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Learning

In the early 1940s, University of Minnesota graduate students Marian Breland and Keller Breland witnessed the power of a new learning technology. Their mentor, B. F. Skinner, would become famous for *shaping* rat and pigeon behaviors, by delivering well-timed rewards as the animals inched closer and closer to a desired behavior. Impressed with Skinner's results, the Brelands began shaping the behavior of cats, chickens, parakeets, turkeys, pigs, ducks, and hamsters (Bailey & Gillaspie, 2005). The rest is history. The company they formed spent the next half-century training more than 15,000 animals from 140 species for movies, traveling shows, amusement parks, corporations, and the government.

While writing about animal trainers, Amy Sutherland wondered if shaping had uses closer to home (2006a,b). If baboons could be trained to skateboard and elephants to paint, might “the same techniques . . . work on that stubborn but lovable species, the American husband”? Step by step, she “began thanking Scott if he threw one dirty shirt into the hamper. If he threw in two, I’d kiss him [and] as he basked in my appreciation, the piles became smaller.” After two years of “thinking of my husband as an exotic animal species,” she reported, “my marriage is far smoother, my husband much easier to love.”

Like husbands and other animals, much of what we do we learn from experience. Indeed, nature’s most important gift may be our *adaptability*—our capacity to learn new behaviors that help us cope with our changing world. We can learn how to build grass huts or snow shelters, submarines or space stations, and thereby adapt to almost any environment.

Learning breeds hope. What is learnable we may be able to teach—a fact that encourages animal trainers, and also parents, educators, and coaches. What has been learned we may be able to change by new learning—an assumption underlying stress management and counseling programs. No matter how unhappy, unsuccessful, or unloving we are, we can learn and change.

No topic is closer to the heart of psychology than *learning*, the process of acquiring, through experience, new and relatively enduring information or behaviors. (Learning acquires information, and memory—our next chapter topic—retains it.) In earlier chapters we considered the learning of sleep patterns, of gender roles, of visual perceptions. In later chapters we will see how learning shapes our thoughts, our emotions, our personality, and our attitudes.



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How Do We Learn?

LOQ Learning Objective Question

6-1 How do we define *learning*, and what are some basic forms of learning?

By **learning**, we humans are able to adapt to our environments. We learn to expect and prepare for significant events such as food or pain (*classical conditioning*). We learn to repeat acts that bring good results and to avoid acts that bring bad results (*operant conditioning*). We learn new behaviors by observing events and by watching other people, and through language, we learn things we have neither experienced nor observed (*cognitive learning*). But how do we learn?

One way we learn is by *association*. Our minds naturally connect events that occur in sequence. Suppose you see and smell freshly baked bread, eat some, and find it satisfying. The next time you see and smell fresh bread, you will expect that eating it will again be satisfying. So, too, with sounds. If you associate a sound with a frightening consequence, hearing the sound alone may trigger your fear. As one 4-year-old said after watching a TV character get mugged, “If I had heard that music, I wouldn’t have gone around the corner!” (Wells, 1981).

Learned associations also feed our habitual behaviors (Wood et al., 2014b). Habits can form when we repeat behaviors in a given context—sleeping in the same comfy position in bed, biting our nails in class, eating buttery popcorn in the movie theater. As behavior becomes linked with the context, our next experience of that context will evoke our habitual response. Especially when our willpower is depleted, as when we’re mentally fatigued, we tend to fall back on our habits—good or bad (Graybiel & Smith, 2014; Neal et al., 2013). To increase our self-control, to connect our resolutions with positive outcomes, the key is forming “beneficial habits” (Galla & Duckworth, 2015). How long does it take to form a beneficial habit? To find out, researchers asked 96 university students to choose some healthy behavior,

such as running before dinner or eating fruit with lunch, and to perform it daily for 84 days. The students also recorded whether the behavior felt automatic (something they did without thinking and would find hard not to do). When did the behaviors turn into habits? After about 66 days, on average (Lally et al., 2010). Is there something you’d like to make a routine or essential part of your life? Just do it every day for two months, or a bit longer for exercise, and you likely will find yourself with a new habit. This happened for both of us—with a midday workout [DM] or late afternoon run [ND] having long ago become an automatic daily routine.

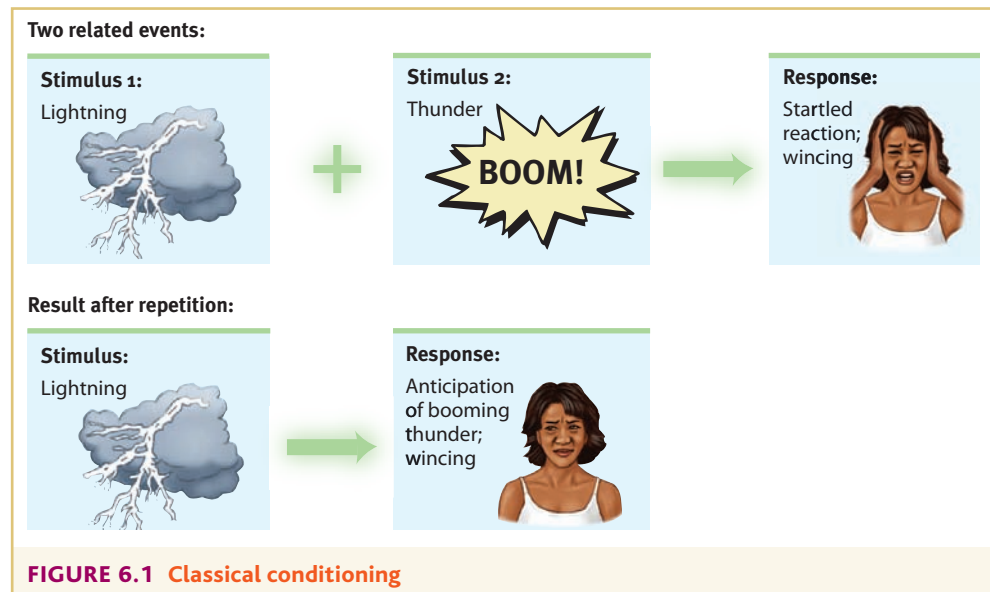
Other animals also learn by association. To protect itself, the sea slug *Aplysia* withdraws its gill when squirted with water. If the squirts continue, as happens naturally in choppy water, the withdrawal response weakens. But if the sea slug repeatedly receives an electric shock just after being squirted, its protective response to the squirt instead grows stronger. The animal has learned that the squirt signals an upcoming shock.

Complex animals can learn to link outcomes with their own responses. An aquarium seal will repeat behaviors, such as slapping and barking, that prompt people to toss it a herring.

By linking two events that occur close together, the sea slug and the seal are exhibiting **associative learning**. The sea slug associated the squirt with an upcoming shock. The seal associated its slapping and barking with a herring treat. Each animal has learned something important to its survival: anticipating the immediate future.

This process of learning associations is *conditioning*. It takes two main forms:

- In *classical conditioning*, we learn to associate two stimuli and thus to anticipate events. (A **stimulus** is any event or situation that evokes a response.) We learn that a flash of lightning will be followed by a crack of thunder, so when lightning flashes nearby, we start to brace ourselves (**FIGURE 6.1**). We associate stimuli that we do not control, and we automatically respond. This is called **respondent behavior**.
- In *operant conditioning*, we learn to associate an action (our behavior) and its consequence. Thus, we (and other animals) learn to repeat acts followed by good results (**FIGURE 6.2**) and to avoid acts followed by bad results. These associations produce **operant behaviors**.



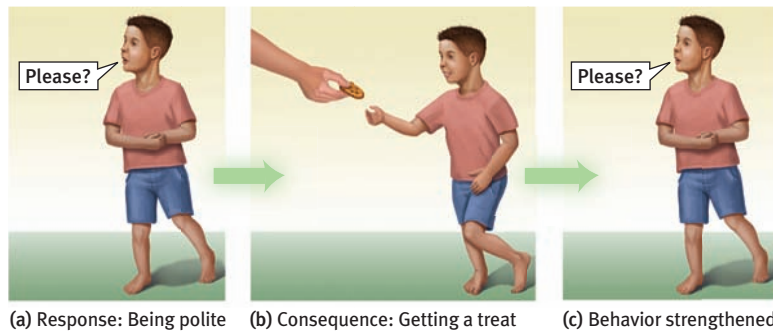


FIGURE 6.2 Operant conditioning

Conditioning is not the only form of learning. Through **cognitive learning** we acquire mental information that guides our behavior. *Observational learning*, one form of cognitive learning, lets us learn from others' experiences. Chimpanzees, for example, sometimes learn behaviors merely by watching others. If one animal sees another solve a puzzle and gain a food reward, the observer may perform the trick more quickly. So, too, in humans: We look and we learn.



Retrieve + Remember

- Why are habits, such as having something sweet with that cup of coffee, so hard to break?

ANSWER: Habits form when we repeat behaviors in a given context and, as a result, learn associations—often without our awareness. For example, we may have eaten a sweet pastry with a cup of coffee often enough to associate the flavor of the coffee with the treat, so that the cup of coffee alone just doesn't seem right anymore!

Classical Conditioning

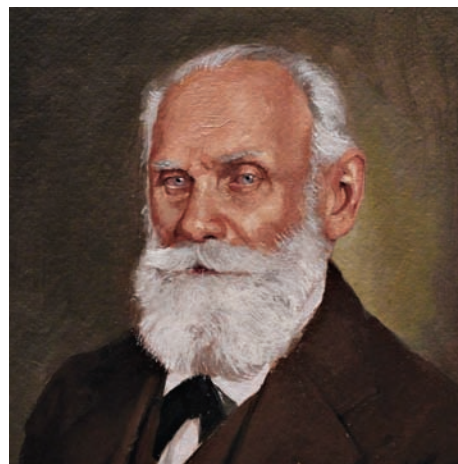
For many people, the name Ivan Pavlov (1849–1936) rings a bell. His early twentieth-century experiments—now psychology's most famous research—are classics. The process he explored we justly call **classical conditioning**.

Pavlov's Experiments

LOQ 6-2 What is *classical conditioning*, and how does it demonstrate *associative learning*?

For his studies of digestion, Pavlov (who held a medical degree) earned Russia's first Nobel Prize. But his novel experiments on learning, which consumed the last three decades of his life, earned Pavlov his place in history.

Pavlov's new direction came when his creative mind focused on what seemed to others an unimportant detail. Without fail, putting food in a dog's mouth caused the animal to drool—to salivate. Moreover, the dog began salivating not only to the taste of the food but also to the mere sight of the food or the



IVAN PAVLOV "Experimental investigation . . . should lay a solid foundation for a future true science of psychology" (1927).

food dish. The dog even drooled at the sight of the person delivering the food or the sound of that person's approaching footsteps. At first, Pavlov considered these "psychic secretions" an annoyance. Then he realized they pointed to a simple but important form of learning.

Pavlov and his assistants tried to imagine what the dog was thinking and feeling as it drooled in anticipation of the food. This only led them into useless debates. So, to make their studies more objective, they experimented. To rule out other possible influences, they isolated the dog in a small room, placed it in a harness, and attached a device to measure its saliva. Then, from the next room, they presented food. First, they slid in a food bowl. Later, they blew meat powder into the dog's mouth at a precise moment. Finally, they paired various **neutral stimuli (NS)**—events the dog could see or hear but didn't associate with food—with food in the dog's mouth. If a sight or sound regularly signaled the arrival of food, would the dog learn the link? If so, would it begin salivating in anticipation of the food?

learning the process of acquiring, through experience, new and relatively enduring information or behaviors.

associative learning learning that certain events occur together. The events may be two stimuli (as in classical conditioning) or a response and its consequences (as in operant conditioning).

stimulus any event or situation that evokes a response.

respondent behavior behavior that occurs as an automatic response to some stimulus.

operant behavior behavior that operates on the environment, producing consequences.

cognitive learning the acquisition of mental information, whether by observing events, by watching others, or through language.

classical conditioning a type of learning in which we learn to link two or more stimuli and anticipate events.

neutral stimulus (NS) in classical conditioning, a stimulus that evokes no response before conditioning.

PEANUTS



The answers proved to be Yes and Yes. Just before placing food in the dog's mouth to produce salivation, Pavlov sounded a tone. After several pairings of tone and food, the dog got the message. Anticipating the meat powder, it began salivating to the tone alone. In later

experiments, a buzzer, a light, a touch on the leg, even the sight of a circle set off the drooling.

A dog doesn't learn to salivate in response to food in its mouth. Rather, food in the mouth automatically, *unconditionally*, triggers this response. Thus, Pavlov called the drooling an **unconditioned response (UR)**. And he called the food an **unconditioned stimulus (US)**.

Salivating in response to a tone, however, is learned. Because it is *conditional* upon the dog's linking the tone with the food (**FIGURE 6.3**), we call this response the **conditioned response (CR)**. The stimulus that used to be neutral (in this case, a previously meaningless tone that now triggers drooling) is the **conditioned stimulus (CS)**. Remembering the difference between these two kinds of stimuli and responses is easy: Conditioned = learned; unconditioned = unlearned.

If Pavlov's demonstration of associative learning was so simple, what did he do for the next three decades? What discoveries did his research factory publish

in his 532 papers on salivary conditioning (Windholz, 1997)? He and his associates explored five major conditioning processes: *acquisition*, *extinction*, *spontaneous recovery*, *generalization*, and *discrimination*.

Remember:

NS = Neutral Stimulus

US = Unconditioned Stimulus

UR = Unconditioned Response

CS = Conditioned Stimulus

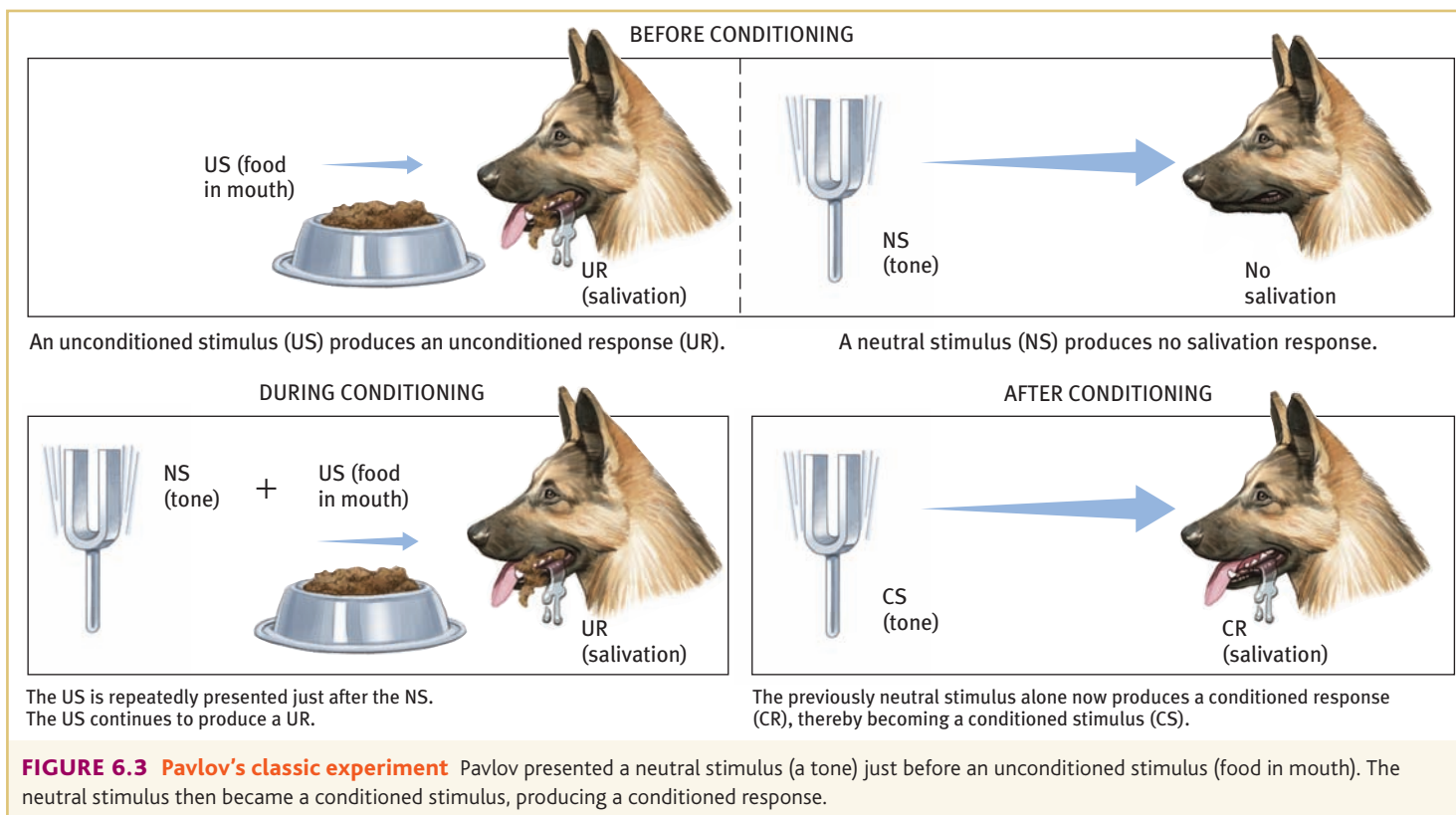
CR = Conditioned Response



Retrieve + Remember

- An experimenter sounds a tone just before delivering an air puff that causes your eye to blink. After several repetitions, you blink to the tone alone. What is the NS? The US? The UR? The CS? The CR?

ANSWERS: NS = tone before conditioning; US = air puff; UR = blink to air puff; CS = tone after conditioning; CR = blink to tone



Acquisition

LOQ 6-3 What parts do acquisition, extinction, spontaneous recovery, generalization, and discrimination play in classical conditioning?

Acquisition is the first stage in classical conditioning. This is the point when Pavlov's dogs learned the link between the NS (the tone, the light, the touch) and the US (the food). To understand this stage, Pavlov and his associates wondered: How much time should pass between presenting the neutral stimulus and the food? In most cases, not much—half a second usually works well.

What do you suppose would happen if the food (US) appeared before the tone (NS) rather than after? Would conditioning occur? Not likely. With only a few exceptions, conditioning doesn't happen when the NS follows the US. *Remember, classical conditioning is biologically adaptive because it helps humans and other animals prepare for good or bad events.* To Pavlov's dogs, the originally neutral tone became a CS after signaling an important biological event—the arrival of food (US). To deer in the forest, the snapping

of a twig (CS) may signal a predator's approach (US).

More recent research on male Japanese quail shows how a CS can signal another important biological event (Domjan, 1992, 1994, 2005). Just before presenting a sexually approachable female quail, the researchers turned on a red light. Over time, as the red light continued to announce the female's arrival, the light caused the male quail to become excited. They developed a preference for their cage's red-light district. When a female appeared, they mated with her more quickly and released more semen and sperm (Matthews et al., 2007). This capacity for classical conditioning gives the quail a reproductive edge.



Eric Isselée/Shutterstock

Can objects, sights, and smells associated with sexual pleasure become conditioned stimuli for human sexual arousal, too? Indeed they can (Byrne, 1982; Hoffman, 2012). Onion breath does not usually produce sexual arousal (FIGURE 6.4). But

when repeatedly paired with a passionate kiss, it can become a CS and do just that. The larger lesson: *Conditioning helps an animal survive and reproduce—by responding to cues that help it gain food,*

avoid dangers, locate mates, and produce offspring (Hollis, 1997). Learning makes for yearning.



Retrieve + Remember

- In horror movies, sexually arousing images of women are sometimes paired with violence against women. Based on classical conditioning principles, what might be an effect of this pairing?

ANSWER: If viewing an attractive nude or semi-nude woman (a US) elicits sexual arousal in some viewers (a UR), then pairing the US with a new stimulus (violence) could turn the violence into a conditioned stimulus (CS) that also becomes sexually arousing, a conditioned response (CR).

Extinction and Spontaneous Recovery

What would happen, Pavlov wondered, if after conditioning, the CS occurred repeatedly without the US? If the tone sounded again and again, but no food appeared, would the tone still trigger drooling? The answer was mixed.

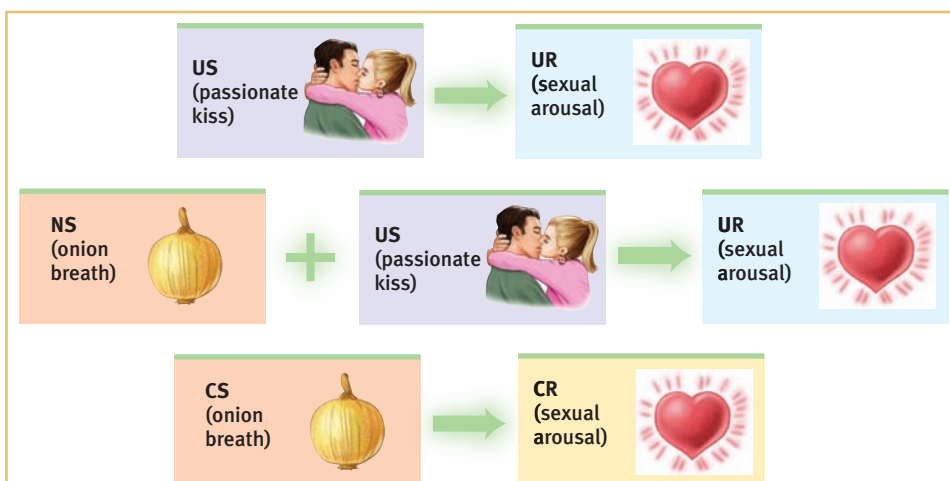


FIGURE 6.4 An unexpected CS Psychologist Michael Tirrell (1990) recalled: "My first girlfriend loved onions, so I came to associate onion breath with kissing. Before long, onion breath sent tingles up and down my spine. Oh what a feeling!"

unconditioned response (UR) in classical conditioning, an unlearned, naturally occurring response (such as salivation) to an unconditioned stimulus (US) (such as food in the mouth).

unconditioned stimulus (US) in classical conditioning, a stimulus that unconditionally—naturally and automatically—triggers a response (UR).

conditioned response (CR) in classical conditioning, a learned response to a previously neutral (but now conditioned) stimulus (CS).

conditioned stimulus (CS) in classical conditioning, an originally irrelevant stimulus that, after association with an unconditioned stimulus (US), comes to trigger a conditioned response (CR).

acquisition in classical conditioning, the initial stage, when we link a neutral stimulus and an unconditioned stimulus so that the neutral stimulus begins triggering the conditioned response. (In operant conditioning, the strengthening of a reinforced response.)

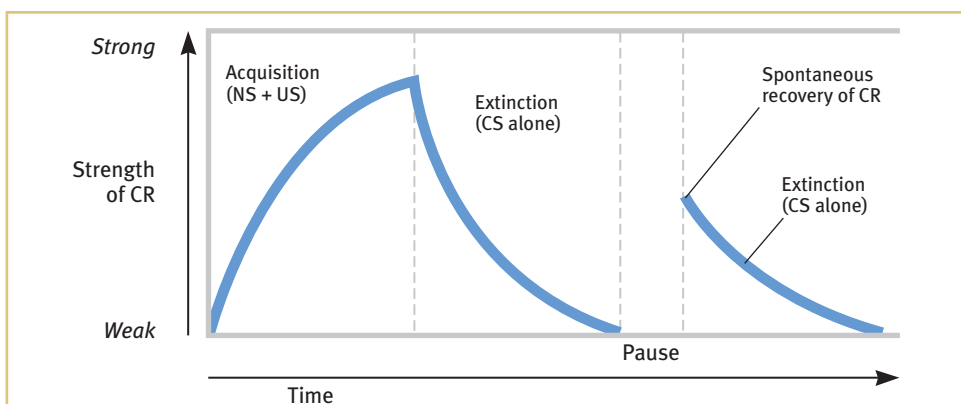


FIGURE 6.5 Acquisition, extinction, and spontaneous recovery The rising curve (simplified here) shows the CR rapidly growing stronger as the NS becomes a CS due to repeated pairing with the US (*acquisition*). The CR then weakens rapidly as the CS is presented alone (*extinction*). After a pause, the (weakened) CR reappears (*spontaneous recovery*).

The dogs salivated less and less, a reaction known as **extinction**—a drop-off in responses when a CS (tone) no longer signals an upcoming US (food). But the dogs began drooling to the tone again if Pavlov scheduled several tone-free hours. This **spontaneous recovery**—the reappearance of a (weakened) CR after a pause—suggested to Pavlov that extinction was *suppressing* the CR rather than eliminating it (**FIGURE 6.5**).



Retrieve + Remember

- The first step of classical conditioning, when an NS becomes a CS, is called _____. When a US no longer follows the CS, and the CR becomes weakened, this is called _____.

ANSWERS: acquisition; extinction

Generalization

Pavlov and his students noticed that a dog conditioned to the sound of one tone also responded somewhat to the sound of a new and different tone. Likewise, a dog conditioned to salivate when rubbed would also drool a bit when scratched or when touched on a different body part (Windholz, 1989). This tendency to respond similarly to stimuli that resemble the CS is called **generalization**.

Generalization can be adaptive, as when toddlers who learn to fear moving cars also become afraid of moving trucks and motorcycles. And generalized fears can linger. One Argentine writer who had been tortured recalled flinching with fear years later at the sight of black shoes—his first glimpse of his torturers as they approached his cell. This generalized fear response was found in laboratory studies comparing abused and nonabused children (Pollak et al., 1998). When an angry face appeared on a computer screen, abused children's brain-wave responses were dramatically stronger and longer lasting. And when a face that we've been conditioned to like (or dislike) is morphed into another face, we also have some tendency to like (or dislike) the vaguely similar morphed face (Gawronski & Quinn, 2013). In all these human examples, people's emotional reactions to one stimulus have generalized to similar stimuli.

Discrimination

Pavlov's dogs also learned to respond to the sound of a particular tone and *not* to other tones. This learned ability to *distinguish* between a conditioned stimulus (which predicts the US) and other irrelevant stimuli is called **discrimination**. Being able to recognize differences is adaptive. Slightly different stimuli can

be followed by vastly different results. Facing a guard dog, your heart may race; facing a guide dog, it probably will not.



Retrieve + Remember

- What conditioning principle is affecting the snail's affections?



"I don't care if she's a tape dispenser. I love her."

ANSWER: generalization

The New Yorker Collection, 1998. Sam Gross from cartoonbank.com. All rights reserved.

Pavlov's Legacy

LOQ 6-4 Why is Pavlov's work important, and how is it being applied?

What remains today of Pavlov's ideas? A great deal. Most psychologists now agree that classical conditioning is a basic form of learning. Judged with today's knowledge of the biological and cognitive influences on conditioning, Pavlov's ideas were incomplete. But if we see further than Pavlov did, it is because we stand on his shoulders.

Why does Pavlov's work remain so important? If he had merely taught us that old dogs can learn new tricks, his experiments would long ago have been forgotten. Why should we care that dogs can be conditioned to drool at the sound of a tone? The importance lies first in this finding: *Many other responses to many other stimuli can be classically conditioned in many other creatures*—in fact, in every species tested, from earthworms to fish to dogs to monkeys to people (Schwartz, 1984). Thus, classical conditioning is one way that virtually all animals learn to adapt to their environment.

Second, Pavlov showed us how a process such as learning can be studied objectively. He was proud that his methods were

not based on guesswork about a dog's mind. The salivary response is a behavior we can measure in cubic centimeters of saliva. Pavlov's success therefore suggested a scientific model for how the young field of psychology might proceed. That model was to isolate the basic building blocks of complex behaviors and study them with objective laboratory procedures.



Retrieve + Remember

- If the aroma of cake baking makes your mouth water, what is the US? The CS? The CR?

ANSWERS: The cake is the US. The associated aroma is the CS. Salivation to the aroma is the CR.



To review Pavlov's classic work and to play the role of experimenter in classical conditioning research, visit LaunchPad's *PsychSim 6: Classical Conditioning*. See also a 3-minute recreation of Pavlov's lab in the *Video: Pavlov's Discovery of Classical Conditioning*.

Classical Conditioning in Everyday Life

Other chapters in this text—on motivation and emotion, stress and health, psychological disorders, and therapy—show how Pavlov's principles can influence human health and well-being. Two examples:

- Drugs given as cancer treatments can trigger nausea and vomiting. Patients may then develop classically conditioned nausea (and sometimes anxiety) to the sights, sounds, and smells associated with the clinic (Hall, 1997). Merely entering the clinic's waiting room or seeing the nurses can provoke these feelings (Burish & Carey, 1986).
- Former drug users often feel a craving when they are again in the drug-using context. They associate particular people or places with previous highs. Thus, drug

counselors advise their clients to steer clear of people and settings that may trigger these cravings (Siegel, 2005).

Does Pavlov's work help us understand our own emotions? John B. Watson thought so. He believed that human emotions and behaviors, though biologically influenced, are mainly a bundle of conditioned responses (1913). Working with an 11-month-old, Watson and his graduate student Rosalie Rayner (1920; Harris, 1979) showed how specific fears might be conditioned. Like most infants, "Little Albert" feared loud noises but not white rats. Watson and Rayner presented a white rat and, as Little Albert reached to touch it, struck a hammer against a steel bar just behind the infant's head. After seven repeats of seeing the rat and hearing the frightening noise, Albert burst into tears at the mere sight of the rat. Five days later, he had generalized this startled fear reaction to the sight of a rabbit, a dog, and a sealskin coat, but not to dissimilar objects.

For years, people wondered what became of Little Albert. Detective work by Russell Powell and his colleagues (2014) found that the child of one of the campus hospital's wet nurses matched Little Albert's description. The child, William Albert Barger, went by Albert B.—precisely the name used by Watson and Rayner. This Albert died in 2007. He was an easygoing person, though, perhaps coincidentally, he had an aversion to dogs. Albert died without ever knowing of his role in psychology's history.

People also wondered what became of Watson. After losing his Johns Hopkins professorship over an affair with Rayner (whom he later married), he joined an advertising agency as the company's resident psychologist. There, he used his knowledge of associative learning in many successful advertising campaigns. One of them, for Maxwell House, helped make the "coffee break" an American custom (Hunt, 1993).

The treatment of Little Albert would be unethical by today's standards.

Also, some psychologists had difficulty repeating Watson and Rayner's findings with other children. Nevertheless, Little Albert's learned fears led many psychologists to wonder whether each of us might be a walking storehouse of conditioned emotions. If so, might extinction procedures or new conditioning help us change our unwanted responses to emotion-arousing stimuli?



See LaunchPad's *Video: Research Ethics* for a helpful tutorial animation.

Comedian-writer Mark Malkoff extinguished his fear of flying by doing just that. With support from an airline, he faced his fear. Living on an airplane for 30 days and taking 135 flights, he spent 14 hours a day in the air. After a week and a half, Malkoff's fear had faded, and he began playing games with fellow passengers (NPR, 2009). (His favorite: He'd put one end of a toilet paper roll in the toilet, unroll the rest down the aisle, and flush—sucking down the whole roll in 3 seconds.) In Chapters 13 and 14, we will see more examples of how psychologists use behavioral techniques such as *counterconditioning* to treat emotional disorders and promote personal growth.

extinction in classical conditioning, the weakening of a conditioned response when an unconditioned stimulus does not follow a conditioned stimulus. (In operant conditioning, the weakening of a response when it is no longer reinforced.)

spontaneous recovery the reappearance, after a pause, of an extinguished conditioned response.

generalization in classical conditioning, the tendency, after conditioning, to respond similarly to stimuli that resemble the conditioned stimulus. (In operant conditioning, *generalization* occurs when our responses to similar stimuli are also reinforced.)

discrimination in classical conditioning, the learned ability to distinguish between a conditioned stimulus and other irrelevant stimuli. (In operant conditioning, the ability to distinguish responses that are reinforced from those that are not.)

Retrieve + Remember



Archives of the History of American Psychology, The Center for the History of Psychology, The University of Akron

- In Watson and Rayner's experiments, "Little Albert" learned to fear a white rat after repeatedly experiencing a loud noise as the rat was presented. In these experiments, what was the US? The UR? The NS? The CS? The CR?

ANSWERS: The US was the loud noise; the UR was the fear response to the noise; the NS was the rat before it was paired with the noise; the CS was the rat after pairing; the CR was fear of the rat.

Operant Conditioning

LOQ 6-5 What is *operant conditioning*, and how is operant behavior reinforced and shaped?

It's one thing to classically condition a dog to drool at the sound of a tone, or a child to fear a white rat. To teach an elephant to walk on its hind legs or a child to say *please*, we must turn to another type of learning—*operant conditioning*.

Classical conditioning and operant conditioning are both forms of associative learning. But their differences are straightforward:

- In *classical conditioning*, an animal (dog, child, sea slug) forms associations between two events it does not control. Classical conditioning involves *respondent behavior*—automatic responses to a stimulus (such as salivating in response to meat powder and later in response to a tone).
- In *operant conditioning*, animals associate their own actions with consequences. Actions followed by

a rewarding event increase; those followed by a punishing event decrease. Behavior that *operates* on the environment to *produce* rewarding or punishing events is called *operant behavior*.

We can therefore distinguish our classical from our operant conditioning by asking two questions. *Are we learning associations between events we do not control* (classical conditioning)? *Or are we learning associations between our behavior and resulting events* (operant conditioning)?

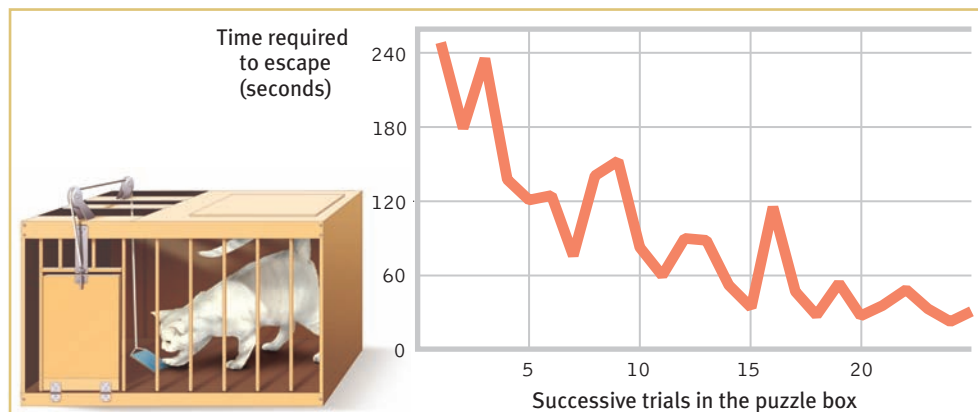


FIGURE 6.6 Cat in a puzzle box Thorndike used a fish reward to entice cats to find their way out of a puzzle box through a series of maneuvers. The cats' performance tended to improve with successive trials, illustrating Thorndike's *law of effect*. (Data from Thorndike, 1898.)

Retrieve + Remember

- With classical conditioning, we learn associations between events we _____ (do/do not) control. With operant conditioning, we learn associations between our behavior and _____ (resulting/random) events.

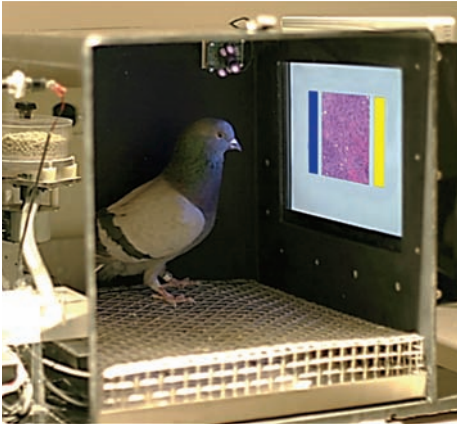
ANSWERS: do not; resulting

Skinner's Experiments

B. F. Skinner (1904–1990) was a college English major who had set his sights on becoming a writer. Then, seeking a new direction, he became a graduate student in psychology, and, eventually, modern *behaviorism's* most influential and controversial figure.

Skinner's work built on a principle that psychologist Edward L. Thorndike (1874–1949) called the **law of effect**: Rewarded behavior tends to be repeated (**FIGURE 6.6**). From this starting point, Skinner went on to develop experiments that would reveal principles of *behavior control*. By shaping pigeons' natural walking and pecking behaviors, for example, Skinner was able to teach them such unpigeon-like behaviors as walking in a figure 8, playing Ping-Pong, and keeping a missile on course by pecking at a screen target. With operant conditioning, pigeons can

Levenson RM, Krupinski EA, Navarro VM, Wasserman EA (2015). Pigeons (Columba livia) as Trainable Observers of Pathology and Radiology Breast Cancer Images. PLoS ONE 10(11): e0141357.



BIRD BRAINS SPOT TUMORS After being rewarded with food when correctly spotting breast tumors, pigeons became as skilled as humans at discriminating cancerous from healthy tissue.

display “remarkable ability” at identifying malignant tumors in breast cancer images (Levenson et al., 2015).

For his studies, Skinner designed an **operant chamber**, popularly known as a **Skinner box** (FIGURE 6.7). The box has a bar or button that an animal presses or pecks to release a food or water reward. It also has a device that records these responses. This design creates a stage on which rats and other animals act out Skinner’s concept of **reinforcement**: any event that strengthens (increases the frequency of) a preceding response. What is reinforcing depends on the animal and the conditions. For people, it may be praise, attention, or a paycheck.

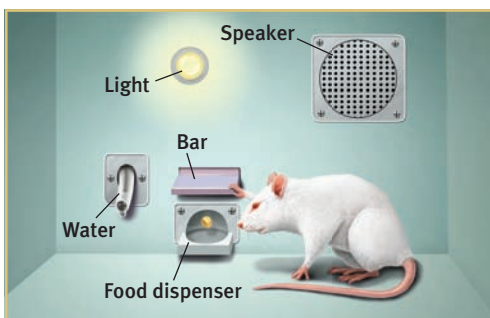


FIGURE 6.7 A Skinner box Inside the box, the rat presses a bar for a food reward. Outside, measuring devices (not shown here) record the animal’s accumulated responses.

For hungry and thirsty rats, food and water work well. Skinner’s experiments have done far more than teach us how to pull habits out of a rat. They have explored the precise conditions that foster efficient and enduring learning.

Shaping Behavior

Imagine that you wanted to condition a hungry rat to press a bar. Like Skinner, you could tease out this action with **shaping**, gradually guiding the rat’s actions toward the desired behavior. First, you would watch how the animal naturally behaves, so that you could build on its existing behaviors. You might give the rat a bit of food each time it approaches the bar. Once the rat is approaching regularly, you would give the treat only when it moves close to the bar, then closer still. Finally, you would require it to touch the bar to get food. By rewarding *successive approximations*, you reinforce responses that are ever-closer to the final desired behavior. By giving rewards only for desired behaviors and ignoring all other responses, researchers and animal trainers gradually shape complex behaviors.

Shaping can also help us understand what nonverbal organisms perceive. Can a dog see red and green? Can a baby hear the difference between lower- and higher-pitched tones? If we can shape them to respond to one stimulus and not to another, then we know they can perceive the difference. Such experiments have even shown that some nonhuman animals can form concepts. When experimenters reinforced pigeons for pecking after seeing a human face, but not after seeing other images, the pigeons learned to recognize human faces (Herrnstein & Loveland, 1964). After being trained to discriminate among classes of events or objects—flowers, people, cars, chairs—pigeons were usually able to identify the category in which a new pictured object belonged (Bhatt et al., 1988; Wasserman, 1993).

Skinner noted that we continually reinforce and shape others’ everyday behaviors, though we may not mean to

do so. Isaac’s whining annoys his dad, but look how his dad typically responds:

Isaac: Could you take me to the mall?

Dad: (Continues reading paper.)

Isaac: Dad, I need to go to the mall.

Dad: (distracted) Uh, yeah, just a minute.

Isaac: DAAAD! The mall!!

Dad: Show me some manners! Okay, where are my keys . . .

Isaac’s whining is reinforced, because he gets something desirable—a trip to the mall. Dad’s response is reinforced, because it ends something *aversive* (unpleasant)—Isaac’s whining.

Or consider a teacher who sticks gold stars on a wall chart beside the names of children scoring 100 percent on spelling tests. As everyone can then see, some children always score 100 percent. The others, who take the same test and may have worked harder than the academic all-stars, get no stars. Using operant conditioning principles, what advice could you offer the teacher to help all students do their best work?¹

1. You might advise the teacher to shape students by reinforcing them all for gradual improvements, as their spelling gets closer and closer to the goal.

operant conditioning a type of learning in which a behavior becomes more probable if followed by a reinforcer or is diminished if followed by a punisher.

law of effect Thorndike’s principle that behaviors followed by favorable consequences become more likely, and that behaviors followed by unfavorable consequences become less likely.

operant chamber in operant conditioning research, a chamber (also known as a *Skinner box*) containing a bar or key that an animal can manipulate to obtain a food or water reinforcer; attached devices record the animal’s rate of bar pressing or key pecking.

reinforcement in operant conditioning, any event that *strengthens* the behavior it follows.

shaping an operant conditioning procedure in which reinforcers guide actions closer and closer toward a desired behavior.

Types of Reinforcers

LOQ 6-6 How do positive and negative reinforcement differ, and what are the basic types of reinforcers?

Up to now, we've mainly been discussing **positive reinforcement**, which strengthens a response by *presenting* a typically pleasurable stimulus immediately afterward. But, as the whining Isaac story shows us, there are two basic kinds of reinforcement (**TABLE 6.1**). **Negative reinforcement** strengthens a response by *reducing or removing* something undesirable or unpleasant. Isaac's whining was positively reinforced, because Isaac got something desirable—a trip to the mall. His dad's response to the whining (doing what Isaac wanted) was *negatively* reinforced, because it got rid of something undesirable—Isaac's annoying whining. Similarly, taking aspirin may relieve your headache, and hitting snooze will silence your irritating alarm. These welcome results provide negative reinforcement and increase the odds that you will repeat these behaviors. For those with drug addiction, the negative reinforcement of ending withdrawal pangs can be a compelling reason to resume using (Baker et al., 2004).

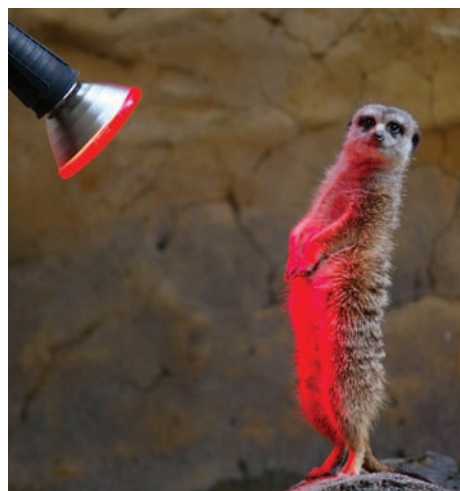
Note that *negative reinforcement* is not *punishment*. (Some friendly advice: Repeat the italicized words in your mind.) Rather, negative reinforcement—psychology's most misunderstood concept—*removes* a punishing event. Think of negative reinforcement as something that provides relief—from that child's whining, a bad headache, or an annoying alarm. *The point to remember:* Whether it works by getting rid of something we *don't* enjoy or by

Retrieve + Remember

- How is operant conditioning at work in this cartoon?



ANSWER: The baby negatively reinforces her parents' behavior when she stops crying once they grant her wish. Her parents positively reinforce her cries by letting her sleep with them.



Will Burgess/Reuters/Landov

REINFORCERS VARY WITH CIRCUMSTANCES

What is reinforcing (a heat lamp) to one animal (a cold meerkat) may not be to another (a penguin). What is reinforcing in one situation (a cold snap at the Taronga Zoo in Sydney) may not be in another (a sweltering summer day).

giving us something we *do* enjoy, reinforcement is *any consequence that strengthens behavior*.

PRIMARY AND CONDITIONED REINFORCERS

Getting food when hungry or having a painful headache go away is innately (naturally) satisfying. These **primary reinforcers** are unlearned. **Conditioned reinforcers**, also called *secondary reinforcers*, get their power through learned associations with primary reinforcers. If a rat in a Skinner box learns that a light reliably signals a food delivery, the rat will work to turn on the light. The light has become a secondary reinforcer linked with food. Our lives are filled with conditioned reinforcers—money, good grades, a pleasant tone of voice—each of which has been linked with a more basic reward—food, shelter, safety, social support.

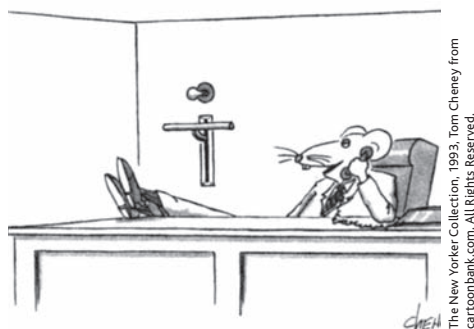
IMMEDIATE AND DELAYED REINFORCERS

In shaping experiments, rats are conditioned with immediate rewards. You want the rat to press the bar. So, when it sniffs the bar (a step toward the target behavior), you immediately give it a food pellet. If a distraction delays your giving the rat its prize, the rat won't learn to link the bar sniffing with the food pellet reward.

Unlike rats, humans *do* respond to delayed reinforcers. We associate the paycheck at the end of the week, the good grade at the end of the semester, the trophy at the end of the season with our earlier actions. Indeed, learning to

TABLE 6.1 Ways to Increase Behavior

Operant Conditioning Term	Description	Examples
Positive reinforcement	Add a desirable stimulus	Pet a dog that comes when you call it; pay the person who paints your house.
Negative reinforcement	Remove an aversive stimulus	Take painkillers to end pain; fasten seat belt to end loud beeping.



"Oh, not bad. The light comes on, I press the bar, they write me a check. How about you?"

control our impulses in order to achieve more valued rewards is a big step toward maturity (Logue, 1998a,b). Chapter 3 described a famous finding in which some children did curb their impulses and delay gratification, choosing two marshmallows later over one now. Those same children achieved greater educational and career success later in life (Mischel, 2014).

Sometimes, however, small but immediate pleasures (the enjoyment of watching late-night TV, for example) are more attractive than big but delayed rewards (feeling rested for a big exam tomorrow). For many teens, the immediate gratification of impulsive, unprotected sex wins over the delayed gratification of safe sex or saved sex (Loewenstein & Furstenberg, 1991). And for too many of us, the immediate rewards of today's gas-guzzling vehicles, air travel, and air conditioning win over the bigger future consequences of climate change, rising seas, and extreme weather.

Reinforcement Schedules

LOQ 6-7 How do continuous and partial reinforcement schedules affect behavior?

In most of our examples, the desired response has been reinforced every time it occurs. But **reinforcement schedules** vary. With **continuous reinforcement**, learning occurs rapidly, which makes it the best choice for mastering a behavior. But there's a catch: Extinction also occurs rapidly. When reinforcement stops—when we stop delivering

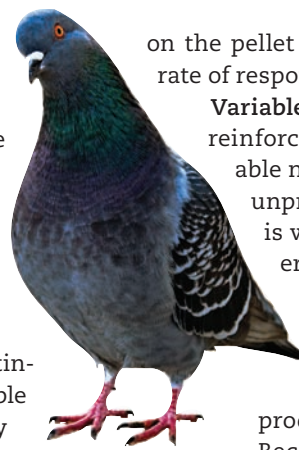
food after the rat presses the bar—the behavior soon stops (extinguishes). If a normally dependable candy machine fails to deliver a chocolate bar twice in a row, we stop putting money into it (although a week later we may exhibit spontaneous recovery by trying again).

Real life rarely provides continuous reinforcement. Salespeople don't make a sale with every pitch. But they persist because their efforts are occasionally rewarded. And that's the good news about **partial (intermittent) reinforcement** schedules, in which responses are sometimes reinforced, sometimes not. Learning is slower than with continuous reinforcement, but *resistance to extinction* is greater. Imagine a pigeon that has learned to peck a key to obtain food. If you gradually phase out the food delivery until it occurs only rarely, in no predictable pattern, the pigeon may peck 150,000 times without a reward (Skinner, 1953). Slot machines reward gamblers in much the same way—occasionally and unpredictably. And like pigeons, slot players keep trying, again and again. With intermittent reinforcement, hope springs eternal.

Lesson for parents: Partial reinforcement also works with children. What happens when we occasionally give in to children's tantrums for the sake of peace and quiet? We have intermittently reinforced the tantrums. This is the best way to make a behavior persist.

Skinner (1961) and his collaborators compared four schedules of partial reinforcement. Some are rigidly fixed, some unpredictably variable (**TABLE 6.2**).

Fixed-ratio schedules reinforce behavior after a set number of responses. Coffee shops may reward us with a free drink after every 10 purchased. In the laboratory, rats may be reinforced on a fixed ratio of, say, one food pellet for every 30 responses. Once conditioned, the rats will pause only briefly to munch



Vitaly Titov & Maria Sidelnikova / Shutterstock

on the pellet before returning to a high rate of responding.

Variable-ratio schedules provide reinforcers after an unpredictable number of responses. This unpredictable reinforcement is what slot-machine players and fly fishers experience. And it's what makes gambling and fly fishing so hard to extinguish even when they don't produce the desired results. Because reinforcers increase as the number of responses increases, variable-ratio schedules produce high rates of responding.

positive reinforcement increases behaviors by presenting positive stimuli, such as food. A positive reinforcer is anything that, when *presented* after a response, strengthens the response.

negative reinforcement increases behaviors by stopping or reducing negative stimuli, such as shock. A negative reinforcer is anything that, when *removed* after a response, strengthens the response. (Note: Negative reinforcement is *not* punishment.)

primary reinforcer an event that is innately reinforcing, often by satisfying a biological need.

conditioned reinforcer (also known as *secondary reinforcer*) an event that gains its reinforcing power through its link with a primary reinforcer.

reinforcement schedule a pattern that defines how often a desired response will be reinforced.

continuous reinforcement reinforcing a desired response every time it occurs.

partial (intermittent) reinforcement reinforcing a response only part of the time; results in slower acquisition but much greater resistance to extinction than does continuous reinforcement.

fixed-ratio schedule in operant conditioning, a reinforcement schedule that reinforces a response only after a specified number of responses.

variable-ratio schedule in operant conditioning, a reinforcement schedule that reinforces a response after an unpredictable number of responses.

TABLE 6.2 Schedules of Partial Reinforcement

	Fixed	Variable
Ratio	Every so many: reinforcement after every nth behavior, such as buy 10 coffees, get 1 free, or pay workers per product unit produced	After an unpredictable number: reinforcement after a random number of behaviors, as when playing slot machines or fly fishing
Interval	Every so often: reinforcement for behavior after a fixed time, such as Tuesday discount prices	Unpredictably often: reinforcement for behavior after a random amount of time, as when checking our phone for a message

Fixed-interval schedules reinforce the first response after a fixed time period. Pigeons on a fixed-interval schedule peck more rapidly as the time for reinforcement draws near. People waiting for an important letter check more often as delivery time approaches. A hungry cook peeks into the oven frequently to see if cookies are brown. This produces a choppy stop-start pattern rather than a steady rate of response.

Variable-interval schedules reinforce the first response after unpredictable time intervals. At unpredictable times, a food pellet rewarded Skinner's pigeons for persistence in pecking a key. Like the longed-for message that finally rewards persistence in rechecking our phone, variable-interval schedules tend to produce slow, steady responding. This makes sense, because there is no knowing when the waiting will be over.

In general, response rates are higher when reinforcement is linked to the number of responses (a ratio schedule) rather than to time (an interval schedule). But responding is more consistent when reinforcement is unpredictable (a variable schedule) than when it is predictable (a fixed schedule).

Animal behaviors differ, yet Skinner (1956) contended that the reinforcement principles of operant conditioning are universal. It matters little, he said, what response, what reinforcer, or what species you use. The effect of a given reinforcement schedule is pretty much the same: "Pigeon, rat, monkey, which is which? It doesn't matter. . . . Behavior shows astonishingly similar properties."

Retrieve + Remember

- People who send spam are reinforced by which schedule? Home bakers checking the oven to see if the cookies are done are on which schedule? Coffee shops that offer a free drink after every 10 drinks purchased are using which reinforcement schedule?

ANSWERS: Spammers are reinforced on a variable-ratio schedule (after a varying number of messages). Cookie checkers are reinforced on a fixed-interval schedule. Coffee drink programs use a fixed-ratio schedule.

Punishment

LOQ 6-8 How does punishment differ from negative reinforcement, and how does punishment affect behavior?

Reinforcement increases a behavior; **punishment** does the opposite. A *punisher* is any consequence that *decreases* the frequency of the behavior it follows (TABLE 6.3). Swift and sure punishers can powerfully restrain unwanted behaviors. The rat that is shocked after touching a forbidden object and the child who is burned by touching a hot stove will learn not to repeat those behaviors.

TABLE 6.3 Ways to Decrease Behavior

Type of Punisher	Description	Examples
Positive punishment	Administer an aversive stimulus	Spray water on a barking dog; give a traffic ticket for speeding.
Negative punishment	Withdraw a rewarding stimulus	Take away a misbehaving teen's driving privileges; revoke a library card for nonpayment of fines.

Criminal behavior, much of it impulsive, is also influenced more by swift and sure punishers than by the threat of severe sentences (Darley & Alter, 2013). Thus, when Arizona introduced an exceptionally harsh sentence for first-time drunk drivers, the drunk-driving rate changed very little. But when Kansas City police patrols started patrolling a high crime area to increase the swiftness and sureness of punishment, that city's crime rate dropped dramatically.

What do punishment studies tell us about parenting practices? Should we physically punish children to change their behavior? Many psychologists and supporters of nonviolent parenting say No, pointing out four major drawbacks of physical punishment (Gershoff, 2002; Marshall, 2002).

1. Punished behavior is suppressed, not forgotten. This temporary state may (negatively) reinforce parents' punishing behavior. The child swears, the parent swats, the parent hears no more swearing and feels the punishment successfully stopped the behavior. No wonder spanking is a hit with so many parents—with 70 percent of American adults agreeing that sometimes children need a "good, hard spanking" (Child Trends, 2013).
2. Punishment teaches discrimination among situations. In operant conditioning, discrimination occurs when we learn that some responses, but not others, will be reinforced. Did the punishment effectively end the child's swearing? Or did the child simply learn that while it's not okay to swear around the house, it's okay elsewhere?

3. *Punishment can teach fear.* In operant conditioning, *generalization* occurs when our responses to similar stimuli are also reinforced. A punished child may associate fear not only with the undesirable behavior but also with the person who delivered the punishment or the place it occurred. Thus, children may learn to fear a punishing teacher and try to avoid school, or may become more anxious (Gershoff et al., 2010). For such reasons, most European countries and most U.S. states now ban hitting children in schools and child-care institutions (EndCorporalPunishment.org). As of 2015, 47 countries outlaw hitting by parents, giving children the same legal protection given to adults.

4. *Physical punishment may increase aggression by modeling violence as a way to cope with problems.* Studies find that spanked children are at increased risk for aggression (MacKenzie et al., 2013). We know, for example, that many aggressive delinquents and abusive parents come from abusive families (Straus et al., 1997).

Some researchers question this logic. Physically punished children may be more aggressive, they say, for the same reason that people who have undergone psychotherapy are more likely to suffer depression—because they had preexisting problems that triggered the treatments (Ferguson, 2013; Larzelere, 2000; Larzelere et al., 2004). Which is the chicken and which is the egg? Correlations don't hand us an answer.

LaunchPad See LaunchPad's *Video: Correlational Studies* for a helpful tutorial animation.

The debate continues. Some researchers note that frequent spankings predict future aggression—even when studies control for preexisting bad behavior (Taylor et al., 2010a). Other researchers believe that lighter spank-



David Stricker/The Image Works

CHILDREN SEE, CHILDREN DO? Children who often experience physical punishment tend to display more aggression.

ings pose less of a problem (Baumrind et al., 2002; Larzelere & Kuhn, 2005). That is especially so if physical punishment is used only as a backup for milder disciplinary tactics, and if it is combined with a generous dose of reasoning and reinforcing.

Parents of delinquent youths may not know how to achieve desirable behaviors without screaming, hitting, or threatening their children with punishment (Patterson et al., 1982). Training programs can help them translate dire threats (“Apologize right now or I’m taking that

fixed-interval schedule in operant conditioning, a reinforcement schedule that reinforces a response only after a specified time has elapsed.

variable-interval schedule in operant conditioning, a reinforcement schedule that reinforces a response at unpredictable time intervals.

punishment an event that decreases the behavior it follows.

cell phone away!”) into positive incentives (“You’re welcome to have your phone back when you apologize”). Stop and think about it. Aren’t many threats of punishment just as forceful, and perhaps more effective, when rephrased positively? Thus, “If you don’t get your homework done, I’m not giving you money for a movie!” could be phrased more positively as . . .

In classrooms, too, teachers can give feedback by saying “No, but try this . . .” and “Yes, that’s it!” Such responses reduce unwanted behavior while reinforcing more desirable alternatives. Remember: *Punishment tells you what not to do; reinforcement tells you what to do.*

What punishment often teaches, said Skinner, is how to avoid it. The bottom line: *Most psychologists now favor an emphasis on reinforcement.* Notice people doing something right and affirm them for it.

Retrieve + Remember

- Fill in the blanks below with one of the following terms: negative reinforcement (NR), positive punishment (PP), and negative punishment (NP). The first answer, positive reinforcement (PR), is provided for you.

Type of Stimulus	Give It	Take It Away
Desired (for example, a teen’s use of the car):	1. PR	2.
Undesired/aversive (for example, an insult):	3.	4.

ANSWERS: 1. PR (positive reinforcement); 2. NP (negative punishment); 3. PP (positive punishment); 4. NR (negative reinforcement)

Skinner's Legacy

LOQ 6-9 Why were Skinner's ideas controversial, and how might his operant conditioning principles be applied at school, at work, in parenting, and for self-improvement?

B. F. Skinner stirred a hornet's nest with his outspoken beliefs. He repeatedly insisted that external influences (not internal thoughts and feelings) shape behavior. And he urged people to use operant conditioning principles to influence others' behavior at school, work, and home. Knowing that behavior is shaped by its results, he argued that we should use rewards to evoke more desirable behavior.

Skinner's critics objected, saying that by neglecting people's personal freedom and trying to control their actions, he treated them as less than human. Skinner's reply: External consequences already control people's behavior. So why not steer those consequences toward human betterment? Wouldn't reinforcers be more humane than the punishments used in homes, schools, and prisons? And if it is humbling to think that our history has shaped us,



To review and experience simulations of operant conditioning, visit LaunchPad's *PsychSim 6: Operant Conditioning* and also *PsychSim 6: Shaping*.



B. F. SKINNER "I am sometimes asked, 'Do you think of yourself as you think of the organisms you study?' The answer is yes. So far as I know, my behavior at any given moment has been nothing more than the product of my genetic endowment, my personal history, and the current setting" (1983).

doesn't this very idea also give us hope that we can shape our future?

Applications of Operant Conditioning

In later chapters we will see how psychologists apply operant conditioning principles to help people reduce high blood pressure or gain social skills. Reinforcement techniques are also at work in schools, workplaces, and homes, and these principles can support our self-improvement as well (Flora, 2004).

AT SCHOOL More than 50 years ago, Skinner and others worked toward a day when "machines and textbooks" would shape learning in small steps, by immediately reinforcing correct responses. Such machines and texts, they said, would revolutionize education and free teachers to focus on each student's special needs. "Good instruction demands two things," said Skinner (1989). "Students must be told immediately whether what they do is right or wrong and, when right, they must be directed to the step to be taken next."

Skinner might be pleased to know that many of his ideals for education are now possible. Teachers used to find it difficult to pace material to each student's rate of learning, and to provide prompt feedback. Online adaptive quizzing, such as the LearningCurve system available with this text, does both. Students move through quizzes at their own pace, according to their own level of understanding. And they get immediate feedback on their efforts, including personalized study plans.

AT WORK Skinner's ideas also show up in the workplace. Knowing that reinforcers influence productivity, many organizations have invited employees to share the risks and rewards of company ownership. Others have focused on reinforcing a job well done. Rewards are most likely to increase productivity if the desired performance is both well defined and achievable. How might managers successfully motivate their employees? *Reward specific, achievable behaviors, not vaguely defined "merit."*

Operant conditioning also reminds us that reinforcement should be *immediate*. IBM legend Thomas Watson understood. When he observed an achievement, he wrote the employee a check on the spot (Peters & Waterman, 1982). But rewards don't have to be material, or lavish. An effective manager may simply walk the floor and sincerely praise people for good work, or write notes of appreciation for a completed project. As Skinner said, "How much richer would the whole world be if the reinforcers in daily life were more effectively contingent on productive work?"

IN PARENTING As we have seen, parents can learn from operant conditioning practices. Parent-training researchers remind us that by saying "Get ready for bed" and then caving in to protests or defiance, parents reinforce such whining and arguing. Exasperated, they may then yell or make threatening gestures. When the child, now frightened, obeys, that in turn reinforces the parents' angry behavior. Over time, a destructive parent-child relationship develops.

To disrupt this cycle, parents should remember the basic rule of shaping: *Notice people doing something right and affirm them for it.* Give children attention and other reinforcers when they are behaving well (Wierson & Forehand, 1994). Target a specific behavior, reward it, and watch it increase. When children misbehave or are defiant, do not yell at or hit them. Simply explain what they did wrong and give them a time-out.

TO CHANGE YOUR OWN BEHAVIOR

Want to stop smoking? Eat less? Study or exercise more? To reinforce your own desired behaviors and extinguish the undesired ones, psychologists suggest applying operant conditioning in five steps.

1. *State a realistic goal in measurable terms and announce it.* You might, for example, aim to boost your study time by an hour a day. Share that goal with friends to increase your commitment and chances of success.
2. *Decide how, when, and where you will work toward your goal.* Take time to plan. Those who list specific steps



"I wrote another five hundred words. Can I have another cookie?"

showing how they will reach their goals more often achieve them (Gollwitzer & Oettingen, 2012).

3. *Monitor how often you engage in your desired behavior.* You might log your current study time, noting under what conditions you do and don't study. (When I [DM] began writing textbooks, I logged how I spent my time each day and was amazed to discover how much time I was wasting. I [ND] experienced a similar rude awakening when I started tracking my daily writing hours.)
4. *Reinforce the desired behavior.* To increase your study time, give yourself a reward (a snack or some activity you enjoy) only after you finish your extra hour of study. Agree with your friends that you will join them for weekend activities only if you have met your realistic weekly studying goal.
5. *Reduce the rewards gradually.* As your new behaviors become habits, give yourself a mental pat on the back instead of a cookie.



Retrieve + Remember

- Ethan constantly misbehaves at preschool even though his teacher scolds him repeatedly. Why does Ethan's misbehavior continue, and what can his teacher do to stop it?

ANSWER: If Ethan is seeking attention, the teacher's scolding may be reinforcing rather than punishing. To change Ethan's behavior, his teacher could offer reinforcement (such as praise) each time he behaves well. The teacher might encourage Ethan toward increasingly appropriate behavior through shaping, or by replacing rules as rewards instead of punishments ("You can have a snack if you play nicely with the other children" [reward] rather than "You will not get a snack if you misbehave!" [punishment]).



Conditioning principles may also be applied in clinical settings. Explore some of these applications in LaunchPad's *IMMERSIVE LEARNING: How Would You Know If People Can Learn to Reduce Anxiety?*

Contrasting Classical and Operant Conditioning

LOQ 6-10 How does classical conditioning differ from operant conditioning?

Both classical and operant conditioning are forms of *associative learning* (TABLE 6.4). In both, we *acquire* behaviors that may later become *extinct* and then *spontaneously reappear*. We often *generalize* our responses but learn to *discriminate* among different stimuli.

Classical and operant conditioning also differ: Through classical conditioning, we associate different events that we don't control, and we respond automatically (*respondent behaviors*). Through operant conditioning, we link our behaviors—which act on our environment to produce rewarding or punishing events (*operant behaviors*)—with their consequences.

As we shall see next, our *biology* and our *thought processes* influence both classical and operant conditioning.



Retrieve + Remember

- Salivating in response to a tone paired with food is a(n) _____ behavior; pressing a bar to obtain food is a(n) _____ behavior.

ANSWERS: respondent; operant

Biology, Cognition, and Learning

From drooling dogs, running rats, and pecking pigeons, we have learned much about the basic processes of learning. But conditioning principles don't tell us the whole story. Once again we see one of psychology's big ideas at work. Our learning is the product of the interaction of biological, psychological, and social-cultural influences.

Biological Limits on Conditioning

LOQ 6-11 What limits does biology place on conditioning?

Evolutionary theorist Charles Darwin proposed that *natural selection* favors traits that aid survival. In the middle of the twentieth century, researchers

TABLE 6.4 Comparison of Classical and Operant Conditioning

	Classical Conditioning	Operant Conditioning
<i>Basic idea</i>	Learning associations between events we don't control	Learning associations between our own behavior and its consequences
<i>Response</i>	Involuntary, automatic	Voluntary, operates on environment
<i>Acquisition</i>	Associating events; NS is paired with US and becomes CS	Associating response with a consequence (reinforcer or punisher)
<i>Extinction</i>	CR decreases when CS is repeatedly presented alone	Responding decreases when reinforcement stops
<i>Spontaneous recovery</i>	The reappearance, after a rest period, of an extinguished CR	The reappearance, after a rest period, of an extinguished response
<i>Generalization</i>	Responding to stimuli similar to the CS	Responding to similar stimuli to achieve or prevent a consequence
<i>Discrimination</i>	Learning to distinguish between a CS and other stimuli that do not signal a US	Learning that some responses, but not others, will be reinforced

further showed that there are **biological constraints** (limits) on learning. Each species comes predisposed (biologically prepared) to learn those things crucial to its survival.

Limits on Classical Conditioning

A discovery by John Garcia and Robert Koelling in the 1960s helped end a popular and widely held belief in psychology: that environments rule our behavior. Part of this idea was that almost any stimulus (whether a taste, sight, or sound) could serve equally well as a conditioned stimulus. Garcia and Koelling's work put that idea to the test and proved it wrong. They noticed that rats would avoid a taste—but not sights or sounds—associated with becoming sick, even hours later (1966). This response, which psychologists call *taste aversion*, makes adaptive sense. For rats, the easiest way to identify tainted food is to taste it. Taste aversion makes it tough to wipe out an invasion of “bait-shy” rats by poisoning. After being sickened by the bait, they are biologically prepared to avoid that taste ever after.



JOHN GARCIA As the laboring son of California farmworkers, Garcia attended school only in the off-season during his early childhood years. After entering junior college in his late twenties, and earning his Ph.D. in his late forties, he received the American Psychological Association's Distinguished Scientific Contribution Award “for his highly original, pioneering research in conditioning and learning.” He was also elected to the National Academy of Sciences.

Humans, too, seem biologically prepared to learn some things rather than others. If you become violently ill four hours after eating a tainted hamburger, you will probably develop an aversion to the taste of hamburger. But you usually won't avoid the sight of the associated restaurant, its plates, the people you were with, or the music you heard there.

Though Garcia and Koelling's taste-aversion research began with the discomfort of some laboratory animals, it later enhanced the welfare of many others. In one taste-aversion study, coyotes and wolves were tempted into eating sheep carcasses laced with a sickening poison. Ever after, they avoided sheep meat (Gustavson et al., 1974, 1976). Two wolves penned with a live sheep seemed actually to fear it. These studies not only saved the sheep from their predators, but also saved the sheep-shunning coyotes and wolves from angry ranchers and farmers. In later experiments, conditioned taste aversion has successfully prevented baboons from raiding African gardens, raccoons from attacking chickens, and ravens and crows from feeding on crane eggs. In all these cases, research helped preserve both the prey and their predators (Dingfelder, 2010; Garcia & Gustavson, 1997).

Such research supports Darwin's principle that natural selection favors traits that aid survival. Our ancestors who readily learned taste aversions were unlikely to eat the same toxic food again and were more likely to survive and leave descendants. Nausea, like anxiety, pain, and other bad feelings, serves a good purpose. Like a car's low-oil warning light, each alerts the body to a threat (Davidson & Riley, 2015; Neese, 1991).

This tendency to learn behaviors favored by natural selection may help explain why we humans seem naturally disposed to learn associations between the color red and sexuality. Female primates display red when nearing ovulation. In human females, enhanced blood flow during sexual excitation may produce a red blush. Does the frequent pairing of red and sex—with



ANIMAL TASTE AVERSION As an alternative to killing wolves and coyotes that prey on sheep, some ranchers have sickened the animals with lamb laced with a drug to help them develop a taste aversion.

Valentine's hearts, red-light districts, and red lipstick—naturally enhance heterosexual men's attraction to women? Experiments (**FIGURE 6.8**) indicate that it does (Elliot et al., 2013; Pazda & Elliot, 2012).

Retrieve + Remember

- How did Garcia and Koelling's taste-aversion studies help disprove the belief that almost any stimulus (tastes, sights, sounds) could serve equally well as a conditioned stimulus?

ANSWER: Garcia and Koelling demonstrated that rats may learn an aversion to tastes, on which their survival depends, but not to sights or sounds.

Limits on Operant Conditioning

As with classical conditioning, nature sets limits on each species' capacity for operant conditioning. Science fiction writer Robert Heinlein (1907–1988) said it well: “Never try to teach a pig to sing; it wastes your time and annoys the pig.”

We most easily learn and retain behaviors that reflect our biological predispositions. Thus, using food as a reinforcer, you could easily condition a hamster to dig or to rear up, because these are among the animal's natural food-searching behaviors. But you won't be so successful if you use food



Andrew Elliot

FIGURE 6.8 Romantic red In a series of experiments that controlled for other factors (such as the brightness of the image), heterosexual men found women more attractive and sexually desirable when framed in red (Elliot & Niesta, 2008). Women have also been observed to wear red during their fertile days, and to perceive other women in red as more sexually receptive (Eisenbruch et al., 2015; Pazda et al., 2014). The phenomenon has been found not only in North America and Europe, but also in the West African nation of Burkina Faso (Elliot et al., 2013).

to try to shape face washing and other hamster behaviors that normally have no link to food or hunger (Shettleworth, 1973). Similarly, you could easily teach pigeons to flap their wings to avoid being shocked, and to peck to obtain food. That's because fleeing with their wings and eating with their beaks are natural pigeon behaviors. However, pigeons have a hard time learning to peck to avoid a shock, or to flap their wings to obtain food (Foree & LoLordo, 1973). The principle: *Our biology predisposes us to learn associations that are naturally adaptive.*



Jeffery Jones/The Gallup Independent/AP Photo

NATURAL ATHLETES Animals can most easily learn and retain behaviors that draw on their biological predispositions, such as horses' inborn ability to move around obstacles with speed and agility.

Cognitive Influences on Conditioning

LOQ 6-12 How do cognitive processes affect classical and operant conditioning?

Cognition and Classical Conditioning

John B. Watson, the “Little Albert” researcher, was one of many psychologists who built on Ivan Pavlov’s work. Pavlov and Watson shared many beliefs. They avoided “mentalist” concepts (such as consciousness) that referred to inner thoughts, feelings, and motives (Watson, 1913). They also maintained that the basic laws of learning are the same for all animals—whether dogs or humans. Thus, the science of psychology should study how organisms respond to stimuli in their environments, said Watson. “Its theoretical goal is the prediction and control of behavior.” This view—that psychology should be an objective science based on observable behavior—was called **behaviorism**. Behaviorism influenced North American psychology during the first half of the twentieth century.

Later research has shown that Pavlov’s and Watson’s views of learning underestimated two important sets of influences. The first, as we have seen, is the way that biological predispositions limit our learning. The second is the effect of our *cognitive processes*—our thoughts, perceptions, and expectations—on learning.



JOHN B. WATSON Watson (1924) admitted to “going beyond my facts” when offering his famous boast: “Give me a dozen healthy infants, well-formed, and my own specified world to bring them up in and I’ll guarantee to take any one at random and train him to become any type of specialist I might select—doctor, lawyer, artist, merchant-chief, and, yes, even beggar-man and thief, regardless of his talents, penchants, tendencies, abilities, vocations, and race of his ancestors.”

The early behaviorists believed that rats’ and dogs’ learned behaviors were mindless mechanisms, so there was no need to consider cognition. But experiments have shown that animals can learn the *predictability* of an event (Rescorla & Wagner, 1972). If a shock always is preceded by a tone, and then may also be preceded by a light that accompanies the tone, a rat will react with fear to the tone but not to the light. Although the light is always followed by the shock, it adds no new information; the tone is a better predictor. It’s as if the animal learns an *expectancy*, an awareness of how likely it is that the US will occur.

Cognition matters in humans, too. For example, people being treated for alcohol use disorder may be given alcohol spiked with a nauseating drug. However, their *awareness* that the drug, not the

biological constraints evolved biological tendencies that predispose animals’ behavior and learning. Thus, certain behaviors are more easily learned than others.

behaviorism the view that psychology (1) should be an objective science that (2) studies behavior without reference to mental processes. Most research psychologists today agree with (1) but not with (2).

alcohol, causes the nausea tends to weaken the association between drinking alcohol and feeling sick, making the treatment less effective. In classical conditioning, it is—especially with humans—not simply the CS-US pairing, but also the thought that counts.

Cognition and Operant Conditioning

B. F. Skinner acknowledged the biological underpinnings of behavior and the existence of private thought processes. Nevertheless, many psychologists criticized him for discounting cognition’s importance.

A mere eight days before dying of leukemia in 1990, Skinner stood before those of us attending the American Psychological Association convention. In this final address, he again rejected the growing belief that presumed cognitive processes have a necessary place in the science of psychology and even in our understanding of conditioning. For Skinner, thoughts and emotions were behaviors that follow the same laws as other behaviors.

Nevertheless, the evidence of cognitive processes cannot be ignored. For example, rats exploring a maze, given no obvious rewards, seem to develop a **cognitive map**, a mental representation of the maze. In one study, when an experimenter placed food in the maze’s goal box, these roaming rats ran the maze as quickly as (and even faster than) other rats that had always been rewarded with food for reaching the goal. Like people sightseeing in a new town, the exploring rats seemingly experienced **latent learning** during their earlier tours. Their latent learning became evident only when they had some reason to demonstrate it.

The cognitive perspective shows the limits of rewards. Promising people a



Will & Deni McIntyre/Science Source

LATENT LEARNING Animals, like people, can learn from experience, with or without reinforcement. In a classic experiment, rats in one group repeatedly explored a maze, always with a food reward at the end. Rats in another group explored the maze with no food reward. But once given a food reward at the end, rats in the second group thereafter ran the maze as quickly as (and even faster than) the always-rewarded rats (Tolman & Honzik, 1930).

reward for a task they already enjoy can backfire. Excessive rewards can destroy **intrinsic motivation**—the desire to do something well, for its own sake. In experiments, rewarding children with toys or candy for reading shortens the time they spend reading (Marinak & Gambrell, 2008). It is as if they think, “If I have to be bribed into doing this, it must not be worth doing for its own sake.”

To sense the difference between intrinsic motivation and **extrinsic motivation** (behaving in certain ways to gain external rewards or to avoid threatened punishment), think about your experience in this course. Are you feeling pressured to finish this reading before a deadline? Worried about your grade? Eager for the credits that will count toward graduation? If Yes, then you are extrinsically motivated (as, to some extent, almost all students must be). Are you also finding the material interesting? Does learning it make you feel more competent? If there were no grade at stake, might you be curious enough to want to learn the material for its own sake? If Yes, intrinsic

motivation also fuels your efforts. People who focus on their work’s meaning and significance not only do better work, but ultimately earn more extrinsic rewards (Wrzesniewski et al., 2014).

Nevertheless, extrinsic rewards that signal a job well done—rather than to bribe or to control someone—can be effective (Boggiano et al., 1985). “Most improved player” awards, for example, can boost feelings of competence and increase enjoyment of a sport. Rightly administered, rewards can improve performance and spark creativity (Eisenberger & Rhoades, 2001; Henderlong & Lepper, 2002). And extrinsic rewards—such as the admissions, scholarships, and jobs that often follow hard work and academic achievement—are here to stay.

To sum up, **TABLE 6.5** compares the biological and cognitive influences on classical and operant conditioning.

Retrieve + Remember

- Latent learning is an example of what important idea?

ANSWER: The success of operant conditioning is affected not just by environmental cues, but also by cognitive factors.

Learning by Observation

LOQ 6-13 How does observational learning differ from associative learning? How may observational learning be enabled by mirror neurons?

Cognition supports **observational learning**, in which higher animals learn without direct experience, by watching and imitating others. A child who sees his sister burn her fingers on a hot stove

TABLE 6.5 Biological and Cognitive Influences on Conditioning

	Classical Conditioning	Operant Conditioning
<i>Biological influences</i>	Biological tendencies limit the types of stimuli and responses that can easily be associated. Involuntary, automatic.	Animals most easily learn behaviors similar to their natural behaviors; associations that are not naturally adaptive are not easily learned.
<i>Cognitive influences</i>	Thoughts, perceptions, and expectations can weaken the association between the CS and the US.	Animals may develop an expectation that a response will be reinforced or punished; latent learning may occur without reinforcement.

learns, without getting burned himself, that hot stoves can burn us. We learn our native languages and all kinds of other specific behaviors by observing and imitating others, a process called **modeling**.

Picture this scene from an experiment by Albert Bandura, the pioneering researcher of observational learning (Bandura et al., 1961). A preschool child works on a drawing. In another part of the room, an adult builds with Tinkertoys. As the child watches, the adult gets up and for nearly 10 minutes pounds, kicks, and throws around the room a large, inflated Bobo doll, yelling, “Sock him in the nose. . . . Hit him down. . . . Kick him.”

The child is then taken to another room filled with appealing toys. Soon the experimenter returns and tells the child she has decided to save these good toys “for the other children.” She takes the now-frustrated child to a third room containing a few toys, including a Bobo doll. Left alone, what does the child do?

Compared with other children in the study, those who viewed the model’s actions were much more likely to lash out at the doll. Apparently, observing the aggressive outburst lowered their inhibitions. But *something more* was also at work, for the children often imitated the very acts they had observed and



ALBERT BANDURA “The Bobo doll follows me wherever I go. The photographs are published in every introductory psychology text and virtually every undergraduate takes introductory psychology. I recently checked into a Washington hotel. The clerk at the desk asked, ‘Aren’t you the psychologist who did the Bobo doll experiment?’ I answered, ‘I am afraid that will be my legacy.’ He replied, ‘That deserves an upgrade. I will put you in a suite in the quiet part of the hotel!’” (2005). A recent analysis of citations, awards, and textbook coverage identified Bandura as the world’s most eminent psychologist (Diener et al., 2014).

used the very words they had heard (**FIGURE 6.9**).

LaunchPad For 3 minutes of classic footage, see LaunchPad’s **Video: Bandura’s Bobo Doll Experiment**.

That “something more,” Bandura suggested, was this: By watching models, we *vicariously* (in our imagination) experience what they are experiencing.

cognitive map a mental image of the layout of one’s environment.

latent learning learning that is not apparent until there is an incentive to demonstrate it.

intrinsic motivation a desire to perform a behavior well for its own sake.

extrinsic motivation a desire to perform a behavior to gain a reward or avoid punishment.

observational learning learning by observing others.

modeling the process of observing and imitating a specific behavior.

Through *vicarious reinforcement* or *vicarious punishment*, we learn to anticipate a behavior’s consequences in situations like those we are observing. We are especially likely to experience models’ outcomes vicariously if we identify with them—if we perceive them as

- similar to ourselves.
- successful.
- admirable.

Functional MRI (fMRI) scans show that when people observe someone winning a reward, their own brain reward systems become active, much as if they themselves had won the reward (Mobbs et al., 2009). Even our learned fears may extinguish as we



FIGURE 6.9 The famous Bobo doll experiment Notice how the children’s actions directly imitate the adult’s.

observe another safely navigating the feared situation (Golkar et al., 2013).

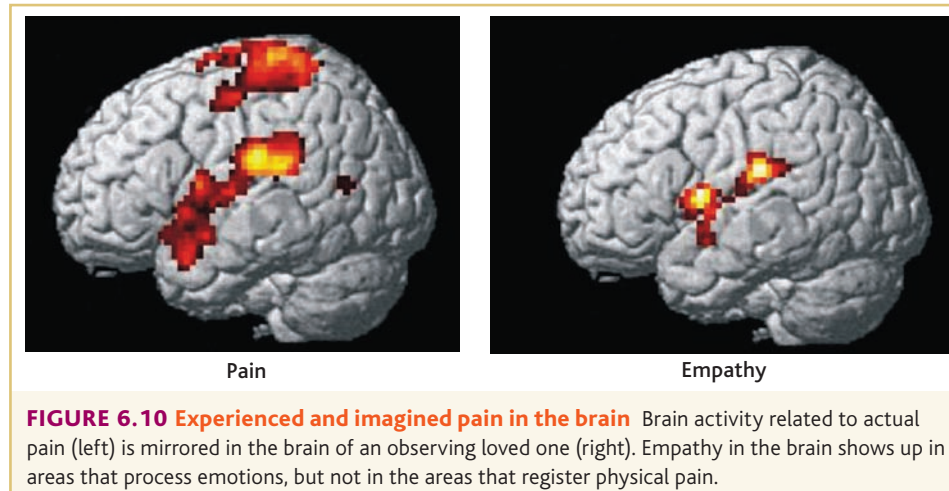
Mirrors and Imitation in the Brain

In one of those quirky events that appear in the growth of science, researchers made an amazing discovery.

On a 1991 hot summer day in Parma, Italy, a lab monkey awaited its researchers' return from lunch. The researchers had implanted a monitoring device in the monkey's brain, in a frontal lobe region important for planning and acting out movements. The device would alert the researchers to activity in that region. When the monkey moved a peanut into its mouth, for example, the device would buzz. That day, the monkey stared as one of the researchers entered the lab carrying an ice cream cone in his hand. As the researcher raised the cone to lick it, the monkey's monitor buzzed—as if the motionless monkey had itself made some movement (Blakeslee, 2006; Iacoboni, 2009). The same buzzing had been heard earlier, when the monkey watched humans or other monkeys move peanuts to their mouths.

This quirky event, the researchers believed, marked an amazing discovery: a previously unknown type of neuron (Rizzolatti et al., 2002, 2006). In their view, these **mirror neurons** provided a neural basis for everyday imitation and observational learning. When a monkey grasps, holds, or tears something, these neurons fire. They likewise fire when the monkey observes another doing so. When one monkey sees, these neurons mirror what another monkey does. (Other researchers continue to debate the existence and importance of mirror neurons and related brain networks [Gallese et al., 2011; Hickok, 2014].)

It's not just monkey business. Imitation occurs in various animal species, but it is most striking in humans. Our catchphrases, fashions, ceremonies, foods, traditions, morals, and fads all spread by one person copying another. Children and even infants are natural imitators (Marshall & Meltzoff, 2014). Shortly after birth, babies may imitate adults



who stick out their tongue. By 8 to 16 months, infants imitate various novel gestures (Jones, 2007). By age 12 months, they begin looking where an adult is looking (Meltzoff et al., 2009). And by 14 months, children imitate acts modeled on TV (Meltzoff & Moore, 1997). Even as 2½-year-olds, when many of their mental abilities are near those of adult chimpanzees, young humans surpass chimps at social tasks such as imitating another's solution to a problem (Herrmann et al., 2007). Children see, children do.

Because of the brain's responses, emotions are contagious. As we observe others' postures, faces, voices, and writing styles, we unconsciously mimic them. And by doing that, we grasp others' states of mind and we feel what they are feeling (Bernieri et al., 1994; Ireland & Pennebaker, 2010).

Seeing a loved one's pain, our faces mirror the loved one's emotion. And so do our brains. In the fMRI scan in **FIGURE 6.10**, the pain imagined by an empathic romantic partner triggered some of the same brain activity experienced by the loved one in actual pain (Singer et al., 2004). Even fiction reading may trigger such activity, as we indirectly experience the feelings and actions described (Mar & Oatley, 2008; Speer et al., 2009). In one experiment, university students read a fictional fellow student's description of overcoming obstacles to vote. A week later, those who read the first-person account were more likely to vote in a presidential primary election (Kaufman & Libby, 2012). In other experiments, reading about Harry Potter and his acceptance of people such as the "Mudbloods" reduced

prejudice against immigrants, refugees, and gay people (Vezzali et al., 2015).

So real are these mental instant replays that we may remember an action we have observed as an action we have actually performed (Lindner et al., 2010). The bottom line: *Brain activity underlies our intensely social nature.*

Applications of Observational Learning

LOQ 6-14 What is the impact of prosocial modeling and of antisocial modeling?

So the big news from Bandura's studies and the mirror-neuron research is that we look, we mentally imitate, and we learn. Models—in our family, our neighborhood, or the media we consume—may have effects, good and bad.

Prosocial Effects

The good news is that **prosocial** (positive, helpful) **behavior** models can have prosocial effects. One research team found that across seven countries, viewing prosocial TV, movies, and video games boosted later helping behavior (Prot et al., 2014). Real people who model nonviolent, helpful behavior can also prompt similar behavior in others. India's Mahatma Gandhi and America's Martin Luther King, Jr., both drew on the power of modeling, making nonviolent action a powerful force for social change in both countries (Matsumoto et al., 2015). Parents are also powerful models. European Christians who risked their lives to



Zumapress/Newscom

A MODEL CAREGIVER This girl is learning orphan-nursing skills, as well as compassion, by observing her mentor in this Humane Society program. As the sixteenth-century proverb states, "Example is better than precept."

rescue Jews from the Nazis usually had a close relationship with at least one parent who modeled a strong moral or humanitarian concern. This was also true for U.S. civil rights activists in the 1960s (London, 1970; Oliner & Oliner, 1988).

Models are most effective when their actions and words are consistent. To encourage children to read, read to them and surround them with books and people who read. To increase the odds that your children will practice your religion, worship and attend religious activities with them. Sometimes, however, models say one thing and do another. Many parents seem to operate according to the principle "Do as I say, not as I do." Experiments suggest that children learn to do both (Rice & Grusec, 1975; Rushton, 1975). Exposed to a hypocrite, they tend to imitate the hypocrisy—by doing what the model did and saying what the model said.

Antisocial Effects

The bad news is that observational learning may also have *antisocial effects*. This helps us understand why abusive parents might have aggressive children, and why many men who beat their wives had wife-battering fathers (Stith et al., 2000). Critics note that such aggressiveness could be genetic. But with monkeys, we know it can be environmental. In study after study, young monkeys separated from their mothers and subjected to high levels of aggression grew up to be aggressive themselves (Chamove, 1980). The lessons we

learn as children are not easily unlearned as adults, and they are sometimes visited on future generations.

TV shows, movies, and online videos are sources of observational learning. While watching TV and videos, children may "learn" that bullying is an effective way to control others, that free and easy sex brings pleasure without later misery or disease, or that men should be tough and women gentle. And they have ample time to learn such lessons. During their first 18 years, most children in developed countries spend more time watching TV shows than they spend in school. In the United States, the average teen watches TV shows more than 4 hours a day; the average adult, 3 hours (Robinson & Martin, 2009; Strasburger et al., 2010).

Viewers are learning about life from a rather peculiar storyteller, one with a taste for violence. During one closely studied year, nearly 6 in 10 U.S. network and cable programs featured violence. Of those violent acts, 74 percent went unpunished, and the victims' pain was usually not shown. Nearly half the events were portrayed as "justified," and nearly half the attackers were attractive (Donnerstein, 1998). These conditions define the recipe for the violence-viewing effect,

mirror neuron a neuron that fires when we perform certain actions and when we observe others performing those actions; a neural basis for imitation and observational learning.

prosocial behavior positive, constructive, helpful behavior. The opposite of antisocial behavior.

described in many studies (Donnerstein, 1998, 2011).

In 2012, a well-armed man targeted young children and their teachers in a horrifying mass shooting at Connecticut's Sandy Hook Elementary School. Was the American media correct in wondering whether the killer was influenced by the violent video games found stockpiled in his home? (See Thinking Critically About: The Effects of Viewing Media Violence.)

Screen time's greatest effect may stem from what it displaces. Children and adults who spend several hours a day in front of a screen spend that many fewer hours in other pursuits—talking, studying, playing, reading, or socializing in real time with friends. What would you have done with your extra time if you had spent even half as many hours in front of a screen, and how might you therefore be different?



Retrieve + Remember

- Jason's parents and older friends all smoke, but they advise him not to. Juan's parents and friends don't smoke, but they say nothing to deter him from doing so. Will Jason or Juan be more likely to start smoking?

ANSWER: Jason may be more likely to smoke, because observational learning studies suggest that children tend to do as others do and say what they say.

- Match the learning examples (items 1–5) to the following concepts (a–e):

- a. Classical conditioning
- b. Operant conditioning
- c. Latent learning

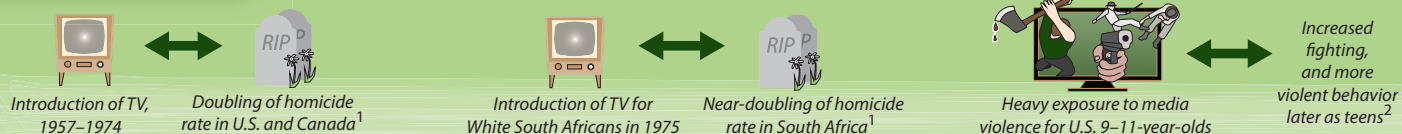
- d. Observational learning
- e. Biological predispositions

- 1. Knowing the way from your bed to the bathroom in the dark
- 2. Speaking the language your parents speak
- 3. Salivating when you smell brownies in the oven
- 4. Disliking the taste of chili after becoming violently sick a few hours after eating chili
- 5. Your dog racing to greet you on your arrival home

ANSWERS: 1. c (You've probably learned your way by latent learning.) 2. d (Observational learning may have contributed to your imitating the language modeled by your parents.) 3. a (Through classical conditioning you have associated the smell with the anticipated tasty result.) 4. e (You are biologically predisposed to develop a conditioned taste aversion to foods associated with illness.) 5. b (Through operant conditioning your dog may have come to associate approaching excitedly with attention, petting, and a treat.)

LOQ 6-15 What is the violence-viewing effect?

Thinking Critically About: The Effects of Viewing Media Violence



BUT, CORRELATION ≠ CAUSATION!

Experimental studies have also found that media violence viewing can cause aggression:

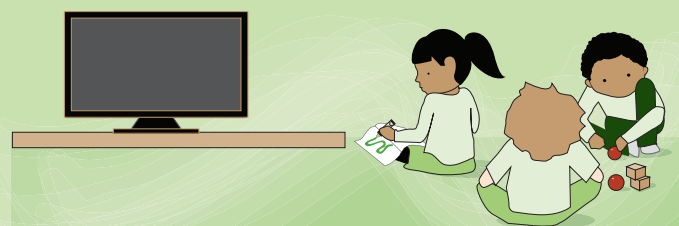
Viewing violence (compared to entertaining nonviolence) → participants react more cruelly when provoked. (Effect is strongest if the violent person is attractive, the violence seems justified and realistic, the act goes unpunished, and the viewer does not see pain or harm caused.)

What prompts the violence-viewing effect?



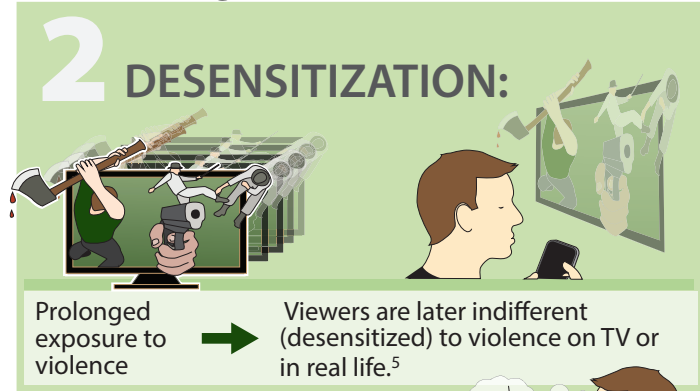
Watching violent cartoons

Sevenfold increase in violent play³



Limited exposure to violent programs

Reduced aggressive behavior⁴



Prolonged exposure to violence

Viewers are later indifferent (desensitized) to violence on TV or in real life.⁵



Adult males spent 3 evenings watching sexually violent movies.

Viewers became progressively less bothered by the violence shown. Compared to a control group, they expressed less sympathy for domestic violence victims and rated victims' injuries as less severe.⁶

Violent moviegoers
Nonviolent moviegoers

less likely to help

more likely to help⁷

• APA Task Force on Violent Media (2015) found that the “research demonstrates a consistent relation between violent video game use and increases in aggressive behavior, aggressive cognitions and aggressive affect, and decreases in prosocial behavior, empathy and sensitivity to aggression.”

• American Academy of Pediatrics (2009) has advised pediatricians that “media violence can contribute to aggressive behavior, desensitization to violence, nightmares, and fear of being harmed.”

1. Centerwall, 1989. 2. Boxer et al., 2009; Gentile et al., 2011; Gentile & Bushman, 2012. 3. Boyatzis et al., 1995. 4. Christakis et al., 2013. 5. Fanti et al., 2009; Rule & Ferguson, 1986. 6. Mullin & Linz, 1995. 7. Bushman & Anderson, 2009.

CHAPTER REVIEW

Learning

Test yourself by taking a moment to answer each of these Learning Objective Questions (repeated here from within the chapter). Then turn to Appendix D, Complete Chapter Reviews, to check your answers. Research suggests that trying to answer these questions on your own will improve your long-term memory of the concepts (McDaniel et al., 2009).

How Do We Learn?

6-1: How do we define *learning*, and what are some basic forms of learning?

Classical Conditioning

6-2: What is *classical conditioning*, and how does it demonstrate associative learning?

6-3: What parts do acquisition, extinction, spontaneous recovery, generalization, and discrimination play in classical conditioning?

6-4: Why is Pavlov's work important, and how is it being applied?

Operant Conditioning

6-5: What is *operant conditioning*, and how is operant behavior reinforced and shaped?

6-6: How do positive and negative reinforcement differ, and what are the basic types of reinforcers?

6-7: How do continuous and partial reinforcement schedules affect behavior?

6-8: How does punishment differ from negative reinforcement, and how does punishment affect behavior?

6-9: Why were Skinner's ideas controversial, and how might his operant conditioning principles be applied at school, at work, in parenting, and for self-improvement?

6-10: How does classical conditioning differ from operant conditioning?

Biology, Cognition, and Learning

6-11: What limits does biology place on conditioning?

6-12: How do cognitive processes affect classical and operant conditioning?

Learning by Observation

6-13: How does observational learning differ from associative learning? How may observational learning be enabled by mirror neurons?

6-14: What is the impact of prosocial modeling and of antisocial modeling?

6-15: What is the violence-viewing effect?

TERMS AND CONCEPTS TO REMEMBER

Test yourself on these terms by trying to write down the definition in your own words before flipping back to the referenced page to check your answer.

learning, p. 171
 associative learning, p. 171
 stimulus, p. 171
 respondent behavior, p. 171
 operant behavior, p. 171
 cognitive learning, p. 171
 classical conditioning, p. 171
 neutral stimulus (NS), p. 171
 unconditioned response (UR), p. 173
 unconditioned stimulus (US), p. 173
 conditioned response (CR), p. 173

conditioned stimulus (CS), p. 173
 acquisition, p. 173
 extinction, p. 175
 spontaneous recovery, p. 175
 generalization, p. 175
 discrimination, p. 175
 operant conditioning, p. 177
 law of effect, p. 177
 operant chamber, p. 177
 reinforcement, p. 177
 shaping, p. 177
 positive reinforcement, p. 179

negative reinforcement, p. 179
 primary reinforcer, p. 179
 conditioned reinforcer, p. 179
 reinforcement schedule, p. 179
 continuous reinforcement, p. 179
 partial (intermittent) reinforcement, p. 179
 fixed-ratio schedule, p. 179
 variable-ratio schedule, p. 179
 fixed-interval schedule, p. 181
 variable-interval schedule, p. 181

punishment, p. 181
 biological constraints, p. 185
 behaviorism, p. 185
 cognitive map, p. 187
 latent learning, p. 187
 intrinsic motivation, p. 187
 extrinsic motivation, p. 187
 observational learning, p. 187
 modeling, p. 187
 mirror neuron, p. 189
 prosocial behavior, p. 189

CHAPTER TEST

Test yourself repeatedly throughout your studies. This will not only help you figure out what you know and don't know; the testing itself will help you learn and remember the information more effectively thanks to the *testing effect*.

- Learning is defined as "the process of acquiring, through experience, new and relatively enduring _____ or _____."
- Two forms of associative learning are classical conditioning, in which we associate _____, and operant conditioning, in which we associate _____.
 - two or more responses; a response and consequence
 - two or more stimuli; two or more responses
 - two or more stimuli; a response and consequence
 - two or more responses; two or more stimuli
- In Pavlov's experiments, the tone started as a neutral stimulus, and then became a(n) _____ stimulus.
- Dogs have been taught to salivate to a circle but not to a square. This process is an example of _____.
- After Watson and Rayner classically conditioned Little Albert to fear a white rat, the child later showed fear in response to a rabbit, a dog, and a sealskin coat. This illustrates
 - extinction.
 - generalization.
 - spontaneous recovery.
 - discrimination between two stimuli.
- "Sex sells!" is a common saying in advertising. Using classical conditioning terms, explain how sexual images in advertisements can condition your response to a product.
- Thorndike's law of effect was the basis for _____'s work on operant conditioning and behavior control.
- One way to change behavior is to reward natural behaviors in small steps, as they get closer and closer to a desired behavior. This process is called _____.
- Your dog is barking so loudly that it's making your ears ring. You clap your hands, the dog stops barking, your ears stop ringing, and you think to yourself, "I'll have to do that when he barks again." The end of the barking was for you a
 - positive reinforcer.
 - negative reinforcer.
 - positive punishment.
 - negative punishment.
- How could your psychology instructor use negative reinforcement to encourage you to pay attention during class?
- Reinforcing a desired response only some of the times it occurs is called _____ reinforcement.
- A restaurant is running a special deal. After you buy four meals at full price, your fifth meal will be free. This is an example of a _____ schedule of reinforcement.
 - fixed-ratio
 - variable-ratio
 - fixed-interval
 - variable-interval
- The partial reinforcement schedule that reinforces a response after unpredictable time periods is a _____ - _____ schedule.
- An old saying notes that "a burnt child dreads the fire." In operant conditioning, the burning would be an example of a
 - primary reinforcer.
 - negative reinforcer.
 - punisher.
 - positive reinforcer.
- Which research showed that conditioning can occur even when the unconditioned stimulus (US) does not immediately follow the neutral stimulus (NS)?
 - The Little Albert experiment
 - Pavlov's experiments with dogs
 - Watson's behaviorism studies
 - Garcia and Koelling's taste-aversion studies
- Taste-aversion research has shown that some animals develop aversions to certain tastes but not to sights or sounds. This finding supports
 - Pavlov's demonstration of generalization.
 - Darwin's principle that natural selection favors traits that aid survival.
 - Watson's belief that psychologists should study observable behavior, not mentalistic concepts.
 - the early behaviorists' view that any organism can be conditioned to any stimulus.
- Evidence that cognitive processes play an important role in learning comes in part from studies in which rats running a maze develop a _____ of the maze.
- Rats that explored a maze without any reward were later able to run the maze as well as other rats that had received food rewards for running the maze. The rats that had learned without reinforcement demonstrated _____.
- Children learn many social behaviors by imitating parents and other models. This type of learning is called _____.

20. According to Bandura, we learn by watching models because we experience _____ reinforcement or _____ punishment.
21. Parents are most effective in getting their children to imitate them if
- their words and actions are consistent.
 - they have outgoing personalities.
 - one parent works and the other stays home to care for the children.
 - they carefully explain why a behavior is acceptable in adults but not in children.
22. Some scientists believe that the brain has _____ neurons that enable observation and imitation.
23. Most experts agree that repeated viewing of TV violence
- makes all viewers significantly more aggressive.
 - has little effect on viewers.
 - is a risk factor for viewers' increased aggression.
 - makes viewers angry and frustrated.

Find answers to these questions in Appendix E, in the back of the book.

IN YOUR EVERYDAY LIFE

Answering these questions will help you make these concepts more personally meaningful, and therefore more memorable.

- How have your emotions or behaviors been classically conditioned?
- Can you recall a time when a teacher, coach, family member, or employer helped you learn something by shaping your behavior in little steps until you achieved your goal?
- Think of a bad habit of yours or of a friend. How could you or your friend use operant conditioning to break it?
- Is your behavior in this class influenced more by intrinsic motivation or extrinsic motivation?
- Who has been a significant role model for you? What did you learn from observing this person? Are you a role model for someone else?

Use  **LearningCurve** to create your personalized study plan, which will direct you to the resources that will help you most in  **LaunchPad**.