought of staying in your warm, comfy bed has greater incentive value than getting a good grade, you will break your nighttime resolution.

Strategies to Modify Troublesome Behavior

Now that you understand the process of shifting incentive values, what can you do to counteract the allure of these resolution-breaking, short-term reinforcers? You can adopt the following six strategies to modify your problem behavior and regain self-control.

1. *Set realistic goals*. Punishment weakens the behavior it follows. Because failure to reach your goals will punish your efforts, it is important that you set goals you can realistically achieve.

2. *Shape your behavior*. As previously noted, the delay in receiving a long-term reinforcement can weaken your resolve to change your troublesome behavior. One strategy to increase the incentive value of the long-term reinforcer is to *shape* your behavior. That is, give yourself modest reinforcers for achieving successive steps toward your ultimately desired goal. For example, after going for a week without missing class, reward yourself by going to a movie or spending time with friends. Similarly, if you were smoking a pack a day and wanted to stop, during the first week you might reward yourself if you smoked only a half-pack per day. Remember, a reinforcer strengthens the behavior it follows, not the behavior it precedes. Reinforce yourself only *after* you perform the desired behavior, not before. If you reward yourself before attending class, or before lowering your cigarette consumption, you are not reinforcing the desired behavior.

3. *Chart your progress*. To give yourself feedback on how well you are progressing toward meeting your goals, keep a chart of your progress. For example, to support your efforts to stop smoking, the chart would track how many cigarettes you smoked each day. Place the chart in a place where you will regularly see it. Charting your progress in this manner will bring into play both positive and negative reinforcement. You will praise yourself after reaching your daily goals, and you will work harder to remove the guilt—a negative reinforcer—that follows a day in which you fail to meet your goals.

4. *Identify environmental cues that trigger undesirable behavior.* Environmental stimuli can serve as signals that we are about to have access to certain desirable, yet harmful, situations or substances. For example, if you have regularly smoked after meals or when in taverns, those situations will likely trigger your urge to "light up" during the time you are trying to quit smoking. If you can identify these environmental cues, you can avoid putting

yourself in those situations while you are trying to change your behavior (stay away from taverns for a while). If you cannot avoid the tempting situations (as will be the case in eating meals), take steps to countercondition yourself. Instead of smoking after meals, have a favorite dessert or beverage.

5. *Keep focused on the long-term reinforcer.* As previously stated, the undesirable short-term reinforcers are generally more salient than the desirable long-term reinforcers. Thus, when tempted by these more salient and troublesome reinforcers, take advantage of the cognitive aspects of learning and selectively focus on the long-term reinforcers. For example, instead of succumbing to temptation and grabbing an extra hour of sleep, imagine how good you will feel at the end of the semester when you receive a good grade in your course. Such imagining can subjectively close the gap between the present and the future goal, increasing its incentive value in the present.
6. *Select desirable role models.* Observational learning teaches us that we can learn by observing and imitating the behavior of others. Just as you may have acquired your undesirable behavior by imitating others, you can change your behavior by identifying people who possess traits and skills you desire. By observing these individuals, you not only will learn how to behave differently but also will receive inspiration by seeing someone successfully doing what you ultimately want to do.

Key Terms

Acquisition 296
Classical conditioning 293
Conditioned response (CR) 293
Conditioned stimulus (CS) 293
Continuous reinforcement schedule 312
Extinction 298
Fixed-interval reinforcement schedule 314
Fixed-ratio reinforcement schedule 313
Higher-order conditioning 301
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Stimulus discrimination 300
Stimulus generalization 299
Superstitious behavior 315
Unconditioned response (UCR) 293
Unconditioned stimulus (UCS) 293
Variable-interval reinforcement schedule 314
Variable-ratio reinforcement schedule 314

Suggested Websites

Neuroscience: Learning and Memory

http://www.brembs.net/learning

This website presents information describing and distinguishing between classical and operant conditioning principles.

Animal Training at Sea World

http://www.seaworld.org/infobooks/Training/home.html

This Sea World website contains information about animal behavior and the training of marine animals at Sea World.

Albert Bandura

http://www.emory.edu/EDUCATION/mfp/bandurabio.html

This website at Emory University provides a biography of Albert Bandura, as well as an overview of his theory of observational learning and his research on modeling violence.

Review Questions

1. The person associated with classical conditioning is ______.
   a. B. F. Skinner
   b. Ivan Pavlov
   c. John Watson
   d. Martin Seligman
   e. *b* and *c*

2. Which of the following is true?
   a. Classical conditioning involves "mindless" automatic learning.
   b. Humans are passive in learning conditioned responses.
   c. Learning occurs when the conditioned stimulus comes after or at the same time as the unconditioned stimulus.
   d. *b* and *c*
   e. none of the above

3. Which of the following was missing from the experiment on Little Albert B.?
   a. extinction
   b. stimulus generalization
   c. punishment
   d. all of the above
   e. *a* and *c*

4. Which of the following is not an example of higher-order conditioning?
   a. A perfume sparks romantic feelings.
   b. A new acquaintance likes you because she knew and liked your sibling.
   c. Upon entering a room to take an exam, you experience test anxiety.
   d. You dislike Pringles™ potato chips because you once got sick from eating too many.
   e. none of the above

5. Which of the following can be used to protect endangered species from predators?
   a. conditioned taste aversion
   b. extinction
   c. spontaneous recovery
   d. *b* and *a*
   e. none of the above

6. Several hours after eating a burrito at a new restaurant, Adam becomes ill with a fever and vomiting. After several days, his doctor diagnoses him with the flu. However, for years after that, Adam can no longer eat a burrito without feeling sick. This is an example of which of the following?
   a. negative reinforcement
   b. learned taste aversion
   c. food punishment
   d. superstitious behavior
   e. stimulus generalization

7. In a study conducted by Öhman et al., which of the following was evidence of a neural mechanism for threat detection?
   a. Participants most quickly identifying spiders and snakes on a background of mushrooms and flowers.
   b. Participants most quickly identifying mushrooms and flowers on a background of spiders and snakes.
   c. Participants identifying natural solutions to threat situations in a picture of an outdoor environment.
   d. Participants more quickly identifying poisonous spiders and snakes in a picture than those that were nonthreatening.
   e. all of the above

8. Which of the following is true of B. F. Skinner?
   a. He assumed that latent learning was not possible.
   b. He overlooked the impact of inborn biology on learning.
   c. He elaborated on the law of effect.
   d. He was named Burrhus Frederick Skinner.
   e. all of the above

9. Which of the following could be a reinforcer for students to study more?
   a. money
   b. less homework
   c. studying with someone you enjoy being with
   d. good grades
   e. all of the above

10. Which of the following is a primary reinforcer?
    a. food
    b. water
    c. warmth
    d. sex
    e. all of the above

11. Which of the following is a negative reinforcer?
    a. money received for mowing the lawn
    b. being fired by your boss for getting to work late
    c. the annoying knocking in your car that leads you to the mechanic
    d. money won in the lottery
    e. none of the above

12. What is the type of reinforcement that has the greatest long-term effects?
    a. continuous reinforcement schedule
    b. fixed-ratio reinforcement schedule
    c. variable-ratio reinforcement schedule
    d. punishment
    e. none of the above

13. What is the term for something that weakens behavior by presenting an aversive stimulus?
    a. negative reinforcement
    b. shaping
    c. punishment
    d. avoidance behavior
    e. none of the above

14. Which of the following is a drawback of punishment?
    a. It doesn't teach new, desirable forms of behavior.
    b. It can lead to more aggression.
    c. It encourages aggressive behavior.
    d. all of the above
    e. none of the above

15. Repeatedly attempting to contact your Internet dial-up server when you receive a busy signal or have been informed that it is currently unavailable is an example of which type of reinforcement?
    a. continuous
    b. variable-ratio
    c. fixed-ratio
    d. variable-interval
    e. fixed-interval

16. Which of the following might be an example of superstitious behavior?
    a. jumping when someone jumps out and says "boo"
    b. pushing an elevator button again and again until the elevator arrives
    c. salivating when someone talks about food
    d. studying harder after being praised
    e. experiencing a feeling of calmness after engaging in prayer or meditation

Chapter Review

17. What is the term for learning that has occurred without apparent reinforcement and that is not currently manifest in behavior?
    a. superstitious behavior
    b. instinctual drift
    c. innate intelligence
    d. latent learning
    e. collective wisdom

18. Which of the following is true of social learning theory?
    a. It contends that people learn social behavior through direct experience.
    b. It is inconsistent with the law of effect.
    c. It requires cognition.
    d. all of the above
    e. none of the above

19. Which of the following is indicated by the survey research on the "role" of role models among teenagers?
    a. The most popular role models are identifiable media figures.
    b. All teenagers have someone they can identify as a role model.
    c. Individuals with role models are most likely to perform better in school.
    d. All races and ethnicities are equally likely to identify role models.
    e. all of the above

20. Which of the following is true?
    a. Media are the primary cause of aggression in children.
    b. Observing someone being punished for behaving aggressively does not prevent the learning of aggression.
    c. Less time watching violent TV diminishes aggressive behavior.
    d. *b* and *c*
    e. all of the above

21. Applying the learning principles in Chapter 7, which of the following would be helpful in modifying troublesome behavior?
    a. Identifying environmental cues that trigger undesirable behavior.
    b. Keeping focused on long-term reinforcers.
    c. Selecting desirable role models.
    d. Charting your progress.
    e. all of the above

Answers: 1.e 2.a 3.e 4.d 5.a 6.b 7.a 8.e 9.e 10.e 11.c 12.c 13.c 14.d 15.d 16.b 17.d 18.c 19.c 20.d 21.e