Think About It

How do phobias and fetishes develop?

How do trainers get animals to do cute tricks, like dancing or water skiing?

Does watching violence on tv really teach children to become violent?

Why do we sometimes avoid a delicious food for decades after only one negative experience?

Can we learn in our sleep?

Learning the information in this textbook is altering your brain in ways that psychologists are increasingly coming to understand.

learning
change in an organism's behavior or thought as a result of experience

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Before reading further, try your hand at the following three items.

1. Ivan Pavlov, the discoverer of classical conditioning, was known to be a
   a. slow eater.
   b. fast walker.
   c. terrible cook.
   d. I have no idea.
2. John B. Watson, the founder of behaviorism, was tossed out of Johns Hopkins University for
   a. plagiarizing a journal article.
   b. stabbing one of his faculty colleagues.
   c. having an affair with his graduate student.
   d. I have no idea.
3. As a college student, B. F. Skinner, the founder of radical behaviorism, once spread a false rumor that which of the following individuals was coming to campus?
   a. silent movie comedian Charlie Chaplin
   b. psychoanalyst Sigmund Freud
   c. President Theodore Roosevelt
   d. I have no idea.

Now, read the following paragraph.

The three most famous figures in the psychology of learning were each colorful characters in their own way. The discoverer of classical conditioning, Ivan Pavlov, was a notoriously compulsive fellow. He ate lunch every day at precisely 12 noon, went to bed at exactly the same time every night, and departed St. Petersburg, Russia, for vacation the same day every year. Pavlov was such a rapid walker that his wife frequently had to run frantically to keep up with him. The life of the founder of behaviorism, John B. Watson, was rocked with scandal. Despite becoming one of the world's most famous psychologists, he was booted out of the Johns Hopkins University for having an affair with his graduate student, Rosalie Rayner. B. F. Skinner, the founder of radical behaviorism, was something of a prankster during his undergraduate years at Hamilton College in New York. He and a friend once spread a false rumor that comedian Charlie Chaplin was coming to campus. This rumor nearly provoked a riot when Chaplin didn't materialize as expected.

Now go back and try again to answer the three questions at the beginning of this chapter.

If you got more questions right the second time than the first—and odds are high that you did—then you've experienced something we all take for granted: learning. (The answers, by the way, are b, c, and a.) By **learning,** we mean a change in an organism's behavior or thought as a result of experience. As we saw in Chapter 3, when we learn our brains change along with our behaviors. Remarkably, your brain is physically different now than it was just a few minutes ago, because it underwent chemical changes that allowed you to learn novel facts. Learning lies at the heart of just about every domain of psychology. As we discovered in Chapter 1, virtually all behaviors are a complex stew of genetic predispositions and learning. Without learning, we'd be unable to do much; we couldn't walk or talk, let alone read an introductory psychology textbook chapter about learning.

Psychologists have long debated how many distinct types of learning there are. We won't try to settle this controversy here. Instead, we'll review several types of learning that psychologists have studied in depth, starting with the most basic.

Before we do, place your brain on pause, put down your pen or highlighter, close your eyes, and attend to several things that you almost never notice: the soft buzzing of the lights in the room, the feel of your clothing against your skin, the sensation of your tongue on your teeth or lips. Unless someone draws our attention to these stimuli, we don't even realize they're there, because we've learned to ignore them. **Habituation** is the process by which we respond less strongly over time to repeated stimuli. It helps explain why loud snorers can sleep peacefully through the night while keeping their irritated roommates wide awake. Chronic snorers have become so accustomed to the sound of their own snoring that they no longer notice it.

Habituation is the simplest and probably earliest form of learning to emerge in humans. Fetuses display habituation as early as 32 weeks. When researchers apply a gentle vibrator to the mother's stomach, the fetus first jerks around in response to the stimulus, but stops moving after repeated vibrations (Morokuma et al., 2004). What was first a jolt to the fetus's system later became a mere annoyance that it could safely ignore.

In research that earned him the Nobel Prize in 2000, neurophysiologist Eric Kandel uncovered the biological mechanism of habituation of *Aplysia,* a five-inch-long sea slug. Prick *Aplysia* on a certain part of its body, and it retracts its gill in a defensive maneuver. Touch *Aplysia* in the same spot repeatedly, and it begins to ignore the stimulus. This habituation, Kandel found, is accompanied by a progressive decrease in release of the neurotransmitter serotonin (see Chapter 3) at *Aplysia*'s synapses (Siegelbaum, Camardo, & Kandel, 1982). This discovery helped psychologists unravel the neural bases of learning (see **FIGURE 6.1**).

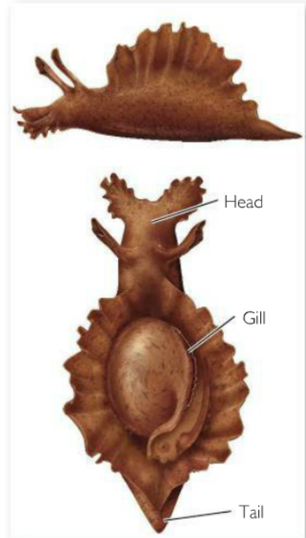


FIGURE 6.1 Habituation in a Simple Animal. *Aplysia californicus* is a sea slug about five inches long that retracts its gill when pricked, but then habituates (stops retracting its gill) if pricked repeatedly.

Psychologists have studied habituation by measuring—of all things—sweat. Because perspiration on our fingertips is a good indicator of anxiety (Fowles, 1980), scientists measure it by using an electrical conductivity measure called the skin conductance response. Most research shows that our hands stop sweating sooner for weak stimuli than they do for strong stimuli, meaning that weak stimuli stop producing anxiety fairly quickly compared with strong stimuli. In the case of very strong stimuli, like painful electric shocks, we often see no habituation at all—people continue to sweat anxiously at the same high levels—even across many trials (Lykken et al., 1988).

This research suggests that habituation makes good sense from an evolutionary standpoint. We wouldn't want to attend to every tiny sensation that comes across our mental radar screens, because most pose no threat. Yet we wouldn't want to habituate to stimuli that could be dangerous. Fortunately, not all repeated stimuli lead to habituation, only those that we deem safe or worth ignoring do.

Some cases of repeated exposure to stimuli don't lead to habituation but to *sensitization*—that is, responding *more strongly* over time. Sensitization is most likely when a stimulus is dangerous, irritating, or both. Many organisms, from *Aplysia* to humans, show sensitization as well as habituation. Have you ever tried to study when the person next to you was whispering, and the whispering kept getting more annoying to the point that you couldn't concentrate? If so, you've experienced sensitization.

Habituating to background noise while studying can be difficult, especially if the noise is loud.

Classical Conditioning

6.1 Describe Pavlov's model of classical conditioning and discriminate conditioned stimuli and responses from unconditioned stimuli and responses.

6.2 Explain the major principles and terminology associated with classical conditioning.

6.3 Explain how complex behaviors can result from classical conditioning and how they emerge in our daily lives.

The story of habituation could hardly be more straightforward. We experience a stimulus, respond to it, and then stop responding after repeated exposure. We've learned something significant, but we haven't learned to forge connections between two stimuli. Yet a great deal of learning depends on associating one thing with another. If we never learned to connect one stimulus, like the appearance of an apple, with another stimulus, like its taste, our everyday life would be a world of disconnected sensory experiences.

habituation
process of responding less strongly over time to repeated stimuli

The rock band Barenaked Ladies accurately described classical conditioning in their song, "Brian Wilson." They sing about Pavlov and how a bell sound comes to trigger salivation. Not bad for a group of nonpsychologists!

In the nineteenth century, a school of thinkers called the *British Associationists* believed that we acquire virtually all of our knowledge by *conditioning*, that is, by forming associations among stimuli. Once we form these links, like the connection between our mother's voice with her face, we need only recall one element of the pair to retrieve the other. The British Associationists believed that simple connections provided the mental building blocks for all of our more complex ideas. Their armchair conjectures were to be confirmed by a pioneering Russian physiologist who demonstrated these processes of association in the laboratory.

Pavlov's Discovery of Classical Conditioning

That physiologist's name was Ivan Pavlov. Pavlov's primary research was on digestion in dogs—in fact, his discoveries concerning digestion, not classical conditioning, earned him the Nobel Prize in 1904. Pavlov placed dogs in a harness and inserted a collection tube into their salivary glands to study their digestive responses to meat powder. In doing so, he observed something unexpected: Dogs began salivating (more informally, they started to drool), not only to the meat powder itself, but to previously neutral stimuli that had become associated with it, such as research assistants who brought in the powder. Indeed, the dogs even salivated to the sound of these assistants' footsteps as they approached the laboratory. The dogs seemed to be anticipating the meat powder and responding to stimuli that signaled its arrival.

Watch in **MyPsychLab** the **Video:** Classical Footage of Pavlov

We call this process of association **classical conditioning** (or **Pavlovian conditioning**): a form of learning in which animals come to respond to a previously neutral stimulus that had been paired with another stimulus that elicits an automatic response. Yet Pavlov's initial observations were merely anecdotal, so like any good scientist he soon put his informal observations to a more rigorous test.

Here's how Pavlov first demonstrated classical conditioning systematically (see **FIGURE 6.2**):

1. He started with an initially neutral stimulus, one that didn't elicit any particular response. In this case, Pavlov used a metronome, a clicking pendulum that keeps time (in other studies, Pavlov used a tuning fork or whistle; contrary to popular belief, he didn't use a bell).
2. He then paired the neutral stimulus again and again with an **unconditioned stimulus (UCS),** a stimulus that elicits an automatic—that is, a reflexive—response. In the case of Pavlov's dogs, the unconditioned stimulus is the meat powder, and the automatic, reflexive response it elicits is the **unconditioned response (UCR).** For Pavlov's dogs, the unconditioned response was salivation. The key point is that the animal doesn't need to learn to respond to the unconditioned stimulus with the unconditioned response: Dogs naturally drool in response to food. The animal generates the unconditioned response without any training at all, because the response is a product of nature (genes), not nurture (experience).
3. As Pavlov repeatedly paired the neutral stimulus with the unconditioned stimulus, he observed something remarkable. If he now presented the metronome alone, it elicited a response, namely, salivation. This new response is the **conditioned response (CR):** a response previously associated with a nonneutral stimulus that comes to be elicited by a neutral stimulus. Lo and behold, learning has occurred. The metronome had become a **conditioned stimulus (CS)**—a previously neutral stimulus that comes to elicit a conditioned response as a result of its association with an unconditioned stimulus. The dog, which previously did nothing when it heard the metronome except perhaps turn its head toward it, now salivates when it hears the metronome. The conditioned response, in contrast to the unconditioned response, is a product of nurture (experience), not nature (genes).

Factoid

Classical conditioning can occur even among people who are in a vegetative state. In one study, researchers repeatedly delivered a musical note, followed by a puff of air to the eyes—a UCS that produces a UCR of blinking—to 22 patients in vegetative or minimally conscious states (Bekinschtein et al., 2009). Eventually, the musical note became a CS, producing eye blinking even in these largely or entirely unconscious individuals.

classical (Pavlovian) conditioning
form of learning in which animals come to respond to a previously neutral stimulus that had been paired with another stimulus that elicits an automatic response

unconditioned stimulus (UCS)
stimulus that elicits an automatic response

unconditioned response (UCR)
automatic response to a nonneutral stimulus that does not need to be learned

conditioned response (CR)
response previously associated with a nonneutral stimulus that is elicited by a neutral stimulus through conditioning

conditioned stimulus (CS)
initially neutral stimulus that comes to elicit a response due to association with an unconditioned stimulus

In most cases, the CR is fairly similar to the UCR, but it's rarely identical to it. For example, Pavlov found that dogs salivated less in response to the metronome (the CS) than to the meat powder (the UCS).

Few findings in psychology are as replicable as classical conditioning. We can apply the classical conditioning paradigm to just about any animal with an intact nervous system, and demonstrate it repeatedly without fail. If only all psychological findings were so dependable!

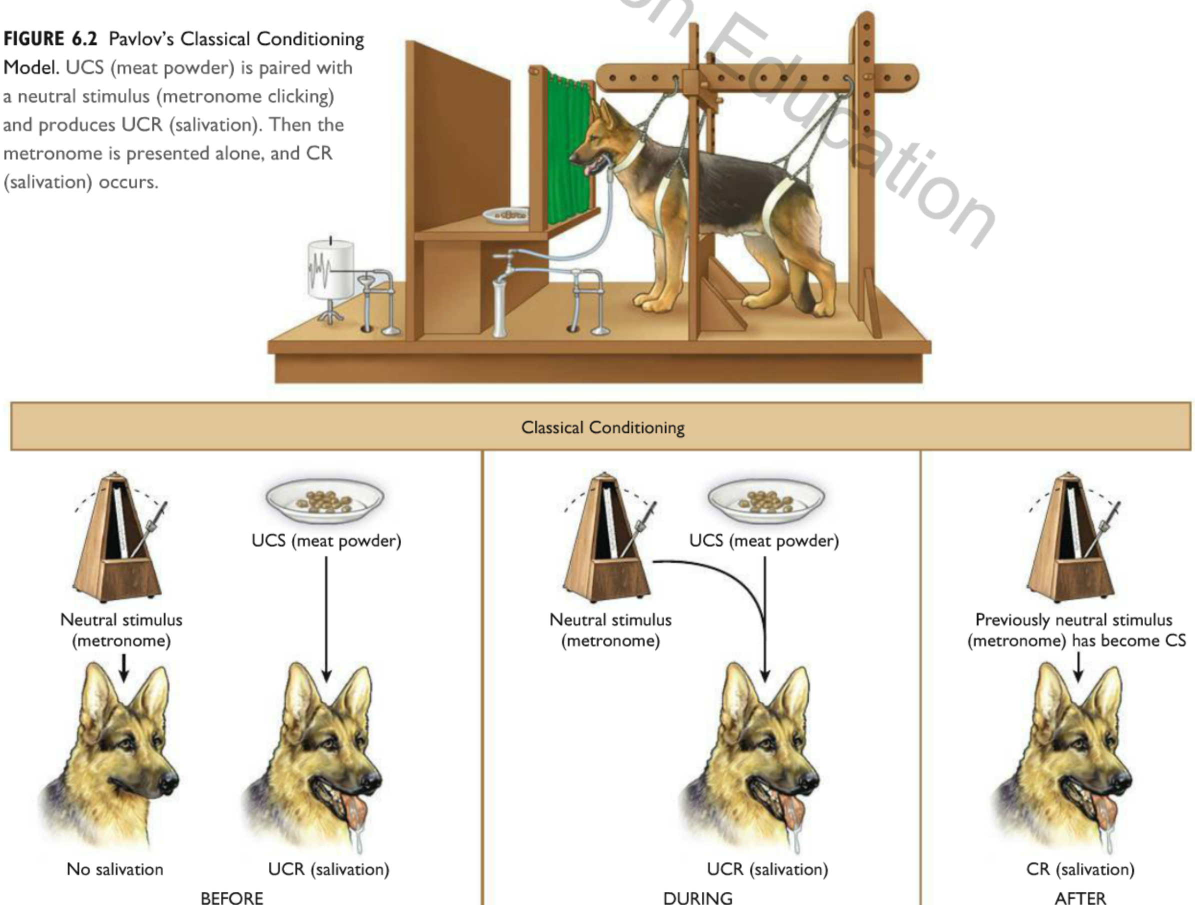
REPLICABILITY
Can the results be duplicated in other studies?

Principles of Classical Conditioning

We'll next explore the major principles underlying classical conditioning. Pavlov noted, and many others have since confirmed, that classical conditioning occurs in three phases—acquisition, extinction, and spontaneous recovery. In addition, as we'll see, once classical conditioning to a stimulus occurs, it often extends to a host of related stimuli, making its everyday life influence surprisingly powerful.

? Like many people, this girl found her first ride on a roller coaster terrifying. Now, all she needs to do is to see a photograph of a roller coaster for her heart to start pounding. In this scenario, what three classical conditioning terms describe (a) her first roller coaster ride, (b) a photograph of a roller coaster, and (c) her heart pounding in response to this photograph? (See answers upside down at bottom of page.)

FIGURE 6.2 Pavlov's Classical Conditioning Model. UCS (meat powder) is paired with a neutral stimulus (metronome clicking) and produces UCR (salivation). Then the metronome is presented alone, and CR (salivation) occurs.



Answers: (a) UCS (b) CS (c) CR

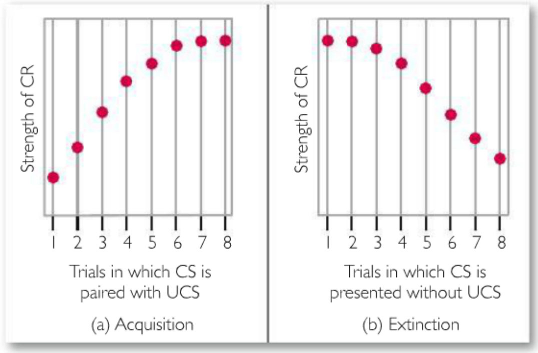


FIGURE 6.3 Acquisition and Extinction. Acquisition is the repeated pairing of UCS and CS, increasing the CR's strength (a). In extinction, the CS is presented again and again without the UCS, resulting in the gradual disappearance of the CR (b).

Factoid

Backward conditioning—in which the UCS is presented *before* the CS—is extremely difficult to achieve. So, if we repeatedly present a dog with meat power, and then a metronome sound a second or two later, the metronome won't later trigger much, if any, salivation on its own. For conditioning to work efficiently, the CS must forecast the appearance of the UCS.

The renewal effect: A person hiking through the woods may experience fear when she approaches an area if she's previously spotted a dangerous animal there.

acquisition
learning phase during which a conditioned response is established

extinction
gradual reduction and eventual elimination of the conditioned response after the conditioned stimulus is presented repeatedly without the unconditioned stimulus

spontaneous recovery
sudden reemergence of an extinct conditioned response after a delay in exposure to the conditioned stimulus

renewal effect
sudden reemergence of a conditioned response following extinction when an animal is returned to the environment in which the conditioned response was acquired

stimulus generalization
process by which conditioned stimuli similar, but not identical, to the original conditioned stimulus elicit a conditioned response

ACQUISITION. In **acquisition,** we gradually learn—or acquire—the CR. If we look at **FIGURE 6.3a,** we'll see that as the CS and UCS are paired over and over again, the CR increases progressively in strength. The steepness of this curve varies somewhat depending on how close together in time we present the CS and UCS. In general, the closer in time the pairing of CS and UCS, the faster learning occurs, with about a half second delay typically being the optimal pairing for learning. Longer delays usually decrease the speed and strength of the organism's response.

EXTINCTION. In a process called **extinction,** the CR decreases in magnitude and eventually disappears when the CS is repeatedly presented alone, that is, without the UCS (see **FIGURE 6.3b**). After numerous presentations of the metronome without meat powder, Pavlov's dogs eventually stopped salivating. Most psychologists once believed that extinction was similar to forgetting: The CR fades away over repeated trials, just as many memories gradually decay (see Chapter 7). Yet the truth is more complicated and interesting than that. Extinction is an active, rather than passive, process. During extinction, a new response, which in the case of Pavlov's dogs was the *absence* of salivation, gradually "writes over" or inhibits the CR, namely, salivation. The extinguished CR doesn't vanish completely; it's merely overwritten by the new behavior. This contrasts with some forms of traditional forgetting, in which the memory itself disappears. Interestingly, Pavlov had proposed this hypothesis in his writings, although few people believed him at the time. How do we know he was right? Read on.

SPONTANEOUS RECOVERY. In a phenomenon called **spontaneous recovery,** a seemingly extinct CR reappears (often in somewhat weaker form) if we present the CS again, say, hours or even days later. It's as though the CR were lurking in the background, waiting to emerge following another presentation of the CS. In a classic study, Pavlov (1927) presented the CS (tone from a metronome) alone again and again and extinguished the CR (salivation) because there was no UCS (mouth-watering meat powder) following it. Two hours later, he presented the CS again and the CR returned. The animal hadn't really forgotten the CR, it had just suppressed it.

A related phenomenon is the **renewal effect,** which occurs when we extinguish a response in a setting different from the one in which the animal acquired it. When we restore the animal to the original setting, the extinguished response reappears (Bouton, 1994; Verliet et al., 2012). The renewal effect may help to explain why people with *phobias*—intense, irrational fears (see Chapter 15)—who've overcome their phobias often experience a reappearance of their symptoms when they return to the environment in which they acquired their fears (Denniston, Chang, & Miller, 2003). Even though it may sometimes lead to a return of phobias, the renewal effect is often adaptive. If we've been bitten by a snake in one part of a forest, it makes sense to experience fear when we find ourselves there again, even years later. That same snake or his slithery descendants may still be lying in wait in the same spot.

STIMULUS GENERALIZATION. Pavlov found that following classical conditioning, his dogs salivated not merely to the original metronome sound, but to sounds similar to it. This phenomenon is **stimulus generalization:** the process by which CSs that are similar, but not identical, to the original CS elicit a CR. Stimulus generalization occurs along a *generalization gradient:* The more similar to the original CS the new CS is, the stronger the CR will be (see **FIGURE 6.4**). Pavlov found that his dogs showed their largest amount of salivation to the original sound, with progressively less salivation to sounds that were less and less similar to it in pitch. Stimulus generalization is typically adaptive, because it allows us to transfer what we've learned to new things. For example, once we've learned to drive our own car, we can borrow a friend's car without needing a full tutorial on how to drive it.

STIMULUS DISCRIMINATION. The flip side of the coin to stimulus generalization is **stimulus discrimination;** it occurs when we exhibit a less pronounced CR to CSs that differ from the original CS. Stimulus discrimination helps us understand why we can enjoy scary movies. Although we may hyperventilate a bit while watching television footage of a ferocious tornado tearing through a small town, we'd respond much more strongly if the tornado were headed straight for our home. Thankfully, we've learned to discriminate between a televised stimulus and the real-world version of it, and to modify our response as a result. Like stimulus generalization, stimulus discrimination is usually adaptive, because it allows us to distinguish among stimuli that share some similarities but that differ in important ways. Without it, we'd be scared to pet a new dog if we were bitten by a similar-looking dog last week.

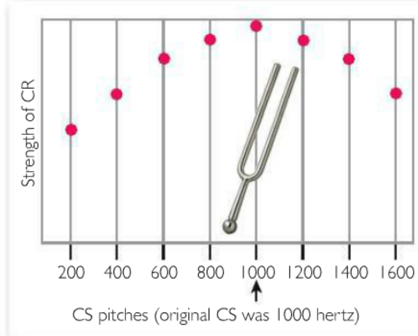


FIGURE 6.4 Generalization Gradient. The more similar to the original CS the new CS is, the stronger the CR will be. Pavlov used a tone pitched close to the original tone's pitch.

Higher-Order Conditioning

Taking conditioning a step further, organisms learn to develop conditioned associations to previously neutral stimuli that come to be associated with the original CS. If after conditioning a dog to salivate to a tone, we pair a picture of a circle with that tone, a dog eventually salivates to the circle as well as to the tone. That's **higher-order conditioning:** the process by which organisms develop classically conditioned responses to previously neutral stimuli that later become associated with the original CS (Gewirtz & Davis, 2000). With higher-order conditioning, each progressive level results in weaker conditioning, just as a verbal message becomes less accurate as it's passed from one person to another. So second-order conditioning—in which a new CS is paired with the original CS—tends to be weaker than garden-variety classical conditioning, and third-order conditioning—in which a third CS is in turn paired with the second-order CS—is even weaker. Fourth-order conditioning and beyond is typically difficult or impossible to achieve.

Higher-order conditioning helps explain the seemingly mysterious "power of suggestion." Merely hearing "Want a Coke?" on a hot summer day can make us feel thirsty.

Higher-order conditioning allows us to extend classical conditioning to a host of new stimuli. It helps explain why we feel thirsty after someone merely says "Coke" on a sweltering summer day. We've already come to associate the sight, sound, and smell of a Coca-Cola with quenching our thirst, and we eventually came to associate the word *Coke* with these CSs.

Factoid

Many addictions are shaped in part by higher-order conditioning, with the context or setting in which people take the drugs serving as higher-order CSs (Sullum, 2003). One research team (Robins, Helzer, & Davis, 1975) examined 451 Vietnam veterans who returned to the United States with serious heroin addictions. Surprisingly, 86 percent of them lost their addiction shortly after returning to the United States. Because the context had changed from Vietnam to the United States, the veterans' classically conditioned responses to heroin extinguished.

Applications of Classical Conditioning to Daily Life

Without classical conditioning, we couldn't develop physiological associations to stimuli that signal biologically important events, like things we want to eat—or that want to eat us. Many of the physiological responses we display in classical conditioning contribute to our survival. Salivation, for instance, helps us to digest food. Skin conductance

stimulus discrimination
process by which organisms display a less pronounced conditioned response to conditioned stimuli that differ from the original conditioned stimulus

higher-order conditioning
developing a conditioned response to a conditioned stimulus by virtue of its association with another conditioned stimulus

responses probably were important to our primate ancestors (Stern, Ray, & Davis, 1980), who found that sticky fingers and toes came in handy for grasping tree limbs while fleeing from predators. Slightly moist fingertips help us adhere to things, as you'll discover if you moisten the tip of your index finger while turning to the next page of this book.

Classical conditioning isn't limited to salivating dogs in old Russian laboratories; it applies to daily life, too. We'll consider four everyday applications of classical conditioning here: advertising, the acquisition of fears and phobias, the acquisition of fetishes, and disgust reactions.

Advertisers use higher-order classical conditioning to get customers to associate their products with an inherently enjoyable stimulus.

CLASSICAL CONDITIONING AND ADVERTISING. Few people grasp the principles of classical conditioning, especially higher-order conditioning, better than advertisers. By repeatedly pairing the sights and sounds of products with photographs of handsome hunks and scantily clad beauties, marketing whizzes aim to establish classically conditioned connections between their brands and positive emotions. They do so for a good reason: Research shows that it works. So does another favorite trick of advertisers: repeatedly pairing pictures of products with pictures our favorite celebrities (Till, Stanley, & Priluck, 2008).

One researcher (Gorn, 1982) paired slides of either blue or beige pens (the CSs) with music that participants had rated as either enjoyable or not enjoyable (the UCSs). Then he gave participants the opportunity to select a pen upon departing the lab. Whereas 79 percent of participants who heard music they liked picked the pen that had been paired with music, only 30 percent of those who heard music they disliked picked the pen that had been paired with music.

REPLICABILITY ▶ Can the results be duplicated in other studies?

RULING OUT RIVAL HYPOTHESES ▶ Have important alternative explanations for the findings been excluded?

Not all researchers who've paired products, like familiar brands of cereal, with pleasurable stimuli have successfully replicated classical conditioning effects (Gresham & Shimp, 1985; Smith, 2001). But many of these negative findings are open to a rival explanation: latent inhibition. **Latent inhibition** refers to the fact that when we've experienced a CS alone many times, it's difficult to classically condition it to another stimulus (Palsson et al., 2005; Vaitl & Lipp, 1997). Because some investigators who failed to obtain classical conditioning effects for products relied on brands with which participants were already familiar, their negative findings may be attributable to latent inhibition. Indeed, when researchers have used novel brands, they've generally been able to show classical conditioning effects (Stuart, Shimp, & Engle, 1987).

THE ACQUISITION OF FEARS AND PHOBIAS: THE STRANGE TALE OF LITTLE ALBERT. Can classical conditioning help explain how we come to fear or avoid stimuli? John B. Watson, the founder of behaviorism (see Chapter 1), answered this question in 1920 when he and his graduate student, Rosalie Rayner, performed what's often regarded as one of the most ethically questionable studies in the history of psychology. Here's what they did.

Explore in **MyPsychLab** the **Concept:** Classical Conditioning of Little Albert

FALSIFIABILITY ▶ Can the claim be disproved?

Watson and Rayner (1920) set out in part to falsify the Freudian view (see Chapters 1 and 14) of phobias, which proposes that phobias stem from deep-seated conflicts buried in the unconscious. To do so, they recruited a 9-month-old infant who'll be forever known in the psychological literature as Little Albert. Little Albert was fond of furry little creatures, like white rats. But Watson and Rayner were about to change that.

Watson and Rayner first allowed Little Albert to play with a rat. But only seconds afterward, Watson snuck up behind Little Albert and struck a gong with a steel hammer, creating an earsplitting noise, startling him out of his wits, and making him cry. After seven such pairings of the rat and UCS (the loud sound from the gong), Little Albert displayed a CR (crying) to the rat alone, demonstrating that the rat had now become a CS. That conditioned response was still present when Watson and Rayner exposed Little Albert to the rat five days later. Little Albert also displayed stimulus generalization, crying not only in response to rats, but also to a rabbit, a dog, a furry coat, and, to a lesser extent, a Santa Claus mask and John B. Watson's hair. Fortunately, Little Albert also demonstrated at least some stimulus discrimination, as he didn't display much fear toward cotton balls or the hair of Dr. Watson's research assistants.

Incidentally, no one knows for sure what became of poor Little Albert (see Factoid). His mother withdrew him from the study about a month after it began, never to be heard from again. Needless to say, because inducing a phobia-like condition

latent inhibition
difficulty in establishing classical conditioning to a conditioned stimulus we've repeatedly experienced alone, that is, without the unconditioned stimulus

in an infant raises a host of troubling ethical questions, Watson and Rayner's Little Albert study would never get past a modern-day college or university Institutional Review Board (see Chapter 2).

Stimulus generalization, like that experienced by Little Albert, allows our learning to be remarkably flexible—which is often, although not always, a good thing. It allows us to develop fears of many stimuli. Certain phobias, like those of snakes, spiders, heights, water, and blood, are considerably more widespread than others (American Psychiatric Association, 2000). And some are downright strange, as **TABLE 6.1** illustrates.

The good news is that if classical conditioning can contribute to our acquiring phobias, it can also contribute to our overcoming them. Mary Cover Jones, a student of Watson, treated a 3-year-old named Little Peter, who had a phobia of rabbits. Jones (1924) treated Peter's fear successfully by gradually introducing him to a white rabbit while giving him a piece of his favorite candy. As she moved the rabbit increasingly close to him, the sight of the rabbit eventually came to elicit a new CR: pleasure rather than fear. Modern-day psychotherapists, although rarely feeding their clients candy, use similar practices to eliminate phobias. They may pair feared stimuli with relaxation or other pleasurable stimuli (Wolpe, 1990; see Chapter 16).

FETISHES On the flip side of the coin from phobias, **fetishism**—sexual attraction to nonliving things—may also arise in part from classical conditioning (Akins, 2004; Hoffmann, 2011). Like phobias, fetishes come in a bewildering variety of forms: shoes, stockings, dolls, stuffed animals, automobile engines (yes, that's right), and just about anything else (Lowenstein, 2002).

TABLE 6.1 Phobias Galore. This sampling of phobias—a few relatively common, most quite rare—illustrates just how enormously varied people's fears can be. Many of these phobias may be acquired at least partly by classical conditioning.

PHOBIA	FEAR OF
Alliumphobia	garlic
Arachibutyrophobia	peanut butter sticking to the roof of one's mouth
Aulophobia	flutes
Brontophobia	thunderstorms
Bufonaophobia	toads
Catoptrophobia	mirrors
Coulrophobia	clowns
Epistaxiaophobia	nosebleeds
Lachanophobia	vegetables
Melissophobia	bees
Peladophobia	bald people
Pogonophobia	beards
Pteronophobia	being tickled by feathers
Rhytiphobia	getting wrinkles
Samhainophobia	Halloween
Taphephobia	being buried alive
Xyrophobia	razors

Classic study in which a 9-month-old boy was conditioned to fear white furry objects. Here, Little Albert, with John B. Watson and Rosalie Rayner, is crying in response to a Santa Claus mask.

Factoid

One team of psychologists has recently claimed that Little Albert was actually "Douglas Merritte," who was born to a nurse in 1919 at Johns Hopkins University Hospital and died at age 6 due to a build-up of fluid in his brain (Beck, Levinson, & Irons, 2009). But a few other psychologists doubt that Little Albert has been discovered, so the debate continues (Powell, 2010; Reese, 2010).

fetishism
sexual attraction to nonliving things

Michael Domjan and his colleagues used classical conditioning to instill a fetish in male quails.

In a series of studies, Michael Domjan and his colleagues classically conditioned fetishes in male Japanese quails. For example, they presented male quails with a cylindrical object made of terrycloth, followed by a female quail with which they happily mated. After 30 such pairings, about half of the male quails attempted to mate with the cylindrical object when it appeared alone (Köksal et al., 2004). Although the generalizability of these findings to humans is unclear, at least some people appear to develop fetishes by the repeated pairing of neutral objects with sexual activity (Rachman & Hodgson, 1968; Weinberg, Williams, & Calhan, 1995).

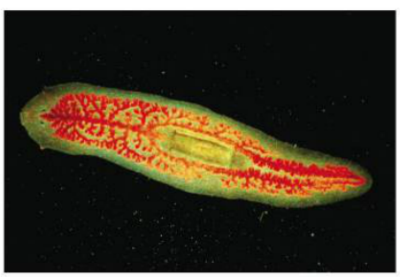
Factoid

Words beginning with the letter "z," like zany, and "k," like kooky, are especially likely to make us laugh (Wiseman, 2009). The explanation may be classical conditioning. Saying these letters makes us contort our faces so that we smile a bit; these smiling expressions may in turn become conditioned stimuli for positive moods.

DISGUST REACTIONS. Imagine that a researcher asked you to eat a piece of fudge. No problem, right? Well, now imagine the fudge were shaped like dog feces. If you're like most subjects in the studies of Paul Rozin and his colleagues, you'd hesitate (D'Amato, 1998; Rozin, Millman, & Nemeroff, 1986).

Rozin (who's earned the nickname "Dr. Disgust") and his colleagues have found that we acquire disgust reactions with surprising ease. In most cases, these reactions are probably a product of classical conditioning. CSs—like a photograph of rotten eggs—that are associated with disgusting UCSs—like the smell and taste of rotten eggs in our mouths—may themselves come to elicit disgust. In many cases, disgust reactions are tied to stimuli that are biologically important to us, like animals or objects that are dirty or potentially poisonous (Connolly et al., 2008; Rozin & Fallon, 1987).

In another study, Rozin and his collaborators asked participants to drink from two glasses of water, both of which contained sugar (sucrose). In one case, the sucrose came from a bottle labeled "Sucrose"; in another, it came from a bottle labeled "Sodium Cyanide, Poison." The investigators told subjects that both bottles were completely safe. They even asked subjects to select which label went with which glass, proving the labels were meaningless. Even so, subjects were hesitant to drink from the glass that contained the sucrose labeled as poisonous (Rozin, Markwith, & Ross, 1990). Participants' responses in this study were irrational, but perhaps understandable: They were probably relying on the heuristic "better safe than sorry." Classical conditioning helps keep us safe, even if it goes too far on occasion (Engelhard, Olatunji, & de Jong, 2011).



James McConnell and his colleagues paired a light with an electric shock, which caused the planaria worm to contract reflexively.

psychomythology

ARE WE WHAT WE EAT?

Many of us have heard that "we are what we eat," but in the 1950s the psychologist James McConnell took this proverb quite literally. McConnell became convinced he'd discovered a means of chemically transferring learning from one animal to another. Indeed, for many years psychology textbooks informed undergraduates that scientists could chemically transfer learning across animals.

McConnell's animal of choice was the planaria, a flatworm that's typically no more than a few inches long. Using classical conditioning, McConnell and his colleagues exposed planaria to a light, which served as the CS, while pairing it with a one-second electric shock, which served as the UCS. When planaria receive an electric shock, they contract reflexively. After numerous pairings between light and shock, the light itself causes planaria to contract (Thompson & McConnell, 1955).

McConnell wanted to find out whether he could chemically transfer the memory of this classical conditioning experience to another planaria. His approach was brutally simple. Relying on the fact that many planaria are miniature cannibals, he chopped up the trained planaria and fed them to their fellow worms. Remarkably, McConnell (1962) reported that planaria who'd gobbled up classically conditioned planaria acquired classically conditioned reactions to the light more quickly than planaria who hadn't.

Understandably, McConnell's memory transfer studies generated enormous excitement. Imagine if McConnell were right! You could sign up for your introductory psychology class, swallow a pill containing all of the psychological knowledge you'd need to get an A, and … voila, you're now an expert psychologist. Indeed, McConnell went directly to the general public with his findings, proclaiming in *Time, Newsweek,* and other popular magazines that scientists were on the verge of developing a "memory pill" (Rilling, 1996).

Yet it wasn't long before the wind went out of McConnell's scientific sails: Although researchers at over 50 labs tried to replicate his findings, many couldn't (Stern, 2010). What's more, researchers brought up a host of alternative explanations for his results. For one, McConnell hadn't ruled out the possibility that his findings were attributable to *pseudoconditioning*, which occurs when the CS by itself triggers the UCR. That is, he hadn't excluded the possibility that the light itself caused the planaria to contract (Collins & Pinch, 1993), perhaps leading him to the false conclusion that the cannibalistic planaria had acquired a classically conditioned reaction to the light. Eventually, after years of intense debate and mixed or negative results, the scientific community concluded that McConnell may have fooled himself into seeing something that was never there: He'd become a likely victim of confirmation bias (see Chapter 2). His planaria lab closed its doors in 1971, and was never heard from again.

Still, McConnell may yet have the last laugh. Even though his studies may have been flawed, some scientists have conjectured that memory may indeed be chemically transferrable in some cases (Smalheiser, Manev, & Costa, 2001). As is so often the case in science, the truth will win out.

REPLICABILITY
Can the results be duplicated in other studies?

RULING OUT RIVAL HYPOTHESES
Have important alternative explanations for the findings been excluded?

Assess Your Knowledge — FACT or FICTION?

Study and **Review** in **MyPsychLab**

1. Habituation to meaningless stimuli is generally adaptive. **True / False**
2. In classical conditioning, the conditioned stimulus (CS) initially yields a reflexive, automatic response. **True / False**
3. Conditioning is generally most effective when the CS precedes the UCS by a short period of time. **True / False**
4. Extinction is produced by the gradual "decay" of the CR over time. **True / False**
5. Once a CS is established, it's almost impossible to extend to it to novel stimuli. **True / False**

Answers: 1. T (p. 207); 2. F (p. 208); 3. T (p. 210); 4. F (p. 210); 5. F (p. 211)

Operant Conditioning

6.4 Distinguish operant conditioning from classical conditioning.

6.5 Describe Thorndike's law of effect.

6.6 Describe reinforcement and its effects on behavior and distinguish negative reinforcement from punishment.

6.7 Identify the four schedules of reinforcement and the response pattern associated with each.

6.8 Describe some applications of operant conditioning.

What do the following four examples have in common?

- Using bird feed as a reward, a behavioral psychologist teaches a pigeon to distinguish paintings by Monet from paintings by Picasso. By the end of the training, the pigeon is a veritable art aficionado.
- Using fish as a treat, a trainer teaches a dolphin to jump out of the water, spin three times, splash in the water, and propel itself through a hoop.