An Introduction to Learning

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ATHLETES IN THE MAKING

Palo Alto, California: It was the spring of 1999, and Ivonne Mosquera was about to graduate from Stanford University with a bachelor’s degree in mathematics. Math majors typically spend a lot of time manipulating numbers on paper, graphing functions, and trying to understand spatial relationships—all activities that draw on their sense of vision. But Ivonne had no memory of seeing an equation, a number, or even a piece of paper. She had been blind since the age of 2, when doctors removed both of her eyes to arrest the spread of an aggressive cancer.

Blindness never stopped Ivonne from doing much of anything. Growing up in New York City, she used to ride her bicycle across the George Washington Bridge as her father ran alongside. She went to school with sighted kids, climbed trees in the park, and studied ballet, tap, and jazz dance (Boccella, 2012, May 6; iminmotion.net, n.d., para. 3). She tried downhill skiing, hiking, and rock climbing. Now Ivonne was graduating from college with a degree in one of the most rigorous academic disciplines, a great accomplishment indeed. Yet there were bigger things to come for Ivonne. In the next decade, she would become a world-class runner and triathlete.

Meanwhile, just a few miles from the Stanford campus, a 10-year-old boy named Jeremy Lin was finishing fifth grade and working on his basketball game. In the evenings, Jeremy and his brothers would go with their father to the nearby YMCA to run drills and shoot hoops late into the night (Dalrymple, 2012). It was during this period that Jeremy’s future high school coach, Peter Diepenbrock, first caught a glimpse of the scrappy young player. “He was very small,” Coach Diepenbrock recalls, “but had just an incredible, incredible amount of confidence.” Jeremy knew exactly how to play and was determined to do so, regardless of his size. Even so, no one could have predicted the “Linsanity” he would be capable of inspiring across the globe.

At first glance, Ivonne Mosquera (now Ivonne Mosquera-Schmidt) and Jeremy Lin don’t seem to have much in common. But as you read their stories, you will see how their relentless determination, work ethic, and optimism led to their athletic achievements—Ivonne as a runner and triathlete and Jeremy as a basketball player. You will also see how learning changed their lives and paved the way for their success.

Note: Quotations attributed to Ivonne Mosquera-Schmidt and Peter Diepenbrock are personal communications.


What is Learning?

Psychologists define learning as a relatively enduring change in behavior or thinking that results from our experiences. Studies suggest that learning can begin before we are even born—prior to birth, a baby has already begun to single out the sound of its mother’s voice (Kislevsky et al., 2008). And learning may continue until our dying day. But even though learning leads to changes in the brain, including alterations to individual neurons as well as their networks, these modifications of behavior and thinking are not always permanent.

The ability to learn is not unique to humans. Trout can learn to press a pendulum to get food (Yau, Duncan, & Mocella, 2008), songbirds can pick up whistling (Wich et al., 2009), and even honeybees can be trained to differentiate among photos of human faces (Dyer, Neumeyer, & Chitika, 2005). One of the most basic forms of learning occurs during the process of habituation—habit-ii-chi-u-na-shun—which is evident when an organism does not respond as strongly or as often to an event following multiple exposures to its occurrence. This type of learning is apparent in a wide range of living beings, from humans to sea slugs (Chapter 6). An animal might initially respond to a stimulus—which is an event that generally leads to a response, but with repeated exposures, the stimulus is increasingly ignored and habituation occurs. Essentially, an organism learns about a stimulus but begins to ignore it as it is repeated.

Animals Learn to Help
Army Specialist Antonio Ingram gets a kiss from Emma, one of the therapy dogs that works with soldiers at Fort Hood, Texas (Flaherty, 2011, October 29). Therapy animals like Emma help ease the stress of wounded veterans, abused children, cancer patients, and others suffering from psychological distress (American Humane Association, 2013). The dogs are trained using the principles of learning. At Has/... (The Khione Daily Herald, Marianne Lijewski)

Sued Up to Swim
Ivonne is on her way to swim practice. As she walks through the locker room and approaches the pool entrance, she catches a whiff of chlorine. Immediately, her shoulders tense and her heart rate jumps. The smell of chlorine gives Ivonne the jitters, not because there is something inherent about the chemical that causes a physical reaction, but because it is associated with something she dreads: swimming.

“I’ve never been a strong swimmer,” Ivonne says. “I just survive in water.” Submerging her ears in water, which is necessary when she swims freestyle stroke in triathlons, makes Ivonne feel disoriented. “I can’t hear what’s around me,” she explains. “There aren’t sounds or echoes for me to follow.”

Imagine navigating a mile in the frigid ocean bordering Canada in the Vancouver Triathlon, or plowing through choppy waves (not to mention dodging pieces of trash) in the Hudson River in New York City’s triathlon. Now imagine doing all of that swimming in the darkness. It’s no surprise that Ivonne feels a little apprehensive about being in the water.

To understand why the smell of chlorine seems to evoke such a strong physiological response for Ivonne, we need to travel back in time and into the lab of a young Russian scientist: Ivan Pavlov.

Researchers have studied learning using a variety of animals. The history of psychology is full of stories about scientists who began studying animal behavior but then switched their focus to animal behavior as unexpected events unfolded in the laboratory. These scientists were often excited to find the connections between biology and experience that became evident as they explored the principles of learning.

Animals are often excellent models for studying and understanding human behavior. Conducting animal research sidesteps many of the ethical dilemmas that arise with human research. It’s generally considered okay to keep rats, cats, and birds in cages to ensure control over experimental variables (as long as they are otherwise treated humanely), but locking up people in laboratories would obviously be unacceptable.

This chapter focuses on three major types of learning: classical conditioning, operant conditioning, and observational learning. As you make your way through these pages, you will begin to realize that learning is very much about creating associations. Through classical conditioning, we associate two different stimuli: for example, the sound of a bell and the arrival of food. In operant conditioning, we make connections between our behaviors and their consequences: for example, through rewards and punishments. With observational learning, we learn by watching and imitating other people, establishing a closer link between our behavior and the behavior of others.

Learning can occur in predictable or unexpected ways. It allows us to grow and change, and it is a key to achieving goals. Now let’s see how learning has shaped the lives of Ivonne Mosquera-Schmidt and Jeremy Lin.
### Classical Conditioning

**Pavlov's Basic Research Plan**

Pavlov followed up on his initial observations with numerous studies in the early 1900s, examining the link between stimulus (for example, the sound of human footsteps) and response (the dog's salivation). The type of behavior Pavlov was studying (salivating) is not voluntary, but involuntary or reflexive (Pavlov, 1906). The connection between food and salivating is innate and universal, whereas occurred whenever a new, nonuniversal stimulus is presented. Thus, Pavlov decided to shift the focus of his research to investigate the dogs' salivation (which he termed "psychic secretions") in these types of scenarios (Fancher & Rutherford, 2012, p. 248; Watson, 1968).

**Tick Tick**

Pavlov conditioned his dogs to salivate in response to auditory stimuli, such as bells and ticking metronomes. A metronome is an instrument whose purpose is to produce a steady tick-tick sound at various speeds. Modern metronomes are digital and often come with additional features such as adjustable volume. Perhaps Pavlov could have used these features to test different aspects of classical conditioning.

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### Learning Through Classical Conditioning

**INFOGRAPHIC 5.1**

#### HAVE YOU BEEN CONDITIONED?

**Before conditioning**

- Neutral stimulus
  - No response

**During conditioning**

- Neutral stimulus + Unconditioned stimulus
  - Neutral stimulus (ringing bell)
  - Unconditioned response (stomach growls)
  - No response

- Unconditioned response (stomach growls)
  - Unconditioned stimulus

**After conditioning**

- Conditioned stimulus
  - Conditioned response (stomach growls)

#### Pavlov's Experiment

- **Before conditioning**
  - Dog salivates automatically when food is presented.
  - Bell means nothing to dog, so there is no response.

- **During conditioning**
  - Neat stimulus + Unconditioned stimulus
  - Neutral stimulus (ringing bell)
  - Neutral stimulus (ringing bell) + Unconditioned stimulus
  - Unconditioned stimulus (stomach growls)

- **After conditioning**
  - Conditioned stimulus
  - Conditioned response (stomach growls)

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Classical conditioning prompts learning that occurs naturally, without studying or other voluntary effort. And it happens every day. Do you feel hungry when you see a pizza box or McDonald's “golden arches”? Just like Pavlov’s dogs, we learn through repeated pairings to associate these neutral stimuli with food, and the sight of a cardboard box or a yellow “M” can be enough to get our stomachs rumbling.

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The son of a village priest, Ivan Pavlov (1849–1936) had planned to devote his life to the church. He changed his mind at a young age, however, when he discovered his love for science. Although he won a Nobel Prize in 1904 for his research on the physiology of digestion, Pavlov’s most enduring legacy was his trailblazing research on learning (Fancher & Rutherford, 2012).

Pavlov spent the 1890s studying the digestive system of dogs at Russia's Institute of Experimental Medicine (Watson, 1968). One of his early experiments involved measuring how much dogs salivate in response to food. Initially, the dogs salivated as expected, but as the experiment progressed, they began salivating to other stimuli as well. After repeated trials with an assistant giving a dog its food and then measuring the dog’s saliva output, Pavlov noticed that instead of salivating the moment it received food, the dog began to salivate at the mere sight or sound of the lab assistant arriving to feed it. The assistant’s footsteps, for example, seemed to act like a trigger (the stimulus) for the dog to start salivating (the response). Pavlov had discovered how associations develop through the process of learning, which he referred to as conditioning. The dog was associating the sound of footsteps with the arrival of food; it had been conditioned to associate certain sights and sounds with eating. Intrigued by his discovery, Pavlov decided to shift the focus of his research to investigate the dogs’ salivation (which he termed “psychic secretions”) in these types of scenarios (Fancher & Rutherford, 2012, p. 248; Watson, 1968).

Classical conditioning involves repeated pairings of a neutral stimulus with an unconditioned stimulus that produces an automatic, natural response. The crucial stage of this process involves exposed pairings of the two stimuli.

Classical conditioning is a fundamental process that occurs naturally, without studying or other voluntary effort. It happens every day. Do you feel hungry when you see a pizza box or McDonald’s “golden arches”? Just like Pavlov’s dogs, we learn through repeated pairings to associate these neutral stimuli with food, and the sight of a cardboard box or a yellow “M” can be enough to get our stomachs rumbling.
Because Pavlov was interested in exploring the link between a stimulus and a dog’s response, he had to pick a stimulus that was more contrasted than the sound of footstep powder. With a high stimulus, Pavlov would need to control the number of steps taken, the type of shoes worn, and so on, to ensure the stimulus was identical for each trial. Otherwise, he would introduce variables, which are characteristics that interfere with the outcome of research, making it difficult to determine what exactly was causing the dog to salivate.

**Time for Some Terms**

Now that you know Pavlov’s basic research procedure, it is important to learn the specific terminology psychologists use to describe what is happening. (Infographic 5.1). Before the experiment began, the tone was a neutral stimulus (NS)—something in the environment that does not naturally cause a relevant automatic or reflexive response. In the current example, salivation is the automatic response associated with food; dogs do not normally respond to the tone of a bell by salivating. But through experience, the dogs learned to link this neutral stimulus (the tone) with another stimulus (food) that prompts an automatic, unlearned response (salivation). This type of learning is called classical conditioning, and it occurs when an originally neutral stimulus is conditioned to elicit or induce an involuntary response, such as salivation, eye blinks, and other types of reflex reactions.

US, UR, CS, and CR

At the start of a trial, before the dogs were conditioned or had learned anything about the neutral stimulus, they salivated when they smelled or were given food. The food is called an unconditioned stimulus (US) because it triggers an automatic response without any learning needed. Salivation by the dogs when exposed to food is an unconditioned response (UR) because it doesn’t require any conditioning (learning); the dog just does it involuntarily. The salivation (the UR) is an automatic response elicited by the smell or taste of food (the US). After conditioning has occurred, the dog responds to the tone of the bell almost as if it were food. The tone, previously a neutral stimulus, has now become a conditioned stimulus (CS) because it triggers the dog’s salivation. When the salivation occurs in response to the tone, it is called a conditioned response (CR); the salivation is a learned response. The acquisition phase is the pairing of the neutral stimulus (the tone) with the US (the meat powder) during the acquisition or initial learning phase. Some points to remember:

- The meat powder is always a US (the dog never has to learn how to respond to it).
- The dog’s salivating is initially a UR to the meat powder, but eventually becomes a CR as it occurs in response to the tone (without the sight or smell of meat powder).
- The US is always different from the CS; the US automatically triggers the response, but with the CS, the response has been learned by the organism.

Pavlov’s work paved the way for a new generation of psychologists who considered behavior to be a topic of objective, scientific study. Like many who would follow, Pavlov believed that scientists should focus on observable behaviors; his work transformed our understanding of learning and our approach to psychological research.

**Ruts and Bolts of Classical Conditioning**

We have learned about Pavlov’s dogs and their demonstration of classical conditioning. We have defined the terminology associated with this process. Now it’s time to take our learning (about learning) to the next level and examine some of the principles that guide the process.

**STIMULUS GENERALIZATION**

What would happen if a dog in one of Pavlov’s experiments heard a slightly higher-frequency tone? Would the dog still salivate? Pavlov (1927/1960) asked this same question and found that a stimulus similar to the CS caused the dogs to salivate as well. This is an example of stimulus generalization. Once an association is forged between a CS and a CR, the learner often responds to similar stimuli as if they are the original CS. When Pavlov’s dogs learned to salivate in response to a metronome ticking at 90 beats per minute, they also salivated when the metronome ticked a little more quickly (100 beats per minute) or slowly (80 beats per minute; Hetherington, 2004). Their response was generalized to metronome speeds ranging from 80 to 100 beats per minute. Perhaps you have been classically conditioned to salivate at the sight of a tall glass of lemonade. Stimulus generalization predicts you would now salivate when seeing a shorter glass of lemonade, or even a mug, if you knew it contained your favorite drink.

**STIMULUS DISCRIMINATION**

Next, let’s see what would happen if you presented Pavlov’s dogs with two stimuli that differed significantly. Believe it or not, the dogs would be able to tell them apart. If you presented the meat powder with a slightly pitched sound, they would associate that pitch with the meat powder and salivate. However, they would not salivate in response to low-pitched sounds. The dogs would differentiate the high-frequency sound from a similar stimulus that is not 50% of the tone’s pitch (Watson, 1968). Similarly, someone who is tone deaf would not make the association. In other words, they are able to differentiate between high and low tones (Watson, 1968). Similarly, someone with poor pitch discrimination might only become aware of the sounds of birds (and not flies, for example) because he has learned to discriminate among various flying insects. He has only been conditioned to experience fear in response to bees.

**EXTINCTION**

Once the dogs in a classical conditioning experiment associate the tone of a bell with meat powder, can they ever learn to salivate without salivating? The answer is yes—if they are repeatedly exposed to the sound of the tone without the meat powder. If the CR is presented in the absence of the US, the association may fade. The CR decreases and eventually disappears in a process called extinction. In general, if dogs are repeatedly exposed to a CS (for example, a metronome or bell) without any tasty treats to follow, they produce progressively less salivation in response to the stimulus and, eventually, none at all (Watson, 1968).

**SPONTANEOUS RECOVERY**

But take note: Even with extinction, the connection is not necessarily gone forever. For example, Pavlov (1927/1960) used classical conditioning with a dog to form an association between the tone of a bell and meat powder. In the presence of that bell, the dog salivated. Then Pavlov removed the meat powder, but the dog continued to salivate. After a while, the dog stopped salivating, but Pavlov continued to sound the bell, and the dog started salivating again. This is called spontaneous recovery.

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Higher Order Conditioning

Higher order conditioning is a process in which a previously neutral stimulus is paired with a conditioned stimulus, thereby becoming a conditioned stimulus itself. This can occur in two ways: spontaneous recovery or paired presentation.

Spontaneous Recovery

Spontaneous recovery occurs when a conditioned response is extinguished and then reappears after a period of non-use. For example, when Pavlov extinguished the conditioned response of salivation in his dog, it was suppressed; however, when the conditioned stimulus was presented again, the conditioned response reappeared.

Paired Presentation

Paired presentation involves presenting a new stimulus with the conditioned stimulus. If the new stimulus is associated with the conditioned stimulus, it can become a conditioned stimulus itself.

Classical Conditioning in Everyday Life

Classical conditioning is a fundamental process in everyday life. It helps us form associations between stimuli and responses, which can have far-reaching implications on our behavior and emotions.

For example, imagine you are at a restaurant and the smell of your meal triggers a conditioned response of salivation. This response is learned through classical conditioning, where a conditioned stimulus (like the smell of food) is repeatedly paired with a neutral stimulus (eating the food) until the conditioned response is elicited.

From Dogs to Triathletes: Extending Pavlov

Humans also learn through classical conditioning. For instance, when you walk into a room where you have had a bad experience, you might feel anxious or fearful, even if there is no physical threat present. This is an example of conditioned anxiety or fear, which can be eliminated through classical conditioning techniques.

Ivonne's Example

Ivonne, a swimmer, experienced conditioning related to the smell of chlorine. Initially, the smell of chlorine made her heart race and feel disoriented in the water. Over time, the association between the chlorine smell and the disorientation persisted, making the experience unbearable.

To overcome this conditioned response, Ivonne could gradually expose herself to the smell of chlorine while maintaining a neutral state. She could practice relaxation skills and positive imagery to help her feel more comfortable in the water.

1. Gradual Exposure

Ivonne could expose herself to the chlorine smell under controlled conditions, like a gym locker room, where the smell of chlorine is present but not associated with anxiety or fear. This helps in breaking the conditioned association between the chlorine smell and anxiety.

2. Pairing a New Response with the US or CS

Ivonne could practice a new response with the US or CS. For example, she could stop swimming for a very long time, and the association might fade away. She could also pair a new response with the US or CS. For instance, she could practice relaxation techniques while being exposed to the chlorine smell.

3. Classical Conditioning

Ivonne could practice classical conditioning by pairing a stimulus with the US until the conditioned response is extinguished. For example, she could pair the smell of chlorine with a neutral stimulus that is not associated with anxiety or fear.

In conclusion, classical conditioning is a powerful tool in shaping behavior and emotions. Understanding and applying these principles can help individuals overcome conditioned responses and develop positive behaviors.
Yuck: Conditioned Taste Aversion

LO 5. Summarize how classical conditioning is dependent on the biology of the organism.

Have you ever experienced food poisoning? After falling ill from something you ate, whether it was sushi, uncooked chicken, or tainted peanut butter, you probably revered clear of that particular food for a while. This is an example of conditioned taste aversion, a powerful form of classical conditioning that occurs when an organism learns to associate the taste of a particular food or drink with illness. Imagine a grizzly bear that avoids poisonous berries after vomiting all day from eating them. Often it only takes a single pairing between a food and a bad feeling—that is, one trial learning—for an organism to learn its lesson. In the case of the bear, the US is the poison in the berries; the UR is the vomiting. After acquisition, the CS would be the sight of the berries, and the UR would be a nauseous feeling, as well as the bearing the berries in the future.

Avoiding foods that induce sickness has adaptive value, meaning it helps organisms survive, suppressing the odds they will reproduce and pass their genes along to the next generation. According to the evolutionary, humans and other animals have a powerful drive to ensure that they and their offspring reach reproductive age, so it’s critical to steer clear of tastes that have been associated with illness.

How might conditioned taste aversion play out in your life? Suppose you eat a hot dog a few hours before coming down with a stomach virus that’s coincidentally spreading throughout your college. The hot dog isn’t responsible for your illness— and you might even be aware of this—but the thought of eating one can make you feel sick even after you have recovered. Physical experiences like this can sometimes be so strong that they override our knowledge of the facts.

RATS WITH BELLYACHES

American psychologist John Garcia and his colleagues provided a demonstration of taste aversion in their well-known studies with laboratory rats (Garcia, Ervin, & Koelling, 1966). They designed a series of experiments to explore how rats respond to eating and drinking foods associated with sickness. In one study, Garcia and his colleagues provided the animals with flavored water followed by injections of a drug that upset their stomachs. The animals rejected that flavored drink thereafter. The rats in Garcia’s studies seemed naturally inclined to link their “internal malaise” (sick feeling) to tastes and smells and less likely to associate the nausea with other types of stimuli related to their hearing or vision, such as noises or things they saw (Garcia et al., 1966). This is clearly an adaptive trait, because nauseas often results from ingesting food that is poisonous or spoiled. In order to survive, an animal must be able to recognize and shun the tastes of dangerous substances. Garcia research highlights the importance of biological preparedness, the predisposition or inclination of animals (and people) to form certain kinds of associations through classical conditioning. Conditioned taste aversion is a powerful form of learning, would you believe it can be used to save endangered species?

Learning to the Rescue

Australia’s northern quoll (left) is threatened by the introduction of an invasive species known as the cane toad (right). The quolls eat the toads, which carry a lethal dose of poison, but they can learn to avoid this toxic prey through conditioned taste aversion (O’Donnell et al., 2010). Left: Eric and David Hosking/CORBIS; right: David Matthews/FLPA/Science Source

Similar approaches are being tried across the world. For example, the U.S. Fish and Wildlife Service is using taste aversion to discourage endangered Mexican wolves from feasting on livestock in New Mexico and Arizona (Bryan, 2012, January 28). As you see, lessons learned by psychologists working in a lab can have far-reaching consequences. —

Little Albert and Conditioned Emotional Response

LO 6. Describe the Little Albert study and explain how fear can be learned.

So far, we have focused chiefly on the classical conditioning of physical responses—salivation, nausea, and increased heart rate. Now let’s take a closer look at some of the emotional reactions classical conditioning can produce, through the pairing of a stimulus with an emotional response. We call this a conditioned emotional response: an emotional reaction acquired via classical conditioning.

The classic case study of “Little Albert,” conducted by John B. Watson and Rosalie Rayner, provides a famous illustration of a conditioned emotional response (Watson & Rayner, 1920). Little Albert was an 11-month-old baby who initially had no fear of rats. When he saw the white rats scurrying about Watson and Rayner’s lab, he didn’t seem the least bit scared. In fact, he was rather intrigued and sometimes reached out to touch them. But all this changed when the researchers began bang- ing a hammer against a steel bar (a US for a fear response in younger children) every time he reached for the rat (Harris, 1979). After seven pairings of the loud noise and the appearance of the rat, Little Albert began to fear rats and generalized this fear to other furry objects, including a sealskin coat and a rabbit (Harris, 1979). The sight of the rat went from being a neutral stimulus to a conditioned stimulus (CS), and Little Albert’s fear of the rat became a conditioned response (CR).
Nobody knows exactly what happened to Little Albert after he participated in Watson and Rayner's research. Some psychologists believe Little Albert's true identity is still unknown (Powell, 2010; Reese, 2010). Others have proposed Little Albert was Douglas Merritte, who at age 6 died of hydrocephalus (Beck & Irons, 2007; Beck, Levinson, & Irons, 2009). More recently, researchers have proposed that Little Albert was William Albert Barger (later known as William Albert Martin), who lived until 2007 and reportedly did not like animals (Powell, Digdon, Harris, & Smithson, 2014). Did Barger’s distaste for animals stem from his participation in Watson and Rayner’s experiment, or was it the result of seeing a childhood pet killed in an accident?

Researchers cannot be sure, and we may never know the true identity of Little Albert or the long-term effects of his exposure to this type of unethical conditioning.

The Little Albert study would never happen today; at least, we hope it wouldn’t. Contemporary psychologists conduct research according to stringent ethical guidelines, and instilling terror in a baby would not be considered acceptable (and would not be allowed at research institutions). However, it is not too far out to imagine a similar scenario playing out in real life. Picture a toddler who is about to reach for a rat on the kitchen floor. A parent sees this happening and shouts “NO!” It would not take many pairings of the toddler reaching for the rat and the parent shouting “NO!” for the child to develop a fear of the rat. In this real-world scenario, you would be hard-pressed to find someone who would say the parent’s behavior was unethical.

Table 5.1: Real-Life Examples of Classical Conditioning

<table>
<thead>
<tr>
<th>Type</th>
<th>Pairing of Neutral Stimulus and US</th>
<th>Expected Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advertising</td>
<td>Repeated pairing of products such as cars (neutral stimulus) with celebrities (US)</td>
<td>Automatic response to celebrity (UR), such as sexual arousal, heart racing, desire pairing leads to similar response, such as sexual arousal, heart racing, desire (CR) to the product (CS).</td>
</tr>
<tr>
<td>Fears</td>
<td>Pairing of a dog lunging (US) at you on the street (neutral stimulus) where you take your morning run</td>
<td>Automatic response to the dog lunging at you is fear (UR); pairing leads to similar response of fear (CR) to the street (CS) where the dog lives.</td>
</tr>
<tr>
<td>Felishes</td>
<td>Repeated pairings of originally nonsexual objects like shoes (neutral stimulus) and sexual activity (US)</td>
<td>Automatic response to the collision is fear (UR); with one pairing, the sight of a car approaching in the rearview mirror (CS) elicits a fearful reaction (CR).</td>
</tr>
<tr>
<td>Romance</td>
<td>Repeated pairings of a cologne (neutral stimulus) with your romantic partner (US)</td>
<td>Automatic response to your feelings for your partner is sexual arousal (UR); paired with the cologne (CS), leads to sexual arousal (CR).</td>
</tr>
</tbody>
</table>

The implications of classical conditioning extend far beyond salvaging dogs. These are just a few examples of how this form of learning impacts daily life.

Remember that classical conditioning is a type of learning associated with automatic (or involuntary) behaviors. You don’t “learn” to go out and buy a particular brand of mouthwash through classical conditioning. Classical conditioning can influence our attitudes toward products, but it can’t teach us voluntary behaviors. Well then, how do we learn these types of deliberate behaviors? Read on.

Table 5.1

| Does Sexy Sell?! Justin Bieber models underwear for Calvin Klein’s Spring 2015 ad campaign. Research suggests that advertisements may instill attitudes toward brands through classical conditioning (Grossman & Till, 1998), but how do these attitudes affect sales? Now that is a question worth researching.

The Advertising Archives

Marketers use classical conditioning to instill positive emotions and attitudes toward product brands. List examples of recent advertisements you have seen on television or the Internet that use this approach to get people to buy products. Which of your recent purchases may have been influenced by such ads?

Remember that classical conditioning is a type of learning associated with automatic (or involuntary) behaviors. You don’t “learn” to go out and buy a particular brand of mouthwash through classical conditioning. Classical conditioning can influence our attitudes toward products, but it can’t teach us voluntary behaviors. Well then, how do we learn these types of deliberate behaviors? Read on.

try this
Operant Conditioning

Chapter 5

Operant Conditioning Defined

What has kept Jeremy working so hard all these years? Psychologists might attribute Jeremy's ongoing efforts to operant conditioning, a type of learning in which people or animals come to associate their voluntary actions with their consequences. Whether pleasant or unpleasant, the effects of a behavior influence future actions. Think about some of the consequences of Jeremy's training—short-term results like seeing his free throw shot improve, and long-term rewards like victory, fame, and fortune. How do you think these outcomes might have influenced (and continue to influence) Jeremy's behavior? Before addressing this question, we need to take a closer look at operant conditioning.

Thorndike and His Cats

One of the first scientists to objectively study the effect of consequences on behavior was American psychologist Edward Thorndike (1874–1949). Thorndike's early research focused on chicks and other animals, many of which he kept in his apartment. But after an incubator almost caught fire, his landlady insisted he get rid of the chicks (Hothewell, 2004). It was in the lab that Thorndike conducted his research on cats. His most famous experimental setup involved putting a cat in a latched cage called a "puzzle box" and planting enticing pieces of fish outside the door. When first placed in the box, the cat would scratch and paw around randomly, but after a while, just by chance, it would pop the latch, causing the door to release. The cat would then escape the cage to devour the fish (Figure 5.2). The next time the cat was put in the box, it would repeat this random escape behavior. If while playing with the Golden State Warriors, he would eat breakfast at the team's training facility by 8:30 a.m., three and a half hours before practice. "Then, all of sudden, would hear a ball bouncing on the floor," Keith Smart, a former coach told The New York Times (Beck, 2012, February 24, para. 14). Between NBA seasons, Jeremy returned to his alma mater Palo Alto High School to run track workouts with Coach Diepenbrock. He also trained with a shooting coach and spent "an inordinate amount of time" honing his shot, according to Diepenbrock.

Jeremy's persistence paid off. The once-scrawny scraper, now 6'3" and 200 pounds (ESPN.com, 2015), is exploding with power and agility. According to Diepenbrock, "He has gotten to the point where now, as far as the strength and the athleticism, he is on par—or good enough—with veteran NBA athletes.

Operant Conditioning Defined

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behaviorism (or are followed by something unpleasant) will not be repeated. The law of effect is not limited to cats. When was the last time your behavior changed as a result of a pleasurable outcome? Because the fish increased the likelihood that the preceding behavior (escaping the cage) would occur again. Reinforcers are consequences that follow behaviors, and they are a key component of operant conditioning. Our daily lives abound with examples of reinforcers. Praise, hugs, good grades, enjoyable food, and attention are all reinforcers that increase the probability the behaviors they follow will be repeated. Through the process of reinforcement, targeted behaviors become more frequent. A child praised for sharing a toy is more likely to share in the future. A student who studies hard and earns an A on an exam is more likely to prepare well for upcoming exams.

SHAPING AND SUCCESSIVE APPROXIMATIONS Building on Thorndike’s law of effect and Watson’s approach to research, Skinner demonstrated, among other things, that reinforcers can be used to condition a series of small steps that gradually approach the target behavior. Skinner employed shaping, the use of reinforcers to change behaviors through small steps toward a desired behavior (see Infographic 5.2 on page 190). Skinner used shaping to teach a rat to “play baseball” (dropping a marble through a hole) and pigeons to “bow! (nudging a ball down a miniature alley). As you can see in the photo on page 188. Skinner placed animals in chambers, or Skinner boxes, which were outfitted with food dispensers the animals could activate (by pecking a target or pressing a lever, for instance) and numbered rewards were dispensed until eventually it was able to break free almost immediately (Thorndike, 1898).

We should highlight a few important issues relating to this early research. First, the cats discovered Skinner pigeons to bowls! The first trial was relatively easy, but the animals needed reinforcement. These boxes allowed Skinner to conduct carefully controlled experiments, measuring activity precisely and advancing the scientific and systematic study of behavior. But as we know, the law in the world of operant conditioning is not absolute. The study of bowling lessons into small steps that pigeons could accomplish. Next, he introduced reinforcers as consequences for behaviors that came closer and closer to achieving the desired goal—bowling a strike! Choosing the right increments for the behaviors was crucial. If his expectations started too high, the pigeons would never be given any reinforcers. If his expectations were too low, the pigeons would get reinforcers for everything they did. Either way, he would be unable to make the critical connection between desired behavior and reward. So Skinner devised a plan such that every time the animals did something that brought them a step closer to completing the desired behavior, they would get a reinforcer (usually food). The first reward might be for simply looking at the ball, the second for bending down and touching it; and the third, for nudge the ball with their beaks. Since each incremental change in behavior brings the birds closer to accomplishing the larger goal of bowling, this method is called successive approximations. As the pigeons were repeatedly driving balls down miniature alleys, knocking down pins with a swipe of the beak (Peterson, 2004).

Successive approximations can also be used with humans, who are sometimes unwilling or unable to change problematic behaviors overnight. For example, psychologists have used successive approximation to change truancy behavior in adolescents (Enna & Dafanos, 2009). The truant teens were provided reinforcers for consistent attendance, but with small steps requiring increasingly more days in school.

It is amazing that the principles used for training animals can also be harnessed to keep teenagers in school. Is there anything operant conditioning can’t accomplish? 

MUSICAL BUNNY Keller and Marian Breland observe one of their animal performers at the IQ Zoo in Hot Springs, Arkansas, circa 1963. Using the operant conditioning concepts they learned from B. F. Skinner, the Brelands trained ducks to play guitars, raccoons to shoot basketballs, and chickens to tell fortunes. But their animal “students” did not always cooperate; sometimes their instincts interfered with the conditioning process (Glenn, Lammers, & Huffman, 2010). The Central Arkansas Library System/Courtesy of Bob Bailey

Radical Behaviorist Amusingly, almost the last word of B. F. Skinner, one of the most influential psychologists of all time. Skinner believed that every thought, emotion, and behavior (basically anything psychological) is shaped by factors in the environment. Using animal chambers known as “Skinner Boxes,” he conducted carefully controlled experiments on animal behavior. This is a typical Skinner box. Getty Images

Law of effect Thorndike’s principle stating that behaviors are more likely to be repeated when followed by pleasurable outcomes, and those followed by something unpleasant are less likely to be repeated.

Reinforcers Consequences, such as events or objects, that increase the likelihood of a behavior reoccurring.

Reinforcement Process by which an organism learns to associate a voluntary behavior with its consequences.

Behaviorism The scientific study of observable behavior.

Shaping The use of reinforcers to guide behavior to the acquisition of a desired, complex behavior.
Learning Through Operant Conditioning

Operant conditioning is a type of learning in which we associate our voluntary actions with the consequences of those actions. For example, a pigeon naturally pecks things. But if every time the pigeon pecks a ball, it is given a reinforcer, the pigeon will soon learn to peck the ball more frequently.

B. F. Skinner showed that operant conditioning could do more than elicit simple, isolated actions. Through the process of shaping, in which reinforcers are used to change behaviors toward a more complex behavior, Skinner taught his pigeons to perform behaviors involving a series of actions, like bowling and tennis. Today, shaping is used routinely by parents, teachers, coaches, and employers to train all kinds of complex behaviors.

The pigeon will soon learn to peck the ball if it is rewarded with seeds for pecking the ball. Learning Through Operant Conditioning

Ball-pushing behavior increases. Now, only the next step toward “tennis” is rewarded.

Child refuses to eat vegetables.

Reinforced for touching fork.

GOOD JOB! Now, reinforced for touching vegetables.

After behavior has been shaped through reinforcement, the pigeon has learned to play tennis.

These examples involve researchers deliberately shaping behaviors with reinforcers in a laboratory setting. Many behaviorists believe behaviors are being shaped all of the time, both in and out of the laboratory. What factors in the environment might be shaping your behavior?

Common Features of Operant and Classical Conditioning

Both operant and classical conditioning are forms of learning, and they share many common principles (Table 5.2). As with classical conditioning, behaviors learned through operant conditioning go through an acquisition phase. Jeremy Lin learned to dunk a basketball when he was a sophomore in high school. The cats in Thorndike’s experiments learned how to escape their puzzle boxes after a certain number of trials. In both cases, the acquisition stage occurred through the gradual process of shaping. Behaviors learned through operant conditioning are also subject to extinction—that is, they may fade in the absence of reinforcers. A rat in a Skinner box essentially gives up pushing on a lever if there is no longer a reinforcer awaiting. But that same lever-pushing behavior can make a sudden comeback through spontaneous recovery. After a rest period, the rat returns to his box and reverts to his old lever-pushing ways.

Cells in the brain that control behavior also form new connections when they are rewarded. With operant conditioning, stimulus generalization is seen when a previously learned response following its extinction. A rat is conditioned to push a particular type of lever, but it may push a variety of other lever types similar in shape, size, and color. Horses also show stimulus generalization. With successive approximations using a tasty oat-molasses grain reinforcer, a small sample of horses learned to push on a “rat lever” with their lips in response to the appearance of a solid black circle with a 2.5-inch diameter. After conditioning, the horses were presented with a variety of black circles of different diameters; demonstrating stimulus generalization, they pressed the lever most often when shown circles close in size to the original (Dougherty & Lewis, 1991).

Stimulus discrimination is also at work in operant conditioning, as organisms can learn to discriminate between behaviors that do and do not result in reinforcement. With the use of reinforcers, turtles can learn to discriminate among black, white, and gray paddles. In one study, researchers rewarded a turtle with morsels of meat when it
chose a black paddle over a white one; subsequently, the turtle chose the black paddle over other-colored paddles (Leighty et al., 2013).

Types of Reinforcement

POSITIVE REINFORCEMENT
With operant conditioning, an organism learns to associate voluntary behaviors with their consequences. Any stimulus that increases a behavior is a reinforcer. What we haven’t addressed is that a reinforcer can be something added or something taken away. In the process of positive reinforcement, reinforcers are presented (added) following the targeted behavior, and reinforcers in this case are generally pleasant (see Infographic 5.3 on page 199). By presenting positive reinforcers following a target behavior, we are increasing the chances that the target behavior will occur again. If the behavior doesn’t increase after the stimulus is presented, that particular stimulus should not be considered a reinforcer. The fish tested in Thorndike’s cats received immediately after escaping the puzzle box and the morsels of bird feed that Skinner’s pigeons got for bowling are examples of positive reinforcement. In both cases, the reinforcers were added following the desired behavior and were pleasurable.

There were also many potential positive reinforcers driving Jeremy Lin. The praise that his coaches gave him for passing a ball to a teammate would be an example of positive reinforcement. Back in high school, Coach Diepenbrock rewarded players with stickers to provide feedback on their performance (“kind of middle schoolish,” he admits, but effective nonetheless). Jeremy averaged the highest sticker score of any player ever. Did the sticker system have an effect on Jeremy’s behavior? Coach Diepenbrock believes so, and he is not alone. You may love getting stickers, but your classmate may be offended by them. You may be wondering if this approach could be used in a college classroom. The answer would inevitably depend on the people involved. Remember, the definition of a positive reinforcer depends on the organism’s response (Skinner, 1953). You may love getting stickers, but your classmate may be offended by them.

Keep in mind, too, that not all positive reinforcers are pleasant; when we refer to positive reinforcement, we mean that something has been added. For example, if a child is starved for attention, a meal will be a positive reinforcer. The removal of an unpleasant stimulus is also positive reinforcement. Back in our example of Jeremy Lin, how might he have learned to discriminate between teammates and opponents. It’s unlikely he would get reinforcement from the crowd if he mistook an opponent for a teammate and passed the ball to the other team. Making a perfect pass to a teammate, on the other hand, would likely earn approval. This brings us to the next topic, positive reinforcement, where we start to see how classical and operant conditioning differ.

NEGATIVE REINFORCEMENT
We have established that behaviors can be increased or strengthened. But it is also possible to increase a behavior by taking something away. Behaviors can increase in response to negative reinforcement, through the process of taking away (or subtracting) something unpleasant. Skinner used negative reinforcement to shape the behavior of his rats. The rats were placed in Skinner boxes with floors that delivered a continuous mild electric shock—except when they pushed on a lever. The animals would begin the experiment scrambling around the floors to escape the electric current, but every once in a while they would accidentally hit the lever and turn off the current. Eventually, they learned to associate pushing the lever with the removal of the unpleasant stimulus (the mild electric shock). After several trials, the rats would push the lever immediately, reducing their shock. This brings us to the next topic.

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PRIMARY AND SECONDARY REINFORCERS
There are two major categories of reinforcers: primary and secondary. The food with which Skinner rewarded his pigeons and rats is considered a primary reinforcer for him (a reinforcer), because it satisfies a biological need. Food, water, and physical contact are considered primary reinforcers (for both animals and people) because they meet essential requirements. Many of the reinforcers shaping human behavior are secondary reinforcers, which means they do not satisfy biological needs but often derive their power from their connection with primary reinforcers. Although money is not a primary reinforcer, we know from experience that it gives us access to primary reinforcers, such as food, a safe place to sleep, and perhaps even the ability to attract desirable mates. Thus, money is a secondary reinforcer. The list of secondary reinforcers is long and varied, because different people find different things and activities to be reinforcing. Listening to music, washing dishes, taking a ride in your car—these would all be considered secondary reinforcers for people who enjoy doing them. Ready for a tongue twister? A reinforcer is only a reinforcer if the person receiving it finds it reinforcing. In other words, the designation of a reinforcer depends on its relationship to the behavior of the organism.

Secondary reinforcers are evident in everyday social interactions. Think about how your behaviors might change in response to praise from a boss, or a pat on the back from a coworker, or even a nod of approval from a friend on Facebook or Instagram. Yes, reinforcers can even exert their effects through the digital channels of social media.

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**Social Media and Psychology**

**CONTAGIOUS BEHAVIORS**

**WHY DO YOU KEEP GLANCING AT YOUR FACEBOOK PAGE, AND WHAT COMPULS YOU TO CHECK YOUR PHONE 10 TIMES AN HOUR?**

All those little tweets and updates you receive are reinforcing. It feels good to be retweeted, and it’s nice to see people “like” your Instagram posts. With its never-ending supply of mini-rewards, social media often sucks away time that would otherwise be devoted to offline relationships and work—a clear drawback. But the reinforcing power of social media can also be harnessed to promote positive behaviors. A study by MIT researcher Damon Centola found that people are more likely to explore healthy behaviors when alerted that others in their social media networks are doing the same. This is especially true for those in “clutered” networks, where people share many of the same contacts. As Centola observed: “People usually require contact with multiple sources of ‘infection’ before being convinced to adopt a behavior” (Centola, 2010, p. 1194). Each of these sources of infection, it seems, provides social reinforcement for the positive behavior. Thus, if you want to develop a healthier lifestyle, it can’t hurt to surround yourself with online friends who exercise, eat well, and don’t smoke.

Now that we have a basic understanding of operant conditioning, let’s take things to the next level and examine its guiding principles.

**THE POWER OF PARTIAL REINFORCEMENT**

**LO 11 Describe continuous reinforcement and partial reinforcement.**

A year after graduating from Stanford, Ivonne returned to New York City and began looking for a new activity to get her outside and moving. She found the New York Road Runners Club, which connected her with an organization that supports and trains runners with all types of disabilities, including paraplegia, amputation, and cerebral palsy. Having no running experience (apart from jogging on a treadmill), Ivonne showed up at a practice one Saturday morning in Central Park and ran 2 miles with one of the running club’s guides. The next week she came back for more, and then the next, and the next.

**CONTINUOUS REINFORCEMENT**

When Ivonne first started attending practices, her teammates promised to buy her dog a treat every time she increased her distance.

"Every time they would try to get me to run farther, they’d say, ‘We’ll have hot chocolate afterwards!’” Ivonne remembers. “They actually would follow through on that reward.” The hot chocolate was given in a schedule of continuous reinforcement, because the reinforcer was presented every time the behavior occurred. Continuous reinforcement can be used in a variety of settings: a child getting praise every time he does the dishes; a dog getting a treat every time it comes when called. You get the commonality: reinforcement every time the behavior is produced.

**PARTIAL REINFORCEMENT**

Continuous reinforcement comes in handy for a variety of purposes and is ideal for establishing new behaviors during the acquisition phase. But delivering reinforcers intermittently, or every once in a while, works better for maintaining behaviors. We call this approach partial reinforcement. Returning to the examples listed for continuous reinforcement, we can also imagine partial reinforcement being used: The child gets praise about every time he does the dishes; a dog gets a treat every third time it comes when called. The reinforcer is not given every time the behavior is observed, only some of the time.

Early on, Ivonne received a reinforcer from her training buddies for every workout she increased her mileage. But how might partial reinforcement be used to help a runner increase her mileage? Perhaps instead of hot chocolate on every occasion, the treat could come after every successful run. Or, a coach might praise the runner’s hard work only some of the time. The amazing thing about partial reinforcement is that it happens to all of us, in an infinite number of settings, and we might never know how many times we have been partially reinforced for any particular behavior. Common to all of these partial reinforcement situations is that the target behavior is exhibited, but the reinforcer is not supplied each time this occurs. The hard work and reinforcement paid off for Ivonne. In 2003 she ran her first marathon—New York City—and has since competed in more than a dozen others.

**PARTIAL REINFORCEMENT EFFECT**

When Skinner put the pigeons in his experiments on partial reinforcement schedules, they would peck at a target up to 10,000 times without getting food before giving up (Skinner, 1953). According to Skinner, “Nothing of this sort is ever obtained after continuous reinforcement” (p. 99). The same seems to be true with humans. In one study from the mid-1950s, researchers observed college students playing slot machines. Some of the slot machines provided continuous reinforcement, delivering pretend coins every time students pulled the lever. Others followed partial reinforcement schedules, dispensing coins only some of the time. After the students played eight rounds, all of the machines stopped giving coins. Without any coins to reinforce them, the students stopped pulling the levers—but not at the same time. Those who had received coins with every lever pull gave up more quickly than did those rewarded intermittently.

In other words, lever-pulling behavior was less likely to be extinguished when established through partial reinforcement (Lewis & Duncan, 1956). Psychologists call this phenomenon the partial reinforcement effect: Behaviors take longer to disappear (through the process of extinction) when they have been acquired or maintained through partial, rather than continuous, reinforcement.

Remember, partial reinforcement works very well for maintaining behaviors, but not necessarily for establishing behaviors. Imagine how long it would take Skinner’s pigeons to learn the first step in the shaping process (looking at the ball) if they were rewarded for doing so only 1 in 5 times. The birds learn faster when reinforced every time, but their behavior will persist longer if they are given partial reinforcement thereafter. Here’s another example: Suppose you are housetraining your puppy. The best plan is to start the process with continuous reinforcement (praise the dog every time it “goes” outside), but then shift to partial reinforcement once the desired behavior is established.

**SYNONYM**

partial reinforcement intermittent reinforcement

**PRACTICE QUIZ**

1. **What is meant by partial reinforcement?**
   a. A schedule of reinforcement in which every target behavior is reinforced intermittently.
   b. A schedule of reinforcement in which target behaviors are reinforced continuously, not intermittently.
   c. The tendency for behaviors acquired through intermittent reinforcement to be more resistant to extinction than those acquired through continuous reinforcement.

2. **Which type of reinforcement is continuous reinforcement?**
   a. No longer used.
   b. Continuously used.
   c. Used with some behaviors.

3. **What is the partial reinforcement effect?**
   a. Partial reinforcement reinforces intermittently, not continuously.
   b. The tendency for behaviors acquired through intermittent reinforcement to be more resistant to extinction than those acquired through continuous reinforcement.
   c. Partial reinforcement intermittently makes it more likely to extinguish behaviors.

**FOR THE LOVE OF RUNNING**

Ivonne runs tethered to her husband, D. John Schmidt. She sets the pace, and they exercise, eat well, and don’t smoke.

"Every time they would try to get me to run further, they’d say, ‘We’ll have hot chocolate afterwards!’” Ivonne remembers. “They actually would follow through on that reward.” The hot chocolate was given in a schedule of continuous reinforcement, because the reinforcer was presented every time the behavior occurred. Continuous reinforcement can be used in a variety of settings: a child getting praise every time he does the dishes; a dog getting a treat every time it comes when called. You get the commonality: reinforcement every time the behavior is produced.

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Timings Is Everything: Reinforcement Schedules

LO 12: Name the schedules of reinforcement and give examples of each.

Skinner identified various ways to administer partial reinforcement, or partial reinforcement schedules. As often occurs in scientific research, he stumbled on the idea by chance. Late one Friday afternoon, Skinner realized he was running low on the food pellets he used as reinforcers for his laboratory animals. If he continued rewarding the animals on a continuous basis, the pellets would run out before the end of the weekend. With this in mind, he decided only to reinforce some of the desired behaviors (Skinner, 1956, 1970). The new strategy worked like a charm. The animals kept performing the target behaviors, even though they weren’t given reinforcers every time.

Clearly partial reinforcement is effective, but how exactly should it be delivered? Four different reinforcement schedules can be used: fixed-ratio, variable-ratio, fixed-interval, and variable-interval (Figure 5.3).

**Fixed-Ratio Schedule**
- **Definition:** Reinforcer is given after a predetermined number of desired responses.
- **Examples:**
  - A pigeon is on a fixed-ratio schedule of 30 seconds; it can peck at the target as often as possible once the interval starts, but it will only get a reinforcer following its first response after the 30 seconds has elapsed. If the third grader is on a fixed-ratio schedule of 1 week, the teacher gives prizes only on Fridays for children who do well on their math quiz that day; it doesn’t matter how they performed on other math quizzes earlier that week.

**Variable-Ratio Schedule**
- **Definition:** Reinforcer is given after a certain number of desired responses—and this number changes from trial to trial.
- **Examples:**
  - A pigeon in a Skinner box may have to peck a spot three times; and so on. In the third-grade classroom, the teacher might not tell the students how many tests they will need to pass to get a prize. She may give a prize after two tests, then the next time after seven tests. This variable-ratio schedule tends to produce a high response rate (pecking and studying in our examples) and behaviors that are difficult to extinguish because of the unpredictability of the reinforcement schedule.

**Fixed-Interval Schedule**
- **Definition:** Reinforcer is given when a desired response occurs after a preestablished interval of time.
- **Examples:**
  - If a pigeon is on a fixed-interval schedule of 40 seconds, it can peck at the target behavior (pecking and studying in our examples) and behaviors that are difficult to extinguish because of the unpredictability of the reinforcement schedule.

**Variable-Interval Schedule**
- **Definition:** Reinforcer is given after an interval of time changes from trial to trial.
- **Examples:**
  - In some cases, it might be important to focus on the interval of time between reinforcements, as opposed to the number of desired responses. In a fixed-interval schedule, the teacher gives prizes only on Fridays for children who do well on their math quiz that day; it doesn’t matter how they performed on other math quizzes earlier that week. With this schedule, the target behavior tends to increase as each time interval comes to an end. The pigeon pecks the spot more often when the time nears 30 seconds, and the students study harder as Friday approaches.

**Fixed-Ratio Schedule**
- **Definition:** Reinforcer is given after a predetermined number of desired responses.
- **Examples:**
  - A pigeon in a Skinner box may have to peck a spot five times in order to score a delicious pellet (5:1). A third-grade teacher might give students prizes when they pass their multiplication tests (3:1). Generally, the fixed-ratio schedule produces a high response rate, but with a characteristic dip immediately following the reinforcement.

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  - In some cases, it might be important to focus on the interval of time between reinforcements, as opposed to the number of desired responses. In a fixed-interval schedule, the teacher gives prizes only on Fridays for children who do well on their math quiz that day; it doesn’t matter how they performed on other math quizzes earlier that week. With this schedule, the target behavior tends to increase as each time interval comes to an end. The pigeon pecks the spot more often when the time nears 30 seconds, and the students study harder as Friday approaches.
so, and the students come to school prepared to take a quiz every day (their amount of study holding steady).

So far, we have learned about increasing desired behaviors through reinforcement, but not all behaviors are desirable. Let’s turn our attention to techniques used to suppress undesirable behaviors.

The Trouble with Punishment

In contrast to reinforcement, which makes a behavior more likely to recur, the goal of punishment is to decrease or stop a behavior (Info Graphic 5.3). Punishment is used to reduce unwanted behaviors by instilling an association between a behavior and some unwanted consequence (for example, between stealing and going to jail, or between misbehavior and a spanking). Punishment isn’t always effective, however; people are often willing to accept unpleasant consequences to get something they really want.

POSITIVE AND NEGATIVE PUNISHMENT

There are two major categories of punishment: positive and negative. With positive punishment, something aversive or disagreeable is applied following an unwanted behavior. For example, getting a ticket for speeding is a positive punishment, the aim of which is to decrease driving over the speed limit. Paying a late fine for overdue library books is a positive punishment, the goal of which is to decrease returning library books past their due date. In basketball, a personal foul (for example, inappropriate physical contact) might result in positive punishment, such as a free throw for the opposing team. Here, the addition of something aversive (the other team getting a wide open shot) is used with the intention of decreasing a behavior (pushing, shoving, and the like).

The goal of negative punishment is also to reduce an unwanted behavior, but in this case, it is done by taking away something desirable. A person who drives while inebriated runs the risk of negative punishment, as his driver’s license may be taken away. This loss of driving privileges is a punishment designed to reduce drunken driving. If you never return your library books, you might suffer the negative punishment of losing your borrowing privileges. The goal is to decrease behaviors that lead to lost or stolen library books. What kind of negative punishment might be used to rein in illegal conduct in basketball? Just ask one of Jeremy Lin’s former teammates, superstar Carmelo Anthony, one of many players suspended for participating in a 2006 brawl between the Knicks and the Denver Nuggets. Anthony, a Nuggets player at the time (how ironic that he was later traded to the Knicks), was dealt a 15-game suspension (and no salary for those games not played) for slugging a Knicks player in the face (Lee, 2006, December 19). Anthony’s suspension is an example of negative punishment, because it involves subtracting something desirable (the privilege to compete and his salary for those games) to decrease a behavior (throwing punches on the court).

Punishment may be useful for the purposes of basketball, but how does it figure into everyday life? Think about the last time you tried using punishment to reduce unwanted behavior. Perhaps you scolded your puppy for having an accident, or snapped at your housemate for leaving dirty dishes in the sink. If you are a parent or caregiver of a young child, perhaps you have tried to reign in misbehavior with various types of punishment, such as spanking.

punishment: The application of a consequence that decreases the likelihood of a behavior recurring.

positive punishment: The addition of something unpleasant following an unwanted behavior, with the intention of decreasing that behavior.

negative punishment: The removal of something desirable following an unwanted behavior, with the intention of decreasing that behavior.

POSITIVE AND NEGATIVE PUNISHMENT

1. negative punishment, 2. positive reinforcement, 3. negative reinforcement, 4. negative punishment, 5. positive reinforcement, 6. positive punishment

4. Gabriel’s assistant had a bad habit of showing up late for work, so Gabriel docked his pay.
5. During food drives, the basketball team offers to wash your car for free if you donate six items or more to the local homeless shelter.
6. Claire received a stern lecture for texting in class. She doesn’t want to hear that again, so now she turns off her phone when she enters the classroom.

T ime-Out

Sending a child to a corner for a “time-out” is an example of negative punishment because it removes something (the privilege to play) in order to decrease an unwanted behavior. Spanking is a positive punishment because it involves the addition of something (a slap) in order to decrease an unwanted behavior. Perhaps you scolded your puppy for having an accident, or snapped at your housemate for leaving dirty dishes in the sink. If you are a parent or caregiver of a young child, perhaps you have tried to reign in misbehavior with various types of punishment, such as spanking.

INFOGRAPHIC 5.3

Learning: Punishment and Reinforcement

Behavior: Driving Fast

Do you want to increase this behavior?

YES!

It’s Nascar! You have to drive faster than anyone else to win. We will apply a reinforcer to increase the behavior.

NO!

We’re not at the racetrack! Speeding is dangerous and against the law. We will apply a punishment to decrease the behavior.

- Positive Reinforcement
- Negative Reinforcement
- Positive Punishment
- Negative Punishment

Positive reinforcement increases a behavior.

Negative reinforcement decreases a behavior.

Positive punishment decreases a behavior.

Negative punishment decreases a behavior.

Which process matches each of the following examples?

Choose from positive reinforcement, negative reinforcement, positive punishment, and negative punishment.

Test yourself.

1. Carlos’ parents grounded him the last time he stayed out past his curfew, so tonight he came home right on time.
2. Joshua spent an entire week helping an elderly neighbor clean out her basement after a flood. The local newspaper caught wind of the story and ran it as an inspiring front-page headline. Joshua enjoyed the attention and decided to organize a neighborhood work group.
3. The trash strikes, so Sherrill takes it out.
4. Gabriel’s assistant had a bad habit of showing up late for work, so Gabriel docked his pay.
5. During food drives, the basketball team offers to wash your car for free if you donate six items or more to the local homeless shelter.
6. Claire received a stern lecture for texting in class. She doesn’t want to hear that again, so now she turns off her phone when she enters the classroom.
reinforcement (positive or negative) aims to increase the behavior. Operant conditioning uses reinforcers (both positive and negative) to increase target behaviors, and punishment to decrease unwanted behaviors.

If all the positives and negatives are confusing you, just think in terms of math: Positive always means adding something, and negative means taking it away. Punishment can be positive, which means the addition of something viewed as unpleasant (“Because you made a mess of your room, you have to wash all the dishes!”), or negative, which involves the removal of something viewed as pleasant or valuable (“Because you made a mess of your room, no ice cream for you!”). For basketball players, a positive punishment might be adding more wind sprints to decrease errors on the free throw line. An example of negative punishment might be benching the players for brawling on the court; taking away the players’ court time to decrease their fighting behavior.

**Apply This**

**Think Positive Reinforcement**

With all this talk of chickens, basketball players, and triathletes, you may be wondering how operant conditioning applies to you. Just think about the last time you earned a good grade on a test after studying really hard. How did this grade affect your preparation for the next test? If you made you study more, then it served as a positive reinforcer. A little dose of positive reinforcement goes a long way when it comes to increasing productivity. Let’s examine three everyday dilemmas and brainstorm ways we could use positive reinforcers to achieve better outcomes.

**Problem 1:** Your housemate frequently goes to sleep without washing his dinner dishes. Almost every morning, you walk into the kitchen and find a tower of dirty pans and plates sitting in the sink. No matter how much you nag and complain, he simply will not change his ways.

**Solution:** Nagging and complaining are getting you nowhere. Try positive reinforcers instead. Wait until a day your housemate takes care of his dishes and then pour on the praise. You might be pleasantly surprised the next morning.
Classical and Operant Conditioning: What’s the Difference?

Students sometimes have trouble differentiating classical and operant conditioning (Figure 5.4). After all, both forms of conditioning—classical and operant—involves forming associations. In classical conditioning, the learner links different stimuli; in operant conditioning, the learner connects her behavior to its consequences (reinforcement and punishment).

Another key similarity is that the principles of acquisition, stimulus discrimination, stimulus generalization, extinction, and spontaneous recovery apply to both types of conditioning.

But there are also key differences between classical and operant conditioning. In classical conditioning, the learned behaviors are involuntary, or reflexive. Ivonne cannot directly control her heart rate any more than Pavlov’s dogs can decide when to salivate.

Operant conditioning, on the other hand, concerns voluntary behavior. Jeremy Lin had direct control over his decision to practice his shot, just as Skinner’s pigeons had control over repeated pairing of stimuli; (Figure 5.4) Jeremy gains from succeeding in basketball, the more mature behavior by responding attentively.

Problem 2: Your child is annoying you with her incessant whining. She whines for milk, so you give it to her. She whines for someone to play with, so you play with her. Why does your child continue to whine although you are responding to all her needs? Solution: Here, we have a case in which positive reinforcers are driving the problem. When you turn off your ears to the whining, you might even want to say something like, “I can’t hear you when you’re whining. If you ask me in a normal voice, I’ll be more than happy to help.” Then reinforce her more mature behavior by responding attentively.

Problem 3: You just trained your puppy to sit. She was cooperating wonder-fully until about a week after you stopped rewarding her with dog biscuits. You want her to sit on command, but you can’t keep doling out doggie treats forever. Solution: Once the dog has adopted the desired behavior, begin rein-forcing unpredictably. Remember, continuous reinforcement is most effective for establishing behaviors, but a variable schedule (that is, giving treats intermittently) is a good bet if you want to make the behavior stick (Pryor, 2002).

Another important distinction is the way in which behaviors are strengthened. In classical conditioning, behaviors become more frequent with repeated pairings of stimuli. The more often Ivonne sniffs chlorine before swim practice, the more likely he will keep practicing. Often classical conditioning and operant conditioning occur simultaneously. A baby learns that he gets fed when he cries; getting milk reinforces the crying behavior (operant conditioning). At the same time, the baby learns to associate milk with the appearance of the bottle. As soon as he sees his mom or dad take the bottle from the refrigerator, he begins salivating in anticipation of gulping it down (classical conditioning).

Classical and operant conditioning are not the only ways we learn. There is one major category of learning we have yet to cover. Use this hint to guess what it might be: “How do you learn to peel a banana, open an umbrella, and throw a Frisbee?” Somebody must have shown you.

1. According to Thorndike and the law of effect, behaviors are more likely to be repeated when they are followed by pleasurable outcomes.

2. A third-grade teacher gives her students prizes for passing math tests. Not only do the students improve in dog bath stores, they also begin studying harder for their spelling tests as a result of this reinforcement schedule. Their increased studying of spelling is an example of a.

3. A child disrupts class and the teacher writes her name on the board. For the rest of the week, the child does not act up to decrease the child’s disruptive behaviors.

4. A child is good at basketball, but he more than makes up for that in confidence and game smarts. Jeremy Lin charges past Jerryd Bayless of the Milwaukee Bucks. Jeremy Lin is not the fastest runner or highest jumper on the planet, and he is certainly not the biggest guy in professional hoops. In the world of the NBA, where the players’ average height is about 6’7” and the average weight is 220 pounds, Jeremy is actually somewhat small (NBA.com, 2007, November 20; NBA.com, 2007, November 27). So what is it about this benchwarmer-turned-big-shot that makes him so special? Jeremy’s success, we suspect, is largely a result of qualities that are extremely hard to measure, like unstoppable confidence, dogged determination, and a penetrating basketball IQ, or mental mastery of the sport. “There are very few people that have the same basketball IQ,” Coach Dresenbrock explains. “That’s what separates him from other players.”

The roots of Jeremy’s hoop smarts reach back to his father’s native country. Growing up in Taiwan, Gie-Ming Lin didn’t have much exposure to basketball, but he was fas-cinated by what he saw of the sport. When Gie-Ming arrived in America, he fell head over heels in love with basketball, tapping NBA games and watching them any chance he got.
This 5’6” engineering student had never picked up a basketball, but he managed to learn the techniques of the game by closely watching the moves of NBA legends like Kareem Abdul-Jabbar, Larry Bird, and Magic Johnson (O’Neil, 2009, December 10). Eventually, he tried those moves on the court, and passed them along to Jeremy and his other two sons.

The NBA greats that Gie-Ming studied served as models, demonstrating behaviors that could be observed and imitated. We call this process observational learning, as it results from watching the behavior of others. According to Bandura (1986), this type of learning is more likely to occur when the learner: (1) is paying attention to the model; (2) remembers what she observed (Bahrick, Gogate, & Ruiz, 2002); (3) is capable of performing the behaviors she has observed; and (4) is motivated to demonstrate the behavior.

The Power of Observational Learning

Think about how observational learning impacts your own life. Speaking English, eating with utensils, and driving a car are all skills you probably picked up in part by watching and mimicking others. Do you ever use slang? Phrases like “gnarley” (cool) from the 1980s, “Wassup” (What is going on?) from the 1990s, and “peeps” (my people, or friends) from the 2000s were widely used because people copy what they observe others saying and writing. Consider some of the phrases trending today that 20 years from now people won’t recognize.

Observational learning doesn’t necessarily require sight. Let’s return to Ivonne, who competes in triathlons, consisting of 1 mile of swimming, 25 miles of biking, and 6 miles of running. Ivonne performs the swimming and running sections of the triathlon attached to a guide with a tether, and the bike section on a tandem bike with the guide. To fine-tune her swimming technique, she feels her swim coach demonstrate the freestyle stroke. Standing in the water behind him, Ivonne places one hand on his back and the other on his arm while he goes through the motions of a stroke. She feels the angle of his arms as they break the water’s surface, the distance between his fingers as he plows through the water, and the position of his head throughout the motion. Then she imitates the movement she observed through her sense of touch.

VIOLENCE IN THE MEDIA

Psychologists have followed up Bandura’s research with studies investigating how children are influenced by violence they see on television, the Internet, and in movies and video games. The American Academy of Pediatrics sums it up nicely: “Extensive research evidence indicates that television, the Internet, and in movies and video games. The American Academy of Pediatrics sums it up nicely: “Extensive research evidence indicates that media violence can contribute to aggressive behavior, desensitization to violence, nightmares, and fear of being harmed” (American Academy of Pediatrics, 2009, p. 1495). One large study found that children who watched TV programs with violent role models, such as Starsky and Hutch (a detective series from the 1970s that included violence and suspense), were at increased risk when they became adults of physically abusing their spouses and getting into trouble with the law (Huesmann, Moise-Titus, Podolski, & Eron, 2003). A more recent study conducted in New Zealand followed over 1,000 children from as early as birth until they were around 26 years old. The researchers found that the more television the children watched, the more likely they were to show antisocial behaviors as young adults. Interestingly, this association was between antisocial behaviors and excessive television viewing, regardless of the content (Robertson, McAnally, & Hancox, 2013).

Identify the independent variable and dependent variable in the experiment by Bandura and colleagues. What might you change if you were to replicate this experiment?
Sunny Days

The prosocial behaviors demonstrated by Big Bird and Sesame Street friends appear to have a meaningful impact on child viewers. Children have a knack for imitating positive behaviors such as sharing and caring (Cole et al., 2008). Positive behaviors such as sharing and caring seem to have been learned by the children watching (Cole et al., 2008). Unfortunately, children and their parents have not followed this recommendation. In fact, the average screen time for preschool-age children in the United States has been reported to be as much as 4 hours a day (Tandon, Zhong, 2011). Instead of following the advice to limit the number of hours children watch television, some have suggested that we should encourage children to watch educational programs that encourage prosocial behaviors, meaning these programs foster kindness, generosity, and forms of behavior that benefit others.

Let’s look more closely at research on the impact of prosocial models. Using scales to measure children’s stereotypes and cultural knowledge before and after they watch TV shows, a group of researchers found evidence that shows how Sesame Street can have a positive influence (Cole, Labin, & del Rocio Galarza, 2008). Based on their review of multiple studies, these researchers made recommendations to increase prosocial behaviors. Children’s shows should have intended messages, include prosocial information about people of other cultures and religions, be relevant to children in terms of culture and environment, and be age-appropriate and contain intentional and direct (unhidden) messages aimed at educating children about people from different backgrounds.

Adults can also pick up prosocial messages from media. In a multipart study, researchers exposed adults to prosocial song lyrics (as opposed to neutral lyrics). The first experiment found that listening to prosocial lyrics increased the frequency of prosocial thoughts. Findings from the second experiment indicated that listening to a song with prosocial lyrics increased empathy, or the ability to understand what another person is going through. The third experiment found that listening to a song with prosocial lyrics increased helping behavior. These researchers only looked at the short-term effects, but exposing people continuously to prosocial lyrics may have a lasting impact (Greitemeyer, 2009).

Critics caution, however, that an association between media portrayals and violent behaviors doesn’t mean there is a cause-and-effect relationship (establishing an association is not the same as pinning down a cause). There are other factors related to parenting that could influence both television viewing and aggression (Huesmann et al., 2003). If a parent is emotionally neglectful and places a child in front of the television all day, the child may eventually imitate some of the aggression she sees on TV. At the same time, the child may resent the parent for ignoring her, and this resentment could lead to aggression. But how do you know which of these factors—television exposure or parenting approach—is more important in the development of aggressive tendencies? This is an active area of psychological research, but experts agree that television and other forms of media may influence aggressive tendencies in children (Clemente, Esponisa, & Vidal, 2008. Office of the Surgeon General, National Center for Injury Prevention and Control, National Institute of Mental Health, & Center for Mental Health Services, 2001). The American Academy of Pediatrics has recommended that children should be limited to less than 1–2 hours of total screen time per day (American Academy of Pediatrics, 2001, 2013). Unfortunately, children and their parents have not followed this recommendation. In fact, the average screen time for preschool-age children in the United States has been reported to be as much as 4 hours a day (Tandon, Zhong, 2011). Instead of following this advice, it helps me feel that I have an idea of what to expect, and when to expect it,” Ivonne says. The mental layout she creates contributes to her cognitive map, a mental representation of the physical surroundings, and it continues to come together in the race. At Ivonne runs, she hears sounds from all directions—the breathing of other runners, their feet hitting the ground, chatter from the sidelines—and uses these auditory cues to produce a mental map of her surroundings. In fact, we all create these cognitive maps, which provide a spatial representation to help us navigate our environment. These maps are developed through latent learning, a type of learning that occurs without awareness and regardless of reinforcement, and that remains hidden until there is a need to use it.

When learning occurs through observation, often it is visible. Children watching television toward a Bobo doll imitate the behaviors they see, which researchers can witness and document. Not all forms of learning are so obvious.

Latent Learning

A MAP THAT CANNOT BE SEEN

Before a race, Ivonne checks online to see if there is a map of the course. She studies a map with her husband or a friend in order to learn the location of important landmarks such as hills, major turns, bridges, railroad tracks, and so on. “Doing this helps me feel that I have an idea of what to expect, and when to expect it,” Ivonne says. The mental layout she creates contributes to her cognitive map, a mental representation of the physical surroundings, and it continues to come together in the race. At Ivonne runs, she hears sounds from all directions—the breathing of other runners, their feet hitting the ground, chatter from the sidelines—and uses these auditory cues to produce a mental map of her surroundings. In fact, we all create these cognitive maps, which provide a spatial representation to help us navigate our environment. These maps are developed through latent learning, a type of learning that occurs without awareness and regardless of reinforcement, and that remains hidden until there is a need to use it.
This line of research highlights the importance of cognitive processes underlying behavior and suggests that learning can occur in the absence of reinforcement. Because of the focus on cognition, this research approach conflicts with the views of Skinner and some other 20th-century psychologists who adhered to a strict form of behaviorism.

Many other studies have challenged Skinner's views. Wolfgang Köhler's (1925) research on chimpanzees suggests that animals are capable of thinking through a problem before taking action. He designed an experiment in which chimps were presented with out-of-reach bananas, and showed that the animals were able to plan a variety of banana-fetching strategies, including stacking crates to climb on. Here, the chimps displayed insightful, a sudden coming together of awareness of a situation, leading to the solution of a problem (Chapter 7).

Today, most psychologists agree that both observable, measurable behaviors and internal cognitive processes such as insight are necessary and complementary elements of learning. Environmental factors have a powerful influence on behavior, as Pavlov, Skinner, and others discovered, but every action can be traced to activity in the brain.

Understanding how cognitive processes translate to behaviors remains one of the great challenges facing psychologists.

**FIGURE 5.5 Latent Learning**

In a classic experiment, groups of rats learned how to navigate a maze at remarkably different rates. Rats in a group receiving reinforcement from Day 1 (the green line on the graph) initially had the lowest rate of errors and were able to work their way through the maze more quickly than the other groups. But when a group began to receive reinforcement for the first time on Day 5, their error rate dropped immediately. This shows that the rats were learning the basic structure of the maze even when they weren’t being reinforced.

Source: Adapted from Tolman, 1948

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**You Asked, Ivonne Answers**

http://qrs.ly/6i3m619

Do you create cognitive maps just when you're running?

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You want to learn how to play basketball, so you watch videos of Jeremy Lin executing plays. If your game improves as a result, this would be considered an example of:

- a. observational learning
- b. association
- c. prosocial behavior
- d. your cognitive map

**IT KEEPS GETTING BETTER**

Wondering what became of Jeremy Lin following “Linsanity”? After suffering a knee injury in the spring of 2012, Jeremy was out of commission for the remainder of the season with the Knicks. He then signed a deal with the Houston Rockets, had a good run with that team for two seasons, and was traded to the Los Angeles Lakers in the summer of 2014. Jeremy has proven he can hold his own as a point guard in the NBA, and we suspect he will continue stirring up “Linsanity” in the future.

Ivonne Mosquera-Schmidt continues to be an unstoppable force. Between 2012 and 2014, she set three American records, running faster than any totally blind woman in the 1,500-meter, the 3,000-meter, and the 5,000-meter distances. She won a gold medal at the 2013 Paratriathlon World Championships, her second gold medal in this competition. In the summer of 2014, Ivonne was diagnosed with a rare type of bladder cancer, a challenge she faced with incredible courage and optimism. She underwent chemotherapy and surgery, and was back on the track within weeks of leaving the hospital. Ivonne is currently preparing for the 2016 Paralympics, which are scheduled to be held in Rio de Janeiro, Brazil. What keeps this amazing woman going? Apart from the obvious reasons, such as love of sport, Ivonne derives great satisfaction from bridging the gap between the able-bodied and disabled communities. Blind and sighted athletes have a common appreciation for exercise, and training and racing unite them in a very human way. "We can have the same dreams, the same goals, the same ambitions," Ivonne says, "and [exercise] gets us working together."

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**Peace of Mind**

Ivonne does the triangle pose during a visit to Queenstown, New Zealand. Yoga helps develop the strength and flexibility she needs for racing, and keeps her grounded. A. Jardine/Queeney Ivonne Mosquera-Schmidt

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**Shoot for the Stars**

Jeremy works with an aspiring basketball player in Taipei, Taiwan. His work with children continues through the Jeremy Lin Foundation, a nonprofit organization devoted to serving young people and their communities. AP Photo/Chiang Ying-ying

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**Show what you know**

1. You want to learn how to play basketball, so you watch videos of Jeremy Lin executing plays. If your game improves as a result, this would be considered an example of:
   - a. observational learning
   - b. association
   - c. prosocial behavior
   - d. your cognitive map

2. Bandura’s Bobo doll study shows us that observational learning results in a wide variety of learned behaviors. Describe several types of behaviors you have learned by observing a model.

3. Although Skinner believed that reinforcement is the cause of learning, there is robust evidence that reinforcement is not always necessary. This comes from experiments studying:
   - a. positive reinforcement
   - b. negative reinforcement
   - c. latent learning
   - d. stimulus generalization

**Check Your Answers in Appendix C.**
summary of concepts

LO 1 Define learning. (p. 174)

Learning is a relatively enduring change in behavior or thinking that results from experiences. Organisms as simple as fish and as complex as humans have the ability to learn. Learning is about creating associations. Sometimes we associate two different stimuli (classical conditioning). Other times we make connections between our behaviors and their consequences (operant conditioning). We can also learn by watching and imitating others (observational learning), creating a link between our behavior and the behavior of others.

LO 2 Explain what Pavlov’s studies teach us about classical conditioning. (p. 176)
The dogs in Pavlov’s studies learned to associate various stimuli with the anticipation of food, which resulted in them salivating when the stimuli were introduced. He discovered how such associations are learned, and referred to this process as conditioning. Classical conditioning is the process in which two stimuli become associated; once this association has been established, an originally neutral stimulus is conditioned to elicit an involuntary response.

LO 3 Identify the differences between the US, UR, CS, and CR. (p. 176)
In classical conditioning, a neutral stimulus is something in the environment that does not normally cause a relevant emotional or reflective response. This neutral stimulus is repeatedly paired with an unconditioned stimulus (US) that triggers an unconditioned response (UR). The neutral stimulus thus becomes a conditioned stimulus (CS) that the organism has learned to associate with the US. This CS elicits a conditioned response (CR). The initial pairing of a neutral stimulus with a US is called acquisition.

LO 4 Summarize the different types of classical conditioning. (p. 176)
Classical conditioning is the process of learning an association between a CS and a CR, the learner often responds to similar stimuli as if they were the original CS. This is called stimulus generalization. For example, someone who has been bitten by a small dog and reacts with fear to all dogs, big and small, demonstrates stimulus generalization. Stimulus discrimination is the ability to differentiate between a CS and other stimuli sufficiently different from it. Someone who was bitten by a small dog may be afraid of small dogs, but not large dogs, thus demonstrating stimulus discrimination.

LO 5 Summarize what classical conditioning is dependent on the biology of the organism. (p. 182)
Animals and people show biological preparedness, meaning they are predisposed to learn associations that have adaptive value. For example, a conditioned taste aversion is a form of classical conditioning that occurs when an organism learns to associate the taste of a particular food or drink with illness. Avoiding foods that induce sickness increases the odds the organism will survive and reproduce, passing its genes along to the next generation.

LO 6 Describe how fear can be learned. (p. 183)
The case study of Little Albert illustrates the conditioned emotional response, an emotional reaction (fear in Little Albert’s case) acquired via classical conditioning. When Little Albert heard a loud bang, this was a US that elicited a fear response (the UR). Through conditioning, the sight of a rat became paired with the loud noise and went from being a neutral stimulus to a CS. Little Albert’s fear of the rat became a CR.

LO 7 Describe Thorndike’s law of effect. (p. 187)
Thorndike’s law of effect was important in the development of operant conditioning, a learning in which people or animals come to associate their voluntary actions with consequences. The law of effect states that if a behavior is followed by a pleasurable outcome, that behavior is more likely to recur.

LO 8 Explain shaping and the method of successive approximations. (p. 188)
Building on Thorndike’s law of effect and Watson’s behaviorism, Skinner used reinforcers to guide behavior to the acquisition of a desired complex behavior, a process called shaping. Successive approximations is a method of shaping that uses reinforcers to condition a series of small steps that gradually approach a target behavior. Animal behavior can be shaped using successive approximations, but instinct can interfere with the process. This instinctive drift is the tendency for animals to revert to instinctual behaviors after a behavior pattern has been learned.

LO 9 Differentiate between positive and negative reinforcement. (p. 192)
Positive reinforcement refers to the process of applying reinforcers that increase future occurrences of a targeted behavior. The fish treats that Thondike gave his cats are examples of positive reinforcers (they increased the likelihood of the cats opening the latch). Behaviors can also increase in response to negative reinforcement through the process of taking away (or removing) something unpleasant. Putting on a seat belt in a car to stop an annoying beep is an example of negative reinforcement (it increases the likelihood of wearing a seat belt). Both positive and negative reinforcement increase desired behaviors.

LO 10 Distinguish between primary and secondary reinforcers. (p. 193)
There are two major categories of reinforcers. Primary reinforcers satisfy biological needs: food, water, and physical contact are considered primary reinforcers. Secondary reinforcers do not satisfy biological needs, but often derive their power from their connection with primary reinforcers. Money is an example of a secondary reinforcer; we know from experience that it gives us access to primary reinforcers. Food is a primary reinforcer whereas money is a secondary reinforcer.

LO 11 Describe continuous reinforcement and partial reinforcement. (p. 194)
Reinforcers can be delivered on a constant basis (continuous reinforcement) or intermittently (partial reinforcement). Continuous reinforcement is generally more effective for establishing a behavior, whereas learning through partial reinforcement is more resistant to extinction (the partial reinforcement effect) and useful for maintaining behavior.

LO 12 Name the schedules of reinforcement and give examples of each. (p. 196)
In a fixed-ratio schedule, reinforcement follows a predetermined number of desired responses or behaviors. In a variable-ratio schedule, the number of desired responses or behaviors that must occur before a reinforcer is given changes across trials and is based on an average number of responses to be reinforced. In a fixed-interval schedule, the reinforcer comes after a preestablished interval of time goes by; the response or behavior is only reinforced after the given interval passes. In a variable-interval schedule, the reinforcement comes after an interval of time passes, but the length of the interval changes from trial to trial. The lengths of these intervals are within a predetermined range based on a desired average interval length.

LO 13 Explain how punishment differs from negative reinforcement. (p. 200)
In contrast to reinforcement, which makes a behavior more likely to occur, the goal of punishment is to decrease a behavior. Negative reinforcement differs from punishment because it strengthens a behavior that it follows by removing something aversive or disagreeable. Punishment decreases a behavior by instilling an association between a behavior and some unwanted consequence (for example, between stealing and going to jail, or between misbehavior, and a spanking).

LO 14 Summarize what Bandura’s classic Bobo doll study teaches us about learning. (p. 204)
Observational learning can occur when we watch a model demonstrate a behavior. Albert Bandura’s classic Bobo doll experiment showed that children readily imitate aggression when they see it modeled by adults. Studies suggest that children and adults may be inclined to mimic aggressive behaviors seen in TV shows, movies, video games, and on the Internet. Observation of prosocial behaviors, on the other hand, can encourage kindness, generosity, and forms of behavior that benefit others.

LO 15 Describe latent learning and explain how cognition is involved in learning. (p. 207)
Learning can occur without reinforcement. Edward Tolman showed that rats could learn to navigate mazes even when given no rewards. Their learning only became apparent when it was needed (latent learning). The rats were learning without reinforcement, just for the sake of learning. This cognitive approach reminds us that measurable behaviors and cognitive processes are necessary and complementary elements in the study of learning.
CHAPTER 5

The behaviors learned with classical conditioning are

1. What is a condition?

2. What is punishment?

3. What is reinforcement?

4. What is aversive?

5. What is positive?

6. What is negative?

7. What is unconditioned?

8. What is conditioned?

9. Which of the following is an example of negative reinforcement?
   a. working hard to get an A on a paper
   b. a child getting more computer time when he finishes his homework
   c. a dog whining in the morning, leading an owner to wake up and take it outside
   d. getting a speeding ticket and then not exceeding the speed limit afterward

10. All your friends tell you that you look fabulous in your new jeans, so you start wearing them all the time. This is an example of
   a. positive reinforcement
   b. negative reinforcement
   c. positive punishment
   d. negative punishment

11. A child is reprimanded for misbehaving, but then she sees that misbehave even more! This indicates that reprimanding her was
   a. negative punishment
   b. positive reinforcement
   c. positive punishment
   d. an unconditioned response

12. In Bandura’s Bobo doll study, children who saw an adult attacking and shouting at the doll:
   a. were more likely to display aggressive behavior
   b. were less likely to display aggressive behavior
   c. did not play with the Bobo doll at all
   d. began to cry when they saw the adult attacking aggressively

13. According to research, children who watch TV programs with violent role models are:
   a. more likely to have parents with legal troubles
   b. less likely to get in trouble with the law as adults
   c. at decreased risk of abusing their spouses when they become adults
   d. at increased risk of abusing their spouses when they become adults

14. Rats allowed to explore a maze, without getting reinforcers until the 11th day of the experiment, subsequently behaved in the maze as if they had been given reinforcers through- out the entire experiment. Their behavior is evidence of
   a. latent learning
   b. observational learning
   c. classical conditioning
   d. operant conditioning

15. Wolfgang Köhler’s research on chimpanzees suggests that animals are capable of thinking through a problem before taking action, and having a sudden coming together of awareness of a situation, leading to the solution of a problem. This is called
   a. observational learning
   b. insight
   c. modeling
   d. higher order conditionings

16. What is the difference between stimulus generalization and stimulus discrimination?

17. Describe an example of how you have used shaping and partial reinforcement to change your behavior. Which schedule of reinforcement do you think you were using?

18. What is the difference between primary reinforcers and secondary reinforcers? Give an example of each and explain how they might be used to change a behavior.

19. How are punishment and negative reinforcement different? Give examples of negative reinforcement, positive punishment, and negative punishment and explain how they change behavior.

20. Some studies show that watching violent films is associated with violent behaviors. Why are such studies unable to show a cause-and-effect relationship between a film’s content and viewers’ behavior?

CHECK YOUR ANSWERS IN APPENDIX C

Get personalized practice by logging into LaunchPad at http://www.worthpublishers.com/launchpad/Licht to take the LearningCurve adaptive quizzes for Chapter 5.