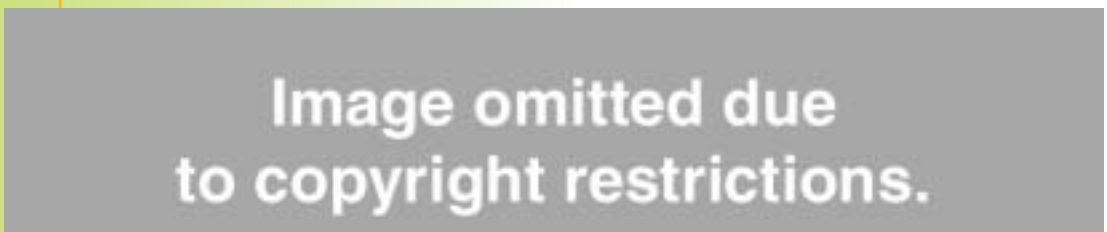
5 Learning



s Canada becoming a more violent society? The answer depends on whom you ask and what information you use to form your opinion. Crime statistics suggest that per capita rates of criminal offences are dropping throughout Canada and are at their lowest rate in 25 years. Yet most people would argue that this is a more violent and less friendly society than it once was. Certainly, the media play a role in our perception of crimes and have reported on some disturbing new crime trends in Canada. Since the beginning of 1997, several gangs of young girls, aged 14 to 17, have been in the news for committing crimes that have shocked us all. In Toronto, a gang called "the Spadina girls" has been linked to a series of vicious extortions and other crimes against fellow students at a local high school; police have described their actions as a "reign of terror" (Lamberti, 1998). In Victoria, seven girls were charged and some of them found guilty of murdering another teenage girl. In Saskatchewan, two teenage girls were charged with murdering a woman at a youth offender facility. Other similar events have been reported across Canada.

Teenage violence and gang behaviour have traditionally been seen as the exclusive domain of males. Like everyone in the community, psychologists and other social scientists are wondering what aspects of our society have changed to cause these new violent trends. Psychologists interested in learning theory, which is described in this chapter, would likely suggest that the young women involved in the crimes described above suffer from having poor role models at home. This negative role modelling is reinforced by movies and TV shows that portray high levels of teen violence as an acceptable way of solving conflict. But role models have also been shown to define acceptable behaviour and to reinforce proper societal values.

Our opening story provides one interpretation that accounts for societal behaviours that are very hard to understand—that is, observational learning through modelling. In observational learning, we learn by observing the behaviour of others, usually those in positions of authority or those we admire and respect, and then we may imitate that behaviour.

Psychologists study two other types of learning: operant conditioning and classical conditioning. In *operant conditioning,* an association is formed between a behaviour and its consequences—for example, between acting out violently and being rewarded by your peers for that behaviour. A third form of learning, *classical conditioning,* may also account for some of the behaviours reported above. In classical conditioning, an association is learned between one **stimulus** and another. A stimulus is any event or object in the environment to which an organism responds. Certain environmental cues (the presence of your gang, the gang's colours, the gang leader) become associated with violence.

These three kinds of learning are all-powerful forces that influence human thought and behaviour for good or for ill. They are perhaps involved in establishing and maintaining inappropriate and violent behaviour in youth gangs. But not all consequences of learning principles are negative. The same principles also help people break addictions, lose weight, study harder, and improve their lives, as you will learn.

Learning may be defined as a relatively permanent change in behaviour, capability, or attitude that is acquired through experience and cannot be attributed to illness, injury, or maturation. Several parts of this definition warrant further explanation. First, defining learning as a "relatively permanent change" excludes temporary changes in our behaviour or attitudes that could result from illness, fatigue, or fluctuations in mood. Second, by referring to changes that are "acquired through experience," we exclude some relatively permanent, readily observable changes in behaviour that occur as a result of brain injury or certain diseases. Moreover, there are observable changes as we grow and mature that have nothing to do with learning. For example, a young male at puberty does not *learn* to speak in a deeper voice; rather, his voice changes to a lower pitch as a result of maturation.

We cannot observe learning directly; instead, we must infer whether it has occurred. We draw our inferences from changes in observable behaviour or from changes in measurable capabilities and attitudes. Certainly, much learning occurs that we are not able to observe or measure. As a student, you surely remember times when you learned much more than your test scores reflected. Finally, learning does not always result in a change in behaviour or performance: sometimes we learn or acquire a capability that we may not demonstrate until we are motivated to do so.

Learning is one of the most important topics in the field of psychology, and available evidence suggests that we learn through many different avenues. This chapter explores the three basic forms of learning: classical conditioning, operant conditioning, and observational learning.

Classical Conditioning

Classical conditioning is one of the simplest forms of learning, yet it has a powerful effect on our attitudes, likes and dislikes, and emotional responses. We have all learned to respond in specific ways to a variety of words and symbols. Santa Claus, Canada Revenue, the Montreal Canadiens, and the GST are just sounds and symbols, but they tend to evoke strong emotional responses because of their associations.

The explanation for these feelings is simple—learning by association. We associate one thing with another—a positive or a negative attitude with a name, a particular gesture, a style of dress, or a manner of speaking. Our lives are profoundly influenced by the associations we learn through classical conditioning. We will now explore the work of Ivan Pavlov, whose research on the conditioned reflex in dogs revealed much of what we know about the principles of classical conditioning (sometimes referred to as "respondent" or "Pavlovian conditioning").

LINK IT!

www.as.wvu.edu/~sbb/comm221/chapters/pavlov.htm
Classical Conditioning

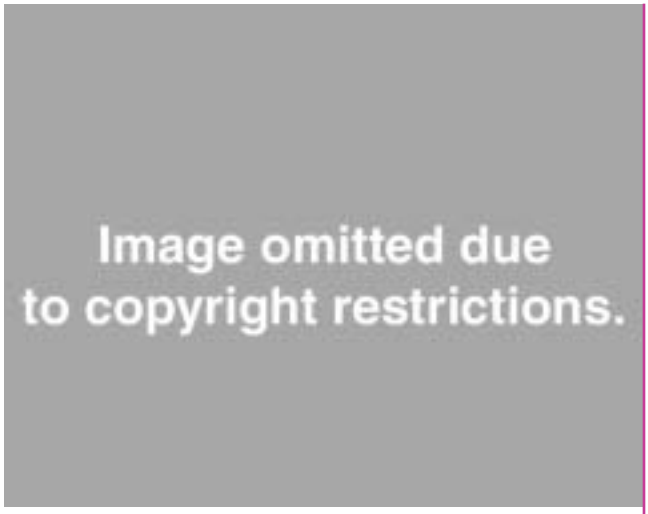
Pavlov and Classical Conditioning

Ivan Pavlov (1849–1936) organized and directed research in physiology at the Institute of Experimental Medicine in St. Petersburg, Russia, from 1891 until his death 45 years later. For his classic experiments on the physiology of digestion, he won a Nobel Prize in 1904—the first Russian to be so honoured. Pavlov's study of the conditioned reflex in dogs brought him fame, and he pursued this research from about 1898 until the end of his career. His book *Conditioned Reflexes* is one of the classic works in the field of psychology.

Pavlov's contribution to psychology came about quite by accident. To conduct his study of the salivary response, Pavlov made a small incision in the side of each experimental dog's mouth. Then he attached a tube so that the flow of saliva could be diverted from the animal's mouth, through the tube, and into a container, where the saliva was collected and measured.

The purpose of this was to collect the saliva that the dogs secreted naturally in response to food placed in the mouth. But Pavlov noticed that in many cases, the dogs began to salivate even before the food was presented. Pavlov observed drops of saliva collecting in the container when the dogs heard the footsteps of the laboratory assistants coming to feed them. And he observed saliva collecting when the dogs only heard their feeding dishes rattling, when they saw the attendant who fed them, and at the mere sight of their food. How could an involuntary response such as salivation come to be associated with the sights and sounds accompanying the act of feeding? Pavlov spent the rest of his life studying this question. The type of learning that he studied is known today as "classical conditioning."

Pavlov was a meticulous researcher; he wanted an experimental environment in which he could carefully control all the factors that could affect the dogs



Ivan Pavlov (1849–1936) earned fame by studying the conditioned reflex in dogs.

stimulus (STIM-yu-lus): Any event or object in the environment to which an organism responds; plural is *stimuli*.

learning: A relatively permanent change in behaviour, capability, or attitude that is acquired through experience and cannot be attributed to illness, injury, or maturation.

classical conditioning: A process through which a response previously made only to a specific stimulus is made to another stimulus that has been paired repeatedly with the original stimulus.

during the experiments. To accomplish this, he planned and built at the institute a laboratory specifically for his purposes.

The dogs were isolated inside soundproof cubicles and placed in harnesses that restrained their movements. From an adjoining cubicle, the experimenter observed the dogs through a one-way mirror. Food and other stimuli could be presented and the flow of saliva measured by remote control (see Figure 5.1). What did Pavlov and his colleagues learn?

The Elements and Processes in Classical Conditioning

The Reflex: We Can't Help It

A **reflex** is an involuntary response to a particular stimulus. Two examples are the eye-blink response to a puff of air and salivation when food is placed in the mouth. There are two kinds of reflexes—conditioned and unconditioned. Think of the term *conditioned* as meaning "learned" and the term *unconditioned* as meaning "unlearned." Salivation in response to food is called an "unconditioned reflex" because this behaviour is an inborn, automatic, unlearned response to a particular stimulus. Unconditioned reflexes are built into the nervous system.

When Pavlov observed that his dogs salivated at the sight of food or the sound of rattling dishes, he realized that this salivation reflex was the result of learning. He called these learned involuntary responses **conditioned reflexes**.

The Conditioned and Unconditioned Stimulus and Response

How is classical conditioning accomplished?

Pavlov continued to investigate the circumstances under which a conditioned reflex is formed. He used tones, bells, buzzers, lights, geometric shapes, electric shocks, and metronomes in his conditioning experiments. In a typical experiment, food powder was placed in the dog's mouth, causing salivation. Dogs do not need to be conditioned to salivate in response to food, so salivation in response to food is an unlearned or **unconditioned response (UR)**. Any stimulus, such as food, that without learning will automatically elicit, or bring forth, an unconditioned response is called an **unconditioned stimulus (US)**.

Remember that a reflex is made up of both a stimulus and a response. Following is a list of some common unconditioned reflexes, showing their two components—the unconditioned stimulus and the unconditioned response.

Unconditioned Reflexes

Unconditioned Stimulus (US)		Unconditioned Response (UR)
food	→	salivation
onion juice	→	tears
heat	→	sweating
loud noise	→	startle
light in eye	→	contraction of pupil
puff of air in eye	→	blink
touching hot stove	→	hand withdrawal

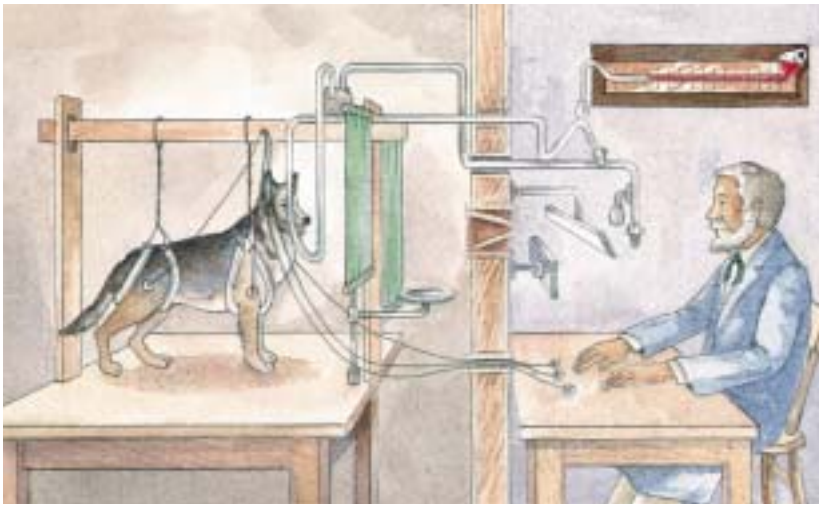


FIGURE 5.1

The Experimental Apparatus Used in Pavlov's Classical Conditioning Studies **In Pavlov's classical conditioning studies, the dog was restrained in a harness in the cubicle and isolated from all distractions. An experimenter observed the dog through a one-way mirror and, by remote control, presented the dog with food and other conditioning stimuli. A tube carried the saliva from the dog's mouth to a container where it was measured.**

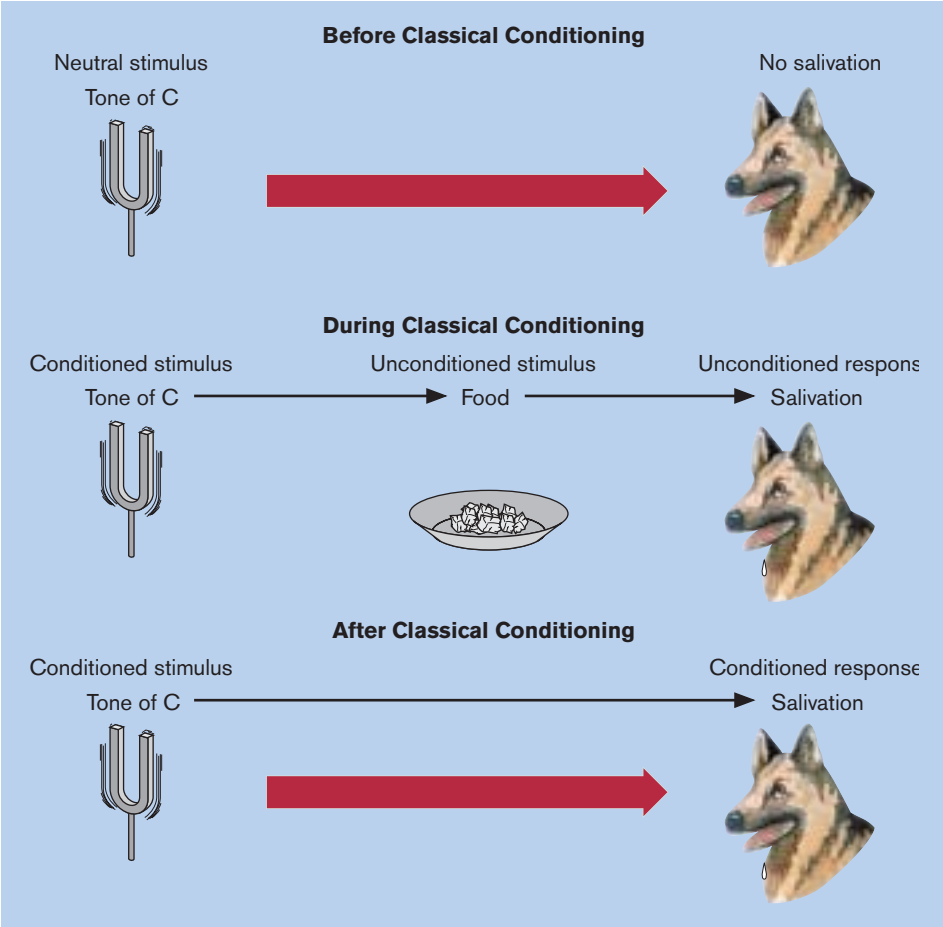


FIGURE 5.2

Classically Conditioning a Salivation Response **A neutral stimulus (a tone) elicits no salivation until it is repeatedly paired with the unconditioned stimulus (food). After many pairings, the neutral stimulus (now called conditioned stimulus) alone produces salivation. Classical conditioning has occurred.**

Pavlov demonstrated that dogs could be conditioned to salivate in response to a variety of stimuli that had never before been associated with food. During the conditioning or acquisition process, the researcher would present a neutral stimulus such as a musical tone shortly before placing food powder in the dog's mouth. The food powder would cause the dog to salivate. After pairing the tone and food many times—usually 20 or more—Pavlov (1960) found that the tone alone would elicit salivation (p. 385). Because dogs do not naturally salivate in response to musical tones, he concluded that this salivation was a learned response. Pavlov called the tone the *learned* or **conditioned stimulus (CS)**, and salivation to the tone the *learned* or **conditioned response (CR)** (see Figure 5.2).

In a modern view of classical conditioning, the conditioned stimulus can be thought of as a signal that the unconditioned stimulus will follow (Schreurs, 1989). In Pavlov's experiment, the tone became a signal that food would follow shortly. So the signal (conditioned stimulus) gives advance warning, and a person or animal is prepared with the proper response (conditioned response) even before the unconditioned stimulus arrives.

reflex: An involuntary response to a particular stimulus, like the eye-blink response to a puff of air or salivation in response to food placed in the mouth.

conditioned reflex: A learned reflex rather than a naturally occurring one.

unconditioned response (UR): A response that is invariably elicited by the unconditioned stimulus without prior learning.

unconditioned stimulus (US): A stimulus that elicits a specific response without prior learning.

conditioned stimulus (CS): A neutral stimulus that, after repeated pairing with an unconditioned stimulus, becomes associated with it and elicits a conditioned response.

conditioned response (CR): A response that comes to be elicited by a conditioned stimulus as a result of its repeated pairing with an unconditioned stimulus.

Extinction and Spontaneous Recovery: Gone but Not Forgotten

How does extinction occur in classical conditioning?

After conditioning an animal to salivate to a tone, what happens when you continue to sound the tone but no longer pair it with food? Pavlov found that salivation to the tone without the food became weaker and weaker and then finally disappeared altogether—a process known as **extinction**.

By extinction, we do not mean that the conditioned response has been completely erased or forgotten. Rather, the animal learns that the tone is no longer a signal that food will follow shortly, and the old conditioned response is gradually inhibited or suppressed. Animals are better able to adapt to a changing environment if they have the ability to discard conditioned responses that are no longer useful or needed.

How did Pavlov determine whether the conditioned response, once extinguished, had been inhibited rather than permanently erased or forgotten? If, after the response had been extinguished, the dog was allowed to rest and was then brought back to the laboratory, Pavlov found that the dog would again salivate to the tone. He called this recurrence **spontaneous recovery**. The spontaneously recovered response, however, was weaker and shorter in duration than the original conditioned response. Figure 5.3 illustrates the processes of extinction and spontaneous recovery.

Generalization: Responding to Similarities

What is generalization?

Assume that you have conditioned a dog to salivate when it hears the tone middle C on the piano. If in your experiment, you accidentally played the tone D or E, would that note produce salivation? Or would the dog not salivate to this slightly different tone? Pavlov found that a tone similar to the original conditioned stimulus produced the conditioned response, a phenomenon called **generalization**. If you are as careful a researcher as Pavlov, you will observe that as you move further away from the original tone, salivation decreases. Eventually the tone will be so different that the dog will not salivate at all (see Figure 5.4).

It is easy to see the impact of generalization in our everyday experience. Suppose that as a child you had been bitten by a large, grey dog. To experience fear in the future, you would not need to see exactly the same dog or another of the same breed or colour coming toward you: your original fear would probably generalize to all large dogs of any description. Because of generalization, we do not need to learn a conditioned response to every stimulus. Rather, we learn to approach or avoid a range of stimuli similar to the one that produced the original conditioned response.

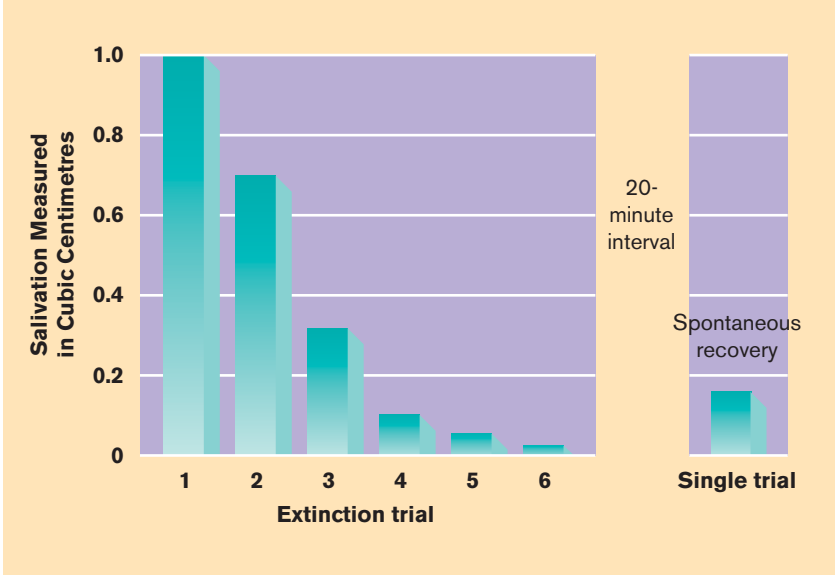


FIGURE 5.3

Extinction of a Classically Conditioned Response **When a classically conditioned stimulus (the tone) was presented in a series of trials without the unconditioned stimulus (the food), Pavlov's dogs salivated less and less until there was virtually no salivation. But after a 20-minute rest, with one sound of the tone, the conditioned response would reappear in a weakened form (producing only a small amount of salivation), a phenomenon Pavlov called "spontaneous recovery." (Data from Pavlov, 1927, p. 58.)**

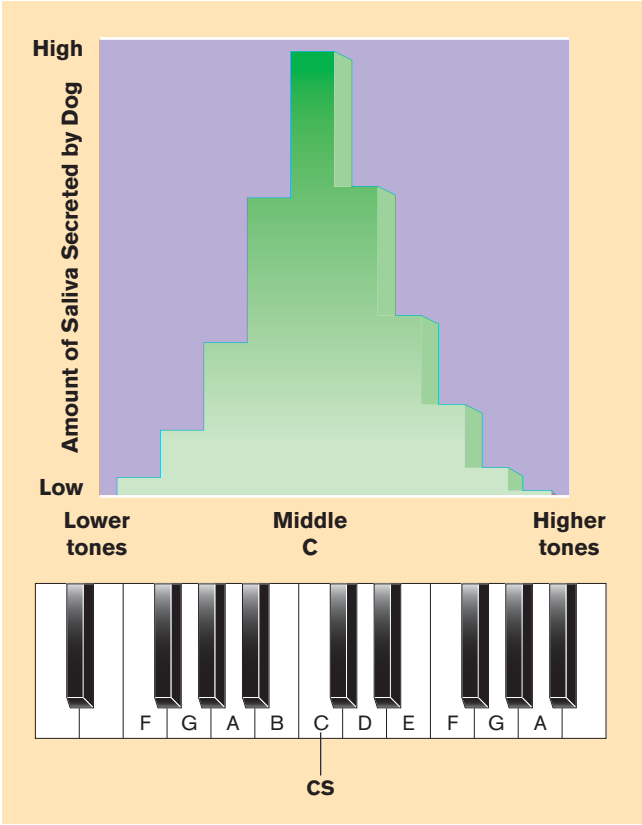


FIGURE 5.4

Generalization in Classical Conditioning **Because of the phenomenon of generalization, a dog conditioned to salivate to middle C (the CS) on the piano also salivates to similar tones—but less and less so as the tone moves away from middle C.**

A child attacked by a dog can easily develop a long-lasting fear of all dogs, through the process of generalization.

Discrimination: Learning That They're Not All Alike

What is discrimination in classical conditioning?

We must learn not only to generalize, but also to distinguish between similar stimuli. Using the previous example of a dog being conditioned to a musical tone, we can trace the process of **discrimination:**

Step 1: The dog is conditioned to the tone C.

Step 2: Generalization occurs, and the dog salivates to a range of musical tones above and below tone C. The dog salivates less and less as the note moves away from C.

Step 3: The original tone C is repeatedly paired with food, but when neighbouring tones are sounded, they are not followed with food. The dog is being conditioned to discriminate. Gradually, the salivation response to the neighbouring tones is extinguished, while salivation to the original tone C is strengthened (as demonstrated below).

Conditioned Stimulus	Conditioned Response
Tone C →	More salivation
Tones A, B, D, E →	Progressively less salivation

Step 4: Eventually, discrimination is achieved (as demonstrated below).

Conditioned Stimulus	Conditioned Response
Tone C →	Stronger salivation response
Tones A, B, D, E →	No salivation

extinction: The weakening and often eventual disappearance of a learned response (in classical conditioning, the conditioned response is weakened by repeated presentation of the conditioned stimulus without the unconditioned stimulus).

spontaneous recovery: The reappearance of an extinguished response (in a weaker form) when an organism is exposed to the original conditioned stimulus following a rest period.

generalization: In classical conditioning, the tendency to make a conditioned response to a stimulus that is similar to the original conditioned stimulus; in operant conditioning, the tendency to make the learned response to a stimulus that is similar to the one for which it was originally reinforced.

discrimination: The learned ability to distinguish between similar stimuli so that the conditioned response occurs only to the original conditioned stimulus but not to similar stimuli.

Like generalization, discrimination has survival value. Discriminating between the odours of fresh and spoiled milk will spare you an upset stomach. Knowing the difference between a rattlesnake and a garter snake could save your life.

Higher-Order Conditioning

Classical conditioning would be somewhat limited in its effect on behaviour if a conditioned response could be produced in only two ways, (1) by the pairing of a conditioned stimulus with an unconditioned stimulus, or (2) through generalization. Fortunately, classical conditioning can occur in another way—through higher-order conditioning. **Higher-order conditioning** takes place when a neutral stimulus is paired with an existing conditioned stimulus, becomes associated with it, and gains the power to elicit the same conditioned response. Suppose that after Pavlov conditioned the dogs to salivate to a tone, he presented a light (a neutral stimulus) immediately before the tone a number of times. The light would become associated with the tone, and the dogs would learn to give the salivation response to the light alone.

John Watson, Little Albert, and Peter

Little Albert and the Conditioned Fear Response: Learning to Fear

How did John B. Watson demonstrate that fear could be classically conditioned?

John Watson believed that in humans all fears except those of loud noises and loss of support are classically conditioned. In 1919, Watson and his laboratory assistant, Rosalie Rayner, conducted a now-famous study to prove that fear could be classically conditioned. The participant in the study, known as "Little Albert," was a healthy and emotionally stable infant. When tested, he showed no fear except of the loud noise Watson made by striking a hammer against a steel bar. In this classic experiment, Watson tested whether he could condition 11-month-old Albert to fear a white rat by causing Albert to associate the rat with a loud noise.

John B. Watson

Remember It!

Classical Conditioning: Knowing the Basics

1. Classical conditioning was originally researched most extensively by _____.
2. The dog's salivation in response to a musical tone was a/an (conditioned/unconditioned) response.
3. The gradual weakening and disappearance of a conditioned response—when the conditioned stimulus is presented repeatedly without the unconditioned stimulus—is termed
   a. generalization.
   b. discrimination.
   c. extinction.
   d. spontaneous recovery.
4. Juanita had an automobile accident on a bridge, and now she becomes very nervous whenever she has to cross any bridge. Which process accounts for this feeling?
   a. generalization
   b. discrimination
   c. extinction
   d. spontaneous recovery
5. Five-year-old Jesse was bitten by his neighbour's collie. He won't go near that dog but seems to have no fear of other dogs, even other collies. Which process accounts for his behaviour?
   a. generalization
   b. discrimination
   c. extinction
   d. spontaneous recovery
6. For higher-order conditioning to occur, a neutral stimulus must be paired repeatedly with
   a. another neutral stimulus.
   b. an existing conditioned stimulus.
   c. an unconditioned stimulus.
   d. a conditioned reflex.

Answers: 1. Ivan Pavlov 2. conditioned 3. c 4. a 5. b 6. b

In the laboratory, Rosalie presented Little Albert with a white rat. As Albert reached for the rat, Watson struck a steel bar with a hammer just behind Albert's head. This procedure was repeated, and Albert "jumped violently, fell forward and began to whimper" (Watson & Rayner, 1920, p. 4). A week later, the rat was paired with the loud noise five more times. Then at the sight of the white rat alone, Albert began to cry.

Conditioned Stimulus		Unconditioned Stimulus		Unconditioned Response
white rat	→	loud noise	→	fear reaction

Conditioned Stimulus		Conditioned Response
white rat	→	fear reaction

When Albert returned to the laboratory five days later, his fear had generalized to a rabbit and (to a lesser degree) to a dog, a seal coat, Watson's hair, and a Santa Claus mask. When he made his final visit to the laboratory 30 days later, his fears remained, although they were somewhat less intense. The researchers concluded that conditioned fears "persist and modify personality throughout life" (Watson & Rayner, 1920, p. 12).

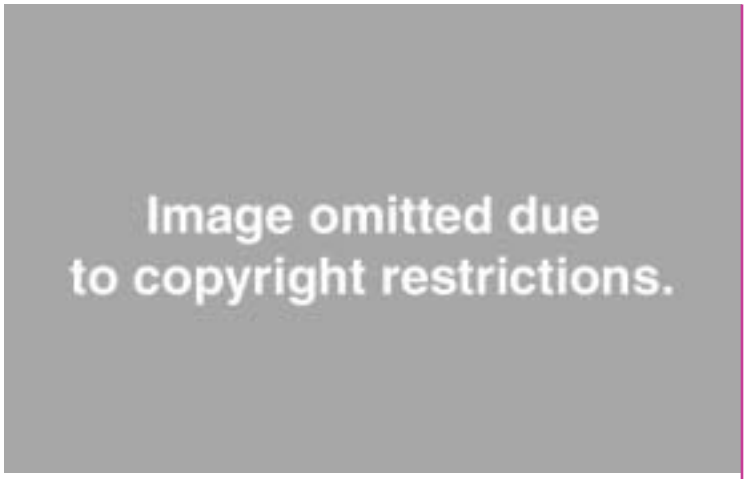
Watson had already formulated techniques for removing conditioned fears, but Albert left the city before they could be tried on him. (Watson apparently knew he would.) Some of Watson's ideas for removing fears were excellent and laid the groundwork for therapies that are used today. One method involved conditioning a new association between the feared object and a positive stimulus. In Albert's case, candy or other food could have been given just as the white rat was presented. Another procedure involved "modelling"—that is, Albert could have observed other children playing happily with the white rat.

It is difficult not to conclude that Watson, in his study of the conditioned fear response, showed a disregard for the welfare of Little Albert. Fortunately, the American Psychological Association (APA) and the Canadian Psychological Association (CPA) now have strict ethical standards for the use of both humans and animals in research. Neither the APA nor the CPA would sanction an experiment such as Watson's today.

Removing Peter's Fears: The Triumph of Candy and Patience

Three years after the experiment with Little Albert, Watson and a colleague, Mary Cover Jones (1924), found three-year-old Peter, who, like Albert, was afraid of white rats. He was also afraid of rabbits, a fur coat, feathers, cotton, and a fur rug. Peter's fear of the rabbit was his strongest fear, and this became the target of these two researchers' fear-removal techniques.

Peter was brought into the laboratory, seated comfortably in a high chair, and given candy to eat. A white rabbit in a wire cage was brought into the room but kept far enough away from Peter that it would not upset him. Over the course of 38 therapy sessions, the rabbit was brought closer and closer to Peter, who continued to enjoy his candy. Occasionally some of Peter's friends were brought into the laboratory to play with the rabbit (at a safe distance) so that Peter could see first-hand that the rabbit did no harm. Toward the end of the therapy, the rabbit was taken out of the cage and eventually put in Peter's lap. By the final session, Peter had grown fond of the rabbit. Moreover, he had lost all fear of the fur coat, cotton, and feathers, and he could tolerate the white rats and the fur rug.



Little Albert demonstrates that his fear of the white rat has generalized to a rabbit.

higher-order conditioning: Occurs when a neutral stimulus is paired with an existing conditioned stimulus, becomes associated with it, and gains the power to elicit the same conditioned response.

So far we have considered classical conditioning primarily in relation to Pavlov's dogs and Watson's human subjects. How does classical conditioning work in everyday life? First let us outline the factors that influence how classical conditioning affects our lives.

Factors Influencing Classical Conditioning

What are four factors that influence classical conditioning?

There are four major factors that affect the strength of a classically conditioned response and the length of time required for conditioning.

1. *The number of pairings of the conditioned stimulus and the unconditioned stimulus.* The number of pairings required varies considerably, depending on the individual characteristics of the person or animal being conditioned. Generally, the greater the number of pairings, the stronger the conditioned response.
2. *The intensity of the unconditioned stimulus.* If a conditioned stimulus is paired with a very strong unconditioned stimulus, the conditioned response will be stronger and will be acquired more rapidly than if it is paired with a weaker unconditioned stimulus (Gormezano, 1984). Striking the steel bar with the hammer produced stronger and faster conditioning in Little Albert than would have occurred if Watson had merely clapped his hands behind Albert's head.
3. *How reliably the conditioned stimulus predicts the unconditioned stimulus.* Robert Rescorla (1967, 1968) has shown that classical conditioning does not occur automatically just because a neutral stimulus is repeatedly paired with an unconditioned stimulus. The neutral stimulus must also reliably predict the occurrence of the unconditioned stimulus. A smoke alarm that never goes off except in response to a fire will elicit more fear than one that occasionally gives false alarms. A tone that is *always* followed by food will elicit more salivation than one that is followed by food only some of the time.
4. *The temporal relationship between the conditioned stimulus and the unconditioned stimulus.* Conditioning takes place fastest if the conditioned stimulus occurs shortly before the unconditioned stimulus. It takes place more slowly or not at all when the two stimuli occur at the same time. Conditioning rarely takes place when the conditioned stimulus follows the unconditioned stimulus (Spetch et al., 1981; Spooner & Kellogg, 1947).

The ideal time between the presentation of the conditioned and the unconditioned stimulus is about half a second, but this varies according to the type of response being conditioned and the nature and intensity of the conditioned and unconditioned stimulus (Wasserman & Miller, 1997). Some studies indicate that the age of the subject may also affect the optimal time interval (Solomon et al., 1991). In general, if the conditioned stimulus occurs too long before the unconditioned stimulus, an association between the two will not form. One notable exception to this general principle relates to the conditioning of taste aversions.

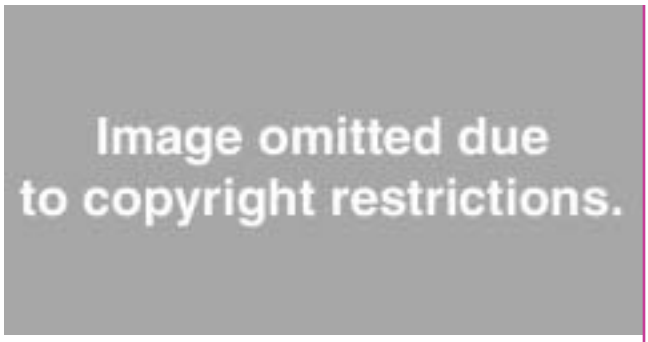
Classical Conditioning in Everyday Life

What types of responses can be learned through classical conditioning?

Do certain songs have special meaning because they remind you of a current or past love? Do you find the scent of a certain perfume or aftershave pleasant or unpleasant because it reminds you of a particular person? Many of our emotional responses, whether positive or negative, result from classical conditioning (often higher-order conditioning). Classical conditioning occurs in everyday life when neutral cues become associated with particular people, objects, locations, situations, or even words, and develop the power to elicit the same feelings as the original stimulus.

Fears and phobias largely result from classical conditioning. For example, many people who have had painful dental work develop a dental phobia. Not only do they come to fear the dentist's drill, but they develop anxiety in response to a wide range of environmental stimuli associated with it—the dental chair, the waiting room, or even the building where the dentist's office is located.

When businesspeople wine and dine customers, they are hoping that they and their product or service will elicit the same positive response as the pleasant setting and fine food. Advertisers are trying to classically condition us when they show us their prod-



Classical conditioning is very effective in advertising. Here a neutral product (clothing) has been paired with images of very attractive people.

ucts along with great-looking models or celebrities, or in situations where people are enjoying themselves. The advertisers are relying on the probability that if the "neutral" product is associated with people, objects, or situations we particularly like, then in time the product will elicit a similarly positive response. Pavlov found that presenting the tone slightly before the food was the most efficient way to condition salivation. Television advertisements, too, are most effective when the products are presented *before* the beautiful people or situations are shown (van den Hout & Merckelbach, 1991).

You might want to see just how much the principles of classical conditioning are applied in advertising by doing *Try It!*

Try It!

Classical Conditioning in Commercials

Some commercials simply give information about a product or place of business. Others are designed to classically condition the viewer to form a positive association. One night while you are watching TV, keep a record of the commercials you see. What proportion rely on classical conditioning? What are the kinds of cues (people, objects, or situations) with which the products are to be associated? Are the products introduced slightly before, during, or after these cues?

Drug Use and Classical Conditioning

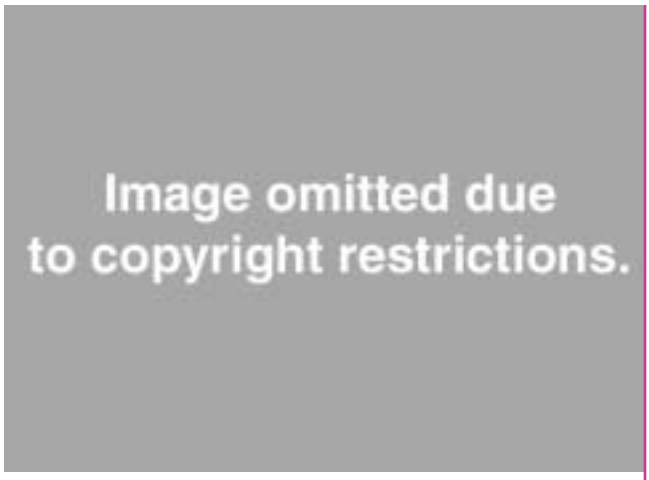
Researchers are discovering that drug abuse in combination with classical conditioning can be deadly. Why do many drug addicts treated for overdoses in hospital emergency rooms report that they had taken only their usual dose but were *not* in their usual drug-taking environment when they overdosed?

All drugs produce characteristic physiological effects. As a person continues to use a drug, the body makes adjustments to decrease the drug's effects. These adjustments enable the body to *tolerate* the drug. For example, opiates elevate skin temperature and decrease respiratory function; the body compensates by lowering skin temperature and increasing the respiratory response. Over time a **drug tolerance** develops—that is, the user becomes progressively less affected by the drug and must take higher and higher doses to maintain the same effects.

If drug tolerance were solely a physiological phenomenon, it wouldn't make any difference where or in what circumstances the addict took the drug. But it does make a difference. In many cases, addicts suffer overdoses (some of them fatal) in unfamiliar surroundings—a hotel room, for example—not in a place where they habitually took the drug. Why should the same amount of a drug produce stronger physiological effects in an unfamiliar environment than in a familiar one? The answer involves classical conditioning. Here is how the process works.

Environmental cues associated with the setting where drugs are usually taken—the familiar surroundings, sights, sounds, odours, and drug paraphernalia, and the familiar drug-use ritual—can act as conditioned stimuli that become associated with the unconditioned stimulus, which is the drug itself (Dworkin, 1993; O'Brien et al., 1992; Siegel et al., 1982). These environmental cues come to signal to the user that the drug is on the way and initiate the compensatory mechanisms. In other words, these cues stimulate physiological effects that are primarily the opposite of the physiological effects of the drug. When the user takes the usual dose of the drug in unfamiliar surroundings, the environmental cues that initiate these protective mechanisms are not pres-

drug tolerance: A condition in which the user becomes progressively less affected by a drug so that larger and larger doses are necessary to maintain the same effect.



Classical conditioning helps explain why certain environmental cues or social situations can lead to continued drug use.

ent. Consequently, the effects of the drugs are more powerful—sometimes even fatal. This explains why drug counsellors strongly urge recovering addicts to avoid any environmental cues associated with their past drug use—the people, the places, the drug paraphernalia, and so on. Relapse is far more common in people who do not avoid the associated environmental cues.

Classically Conditioned Taste Aversions

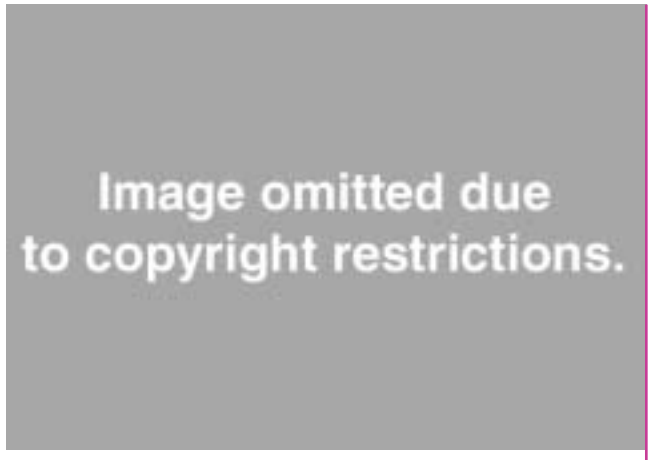
Taste Aversions

The experience of nausea and vomiting after eating a certain food is often enough to condition a long-lasting taste aversion. A **taste aversion** is an intense dislike and/or avoidance of a particular food associated with nausea or discomfort. Taste aversions can be classically conditioned when the delay between the conditioned stimulus (food) and the unconditioned stimulus (nausea) is as long as 12 hours. Researchers believe that many taste aversions begin when we are between two and three years old, so we may not remember how our taste aversions originated (Rozin & Zellner, 1985). Taste aversions are more likely to develop to "less preferred, less familiar foods," and they can be acquired even when people are convinced that the food did not cause the nausea (Logue, 1985, p. 27). Once developed, taste aversions frequently generalize to similar foods (Logue et al., 1981). For example, an aversion to chili is likely to include sloppy joes as well.

Using Conditioned Taste Aversions to Help Cancer Patients

One unfortunate result of chemotherapy is that patients often associate nausea with the foods they ate several hours before treatment (Bovbjerg et al., 1992). As a result, they often develop taste aversions to the foods they normally eat—even favourite foods. This can lead to a loss of appetite and weight at a time when good nutrition is particularly important.

Bernstein and colleagues (1982, 1985) devised a technique to help patients avoid developing aversions to desirable foods. A group of cancer patients were fed a novel-tasting, maple-flavoured ice cream before chemotherapy. The nausea caused by the treatment resulted in a taste aversion to the ice cream. It was found that when an unusual or unfamiliar food became the "scapegoat" or target for taste aversion, other foods in the patient's diet were often protected, and the patient continued to eat them regularly. Perhaps cancer patients should refrain from eating preferred or nutritious foods before a chemotherapy session. Instead, they should be given unusual-tasting foods at that time.



Chemotherapy treatments can result in conditioned taste aversions, but providing patients with a "scapegoat" target for the taste aversion can help them maintain a proper diet.

Remember It! Classical Conditioning: Albert and Everyday Life

1. In Watson's experiment on Little Albert, the white rat was the (conditioned/unconditioned) stimulus, and Albert's crying when the hammer struck the steel bar was the (conditioned/unconditioned) response.
2. Albert's fear of the white rat transferred to the rabbit, dog, fur coat, and mask. What process did this demonstrate?
   a. generalization
   b. discrimination
   c. extinction
   d. spontaneous recovery
3. In everyday life, which of the following are *not* acquired through classical conditioning?
   a. positive feelings
   b. negative feelings
   c. skills
   d. fears and phobias
4. Which of the following does *not* increase the strength of the conditioned response in classical conditioning?
   a. more pairings of the conditioned with the unconditioned stimulus
   b. presenting the conditioned stimulus a considerable time before the unconditioned stimulus
   c. increasing the intensity of the unconditioned stimulus
   d. always following the conditioned stimulus with the unconditioned stimulus
5. Which element in classical conditioning is the signal?
   a. unconditioned response
   b. unconditioned stimulus
   c. conditioned response
   d. conditioned stimulus
6. In order for classical conditioning to occur, the unconditioned stimulus should occur immediately after the conditioned stimulus and the two must be paired repeatedly. Which of the following is an exception to this statement?
   a. conditioned salivation response
   b. conditioned immune response
   c. conditioned taste aversion
   d. conditioned drug tolerance

Answers: 1. conditioned; unconditioned 2. a 3. c 4. b 5. d 6. c

Operant Conditioning

Skinner and Operant Conditioning

How are responses acquired through operant conditioning?

Recall that in classical conditioning, the organism does not learn a new response. Rather, it learns to make an old or existing response to a new stimulus. Classically conditioned responses are involuntary or reflexive, and in most cases the person or animal cannot help but respond in expected ways.

Let's now examine a method for conditioning *voluntary* responses, known as **operant conditioning**. Operant conditioning does not begin, as does classical conditioning, with the presentation of a stimulus to elicit a response. Rather, the response comes first, and the consequence tends to modify this response in the future. In operant conditioning, the consequences of behaviour are manipulated to increase or decrease the frequency of a response or to shape an entirely new response. Behaviour that is reinforced—followed by rewarding consequences—tends to be repeated. A **reinforcer** is anything that strengthens a response or increases the probability that the response will occur. Behaviour that is ignored or punished is less likely to be repeated.

Operant conditioning permits the learning of a wide range of new responses. A simple response can be operantly conditioned if we merely wait for it to appear and then reinforce it. But this can be time-consuming. The process can be speeded up with a technique called "shaping." Shaping can also be used to condition responses that would never occur naturally.

taste aversion: The dislike and/or avoidance of a particular food that has been associated with nausea or discomfort.

operant conditioning: A type of learning in which the consequences of behaviour tend to modify that behaviour in the future (behaviour that is reinforced tends to be repeated; behaviour that is ignored or punished is less likely to be repeated).

reinforcer: Anything that strengthens a response or increases the probability that it will occur.

LINK IT!

www.biozentrum.uni-wuerzburg.de/genetics/behavior/learning/operant.html
Tutorial in Operant Conditioning

Shaping Behaviour: Just a Little Bit at a Time

How is shaping used to condition a response?

Shaping is a technique that was employed by B.F. Skinner at Harvard University. Skinner is seen by many as the great authority on operant conditioning, which is particularly useful in conditioning complex behaviours. In shaping, rather than waiting for the desired response to occur and then reinforcing it, we reinforce any movement in the direction of the desired response, gradually guiding the responses closer and closer to the ultimate goal.

Influenced by the early work of Thorndike on animal influence (Thorndike, 1920, 1970), Skinner designed a soundproof operant-conditioning apparatus, commonly called a **Skinner box**, with which he conducted his experiment. One type of box is equipped with a lever or bar that a rat presses to gain a reward of food pellets or water from a dispenser. A complete record of the animal's bar-pressing responses is registered on a device called a "cumulative recorder," also invented by Skinner.

B.F. Skinner

B.F. Skinner shapes a rat's bar-pressing behaviour in a Skinner box.

Rats in a Skinner box are conditioned through the use of shaping to press a bar for rewards. A rat may be rewarded first for simply turning toward the bar. Once this behaviour is established, the next reward comes only when the rat moves closer to the bar. Each step closer to the bar is rewarded. Next the rat may touch the bar and receive a reward; finally, the rat is rewarded only when it presses the bar.

Shaping—rewarding gradual **successive approximations** toward the terminal or desired response—has been used effectively to condition complex behaviours in people as well as in non-human animals. Parents may use shaping to help their children develop good table manners, praising them each time they show gradual improvements. Teachers often use shaping with disruptive children, rewarding them at first for very short periods of good behaviour and then gradually expecting them to work productively for longer and longer periods. Through shaping, circus animals have learned to perform a wide range of amazing feats, and pigeons have learned to bowl and play table tennis. You might even want to try shaping your own behaviour using the next *Try It!*

LINK IT!

www.bfskinner.org
The B.F. Skinner Foundation

Superstitious Behaviour: Mistaking a Coincidence for a Cause

Sometimes a rewarding event follows a response but is not caused by or connected with it. Superstitious behaviour occurs when an individual believes that a connection exists between an act and its consequences although, in fact, there is no relationship between the two.

A gambler in Windsor, Ontario, blows on the dice just before he rolls them and wins $1000. On the next roll, he follows the same ritual and wins again. Although this rewarding event follows the ritual of blowing on the dice, the connection between the two is accidental. Nevertheless, the gambler will probably persist in this superstitious behaviour at least as long as his winning streak continues. Some professional athletes have been known to carry superstitious

tious behaviour to remarkable extremes. Baseball star Keith Hernandez reportedly wears his lucky socks (the same pair) for the entire season.

Extinction: Withholding Reinforcers

How does extinction occur in operant conditioning?

We have seen that responses followed by reinforcers tend to be repeated and that responses no longer followed by reinforcers will occur less and less often and eventually die out. A rat in a Skinner box will eventually stop pressing a bar when it is no longer rewarded with food pellets. In operant conditioning, **extinction** occurs when reinforcers are withheld.

In humans and other animals, extinction can lead to frustration or even rage. Consider a child having a temper tantrum. If whining and loud demands do not bring the reinforcer, the child may progress to kicking and screaming. If a vending machine takes your coins but fails to deliver candy or pop, your button-pushing or lever-pulling behaviour may become erratic and more forceful. You might even shake the machine or kick it before giving up. Not getting what we expect makes us angry.

The process of spontaneous recovery, which we discussed in relation to classical conditioning, also occurs in operant conditioning. A rat whose bar pressing has been extinguished may again press the bar a few times when returned to the Skinner box after a period of rest.

Generalization and Discrimination

Skinner conducted many of his experiments with pigeons placed in a Skinner box specially designed for them. The box contained small, illuminated disks that the pigeons could peck to receive bits of grain from a food tray. Skinner found that generalization occurs in operant conditioning. A pigeon rewarded for pecking at a yellow disk is likely to peck at another disk similar in colour. The less similar a disk is to the original colour, the lower the rate of pecking will be.

Try It!

Can You Modify Your Own Behaviour?

Use conditioning to modify your own behaviour.

1. *Identify the target behaviour.* It must be both observable and measurable. You might choose, for example, to increase the amount of time you spend studying.
2. *Gather and record baseline data.* Keep a daily record of how much time you spend on the target behaviour for about a week. Also note where the behaviour takes place and what cues (or temptations) in the environment precede any slacking off from the target behaviour.
3. *Plan your behaviour modification program.* Formulate a plan and set goals to either decrease or increase the target behaviour.
4. *Choose your reinforcers.* Any activity you enjoy more can be used to reinforce any activity you enjoy less. For example, you could reward yourself with a game of basketball after a specified period of studying.
5. *Set the reinforcement conditions and begin recording and reinforcing your progress.* Be careful not to set your reinforcement goals so high that it becomes nearly impossible to earn a reward; remember Skinner's concept of shaping—rewarding small steps to reach a desired outcome. Be perfectly honest with yourself and claim a reward only when the goals are met. Chart your progress as you work toward gaining more and more control over the target behaviour.

shaping: Gradually moulding a desired behaviour by reinforcing responses that become progressively closer to it; reinforcing successive approximations of the desired response.

Skinner box: Invented by B.F. Skinner for conducting experiments in operant conditioning; a soundproof chamber with a device for delivering food and either a bar for rats to press or a disk for pigeons to peck.

successive approximations: A series of gradual training steps, with each step becoming more like the final desired response.

extinction: The weakening and often eventual disappearance of a learned response (in operant conditioning, the conditioned response is weakened by the withholding of reinforcement).

Discrimination in operant conditioning involves learning to distinguish between a stimulus that has been reinforced and other stimuli that may be very similar. We learn discrimination when our response to the original stimulus is reinforced but responses to similar stimuli are not reinforced. For example, to encourage discrimination, a researcher would reward the pigeon for pecking at the yellow disk but not for pecking at the orange or red disk.

There are certain cues that have come to be associated with reinforcement or punishment. For example, children are more likely to ask their parents for a treat when the parents are smiling than when they are frowning. The stimulus that signals whether a certain response or behaviour is likely to be rewarded, ignored, or punished is called a **discriminative stimulus**. If a pigeon's peck at a lighted disk results in a reward but a peck at an unlighted disk does not, the pigeon will soon be pecking at the lighted disk but not at the unlighted one. The presence or absence of the discriminative stimulus, in this case the lighted disk, will control whether or not the pecking takes place.

We may wonder why children sometimes misbehave with a grandparent but not with a parent, or why they make one teacher's life miserable but are model students for another. The children may have learned that in the presence of some people (the discriminative stimuli), misbehaviour will almost certainly lead to punishment, whereas in the presence of certain other people, it may even be rewarded.

Reinforcement: What's the Payoff?

Positive and Negative Reinforcement: Adding the Good, Taking Away the Bad

What are the goals of both positive and negative reinforcement, and how are the goals accomplished for each?

Reinforcement is a key concept in operant conditioning and may be defined as any event that increases the probability of the response that it follows. There are two types of reinforcement, positive and negative. **Positive reinforcement**, roughly the same thing as a reward, refers to any *positive* consequence that, if applied after a response, increases the probability of that response. We know that many people will work hard for a raise or a promotion, that salespeople will increase their efforts to get awards and bonuses, that students will study to get good grades, and that children will throw temper tantrums to get candy or ice cream. In these examples, raises, promotions, awards, bonuses, good grades, candy, and ice cream are positive reinforcers.

Just as people engage in behaviours to get positive reinforcers, they also engage in behaviours to avoid or escape unpleasant conditions. Terminating an unpleasant stimulus to increase the probability of a response is called **negative reinforcement**. When people find that a response successfully ends an aversive condition, they are likely to repeat it. People will turn on their air conditioner to terminate the heat, and they will get out of bed to turn off a faucet to

Remember It!

Operant Conditioning

1. Operant conditioning was researched most extensively by
   a. Watson.
   b. Wundt.
   c. Skinner.
   d. Pavlov.
2. Operant conditioning can be used effectively for all of the following *except*
   a. learning new responses.
   b. learning to make an existing response to a new stimulus.
   c. increasing the frequency of an existing response.
   d. decreasing the frequency of an existing response.
3. Even though the B that Billy wrote looked more like a D, his teacher, Mrs. Chen, praised him because it was better than his previous attempts. Mrs. Chen is using a procedure called _____.
4. Which of the following processes occurs in operant conditioning when reinforcers are withheld?
   a. generalization
   b. discrimination
   c. spontaneous recovery
   d. extinction

Answers 1. c 2. b 3. shaping 4. d

avoid listening to the annoying "drip, drip, drip." Heroin addicts will do almost anything to obtain heroin to terminate their painful withdrawal symptoms. In these instances, negative reinforcement involves putting an end to the heat, the dripping faucet, and the withdrawal symptoms.

Responses that end discomfort and responses that are followed by rewards are likely to be strengthened or repeated because *both* lead to a more positive outcome. Some behaviours are influenced by a combination of positive and negative reinforcement. If you eat a plateful of rather disgusting leftovers to relieve intense hunger, then eating probably has been negatively reinforced. You are eating solely to remove hunger, a negative reinforcer. But if your hunger is relieved by a gourmet dinner at a fine restaurant, both positive and negative reinforcement will have played a role. Your hunger has been removed, and the delicious dinner has been a reward in itself.

Do the *Try It!* to see how your behaviour is influenced by positive and negative reinforcers in everyday life.

LINK IT!

server.bmod.athabascau.ca/html/prtut/reinpair.htm
Positive Reinforcement: A Self-Instructional Exercise

Primary and Secondary Reinforcers: The Unlearned and the Learned

A **primary reinforcer** is one that fulfills a basic physical need for survival and does not depend on learning. Food, water, sleep, and termination of pain are examples of primary reinforcers. And sex too is a powerful reinforcer. Fortunately, learning does not depend solely on primary reinforcers. If that were the case, we would need to be hungry, thirsty, or sex-starved before we would respond at all. Much observed behaviour in humans is in response to secondary rather than primary reinforcers. A **secondary reinforcer** is acquired or learned by association with other reinforcers. Some secondary reinforcers (money, for example) can be exchanged at a later time for other reinforcers. Praise, good grades, awards, bonuses, applause, and signals of approval such as a smile or a kind word are all examples of secondary reinforcers.

Attention is a secondary reinforcer of great general worth. To obtain the reinforcers we seek from other people, we must first get their attention. Children vie for the attention of parents because they represent the main source of a child's reinforcers. But often parents reward children with attention for misbehaviour and ignore their good behaviour. When this happens, misbehaviour is strengthened, and good behaviour may be extinguished for lack of reinforcement.

Try It!

Reinforcement in Everyday Life

List all of your behaviours during the course of a day that have been influenced by either positive or negative reinforcement. Also list the behaviours that have been influenced by a combination of the two. During that day, were more behaviours positively or negatively reinforced?

Behaviour	Positive Reinforcement	Negative Reinforcement	Combination
Ate breakfast Attended class			
Totals:			

discriminative stimulus: A stimulus that signals whether a certain response or behaviour is likely to be followed by reward or punishment.

reinforcement: An event that follows a response and increases the strength of the response and/or the likelihood that it will be repeated.

positive reinforcement: A reward or pleasant consequence that follows a response and increases the probability that the response will be repeated.

negative reinforcement: The termination of an unpleasant stimulus after a response in order to increase the probability that the response will be repeated.

primary reinforcer: A reinforcer that fulfills a basic physical need for survival and does not depend on learning (examples: food, water, sleep, termination of pain).

secondary reinforcer: A neutral stimulus that becomes reinforcing after repeated pairing with other reinforcers.

Schedules of Reinforcement: When Will I Get My Reinforcers?

What are the four major schedules of reinforcement, and which schedule yields the highest response rate and the greatest resistance to extinction?

In conditioning the bar-pressing response in rats, every time the rat pressed the bar, the experimenter reinforced the response with a food pellet. Reinforcing every correct response, known as **continuous reinforcement**, is the most efficient way to condition a new response. However, after a response has been conditioned, partial or intermittent reinforcement is more effective if we want to maintain or increase the rate of response (Nation & Woods, 1980). **Partial reinforcement** is operating when some but not all of an organism's responses are reinforced. In real life, reinforcement is almost never continuous. Partial reinforcement is the rule.

Partial reinforcement may be administered according to different **schedules of reinforcement**. Different schedules produce distinct rates and patterns of responses, as well as varying degrees of resistance to extinction when reinforcement is discontinued. Although several varieties of reinforcement schedules are possible, the two basic types are the ratio and interval schedules. Ratio schedules require that a certain *number of responses* be made before one of the responses is reinforced. With interval schedules, a given *amount of time* must pass before a reinforcer is administered. These schedules are further subdivided into fixed and variable categories.

Following are descriptions of the four most basic schedules of reinforcement: the fixed-ratio schedule, the variable-ratio schedule, the fixed-interval schedule, and the variable-interval schedule.

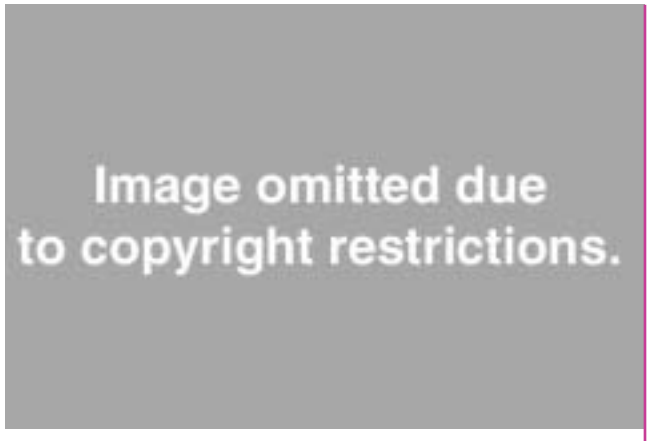
THE FIXED-RATIO SCHEDULE On a **fixed-ratio schedule**, a reinforcer is administered after a fixed number of non-reinforced correct responses. If the fixed ratio is set at 30 responses (FR-30), a reinforcer is given after 30 correct responses. Examples of this schedule are factory workers whose payment depends on the number of units produced, and farm workers who are paid by the basket for the fruit they pick.

The fixed-ratio schedule is a very effective way to maintain a high response rate, because the number of reinforcers received depends directly on the response rate. The faster people respond, the more reinforcers they earn. When large ratios are used, people and animals tend to pause after each reinforcement but then return to the characteristic high rate of responding.

THE VARIABLE-RATIO SCHEDULE Pauses after reinforcement do not occur when the variable-ratio schedule is used. On a **variable-ratio schedule**, a reinforcer is administered on the basis of an average ratio after a varying number of non-reinforced correct responses. With a variable ratio of 30 responses (VR-30), you might be reinforced one time after 10 responses, another after 50, another after 30, and so on. You cannot predict exactly which responses will be reinforced, but in this example, reinforcement would average 1 in 30.

Variable-ratio schedules result in higher, more stable rates of responding than fixed-ratio schedules. Skinner (1953) reports that on this schedule "a pigeon may respond as rapidly as five times per second and maintain this rate for many hours" (p. 104). According to Skinner (1988), the variable-ratio schedule is useful because "it maintains behavior against extinction when reinforcers occur only infrequently. The behavior of the dedicated artist, writer, businessman, or scientist is sustained by an occasional, unpredictable reinforcement" (p. 174).

An insurance salesperson working on a variable-ratio schedule may sell policies to two clients in a row but then may have to contact 20 more prospects before making another sale. The best example of the seemingly addictive power of the variable-ratio schedule is



Migrant farm workers are paid according to a fixed-ratio schedule. Since their earnings depend on the number of bushels of tomatoes they pick, they are motivated to work quickly.

the gambling casino. Slot machines, roulette wheels, and most other games of chance pay on this schedule (see *It Happened in Canada*). The variable-ratio schedule, in general, produces the highest response rate and the most resistance to extinction.

THE FIXED-INTERVAL SCHEDULE On a **fixed-interval schedule**, a specific time interval must pass before a response is reinforced. For example, on a 60-second fixed-interval schedule (FI-60), a reinforcer is given for the first correct response that occurs 60 seconds after the last reinforced response. People working on salary are reinforced on the fixed-interval schedule.

IT HAPPENED IN CANADA

Reinforcement: Video Lottery Terminals

A new addiction has been in the news lately: the addiction to video lottery terminals (VLTs). Perhaps you have seen or even used these electronic slot machines, or "one-armed bandits." On the surface, VLTs appear to be no worse than regular video games, but critics of video gambling have a very different opinion. Researchers who study gambling behaviour now refer to VLTs as "the crack cocaine of gambling." VLTs are widely available, even in many corner stores across Canada. They require no skill or knowledge to operate, cost very little, and tempt the user by the potential for high returns. Not surprisingly, VLTs are highly addictive: Canadians spend more on VLTs than they spend on movies, CDs, and books combined.

With VLTs within easy reach, it should not be surprising that gambling in Canada is on the rise. For instance, casino gambling and VLTs are now generating almost $2.8 billion in net revenue in Canada, which is 100 times more than was the case just eight years earlier. And according to a study conducted by the National Council on Welfare, up to 1.2 million Canadians are problem gamblers. Gambling especially affects the poor, who tend to spend over four times more on lottery tickets and VLTs than wealthier Canadians.

Why are VLTs so addictive? According to the learning principles described in this chapter, the appeal of these machines may be related to the fact that they use a "variable-ratio schedule" of reinforcement. As Skinner (1988) himself pointed out, this form of reinforcement schedule has the highest response rate and is the most resistant to extinction. (Based on Duffy & Everson, 1996; Gombu, 2000; Schwartz, 1997.)

Unlike ratio schedules, reinforcement on interval schedules does not depend on the number of responses made, only on the one correct response made after the time interval has passed. Characteristic of the fixed-interval schedule is a pause or a sharp decline in responding immediately after each reinforcement and a rapid acceleration in responding just before the next reinforcer is due.

As an example of this schedule, think of a psychology test as a reinforcer (that's a joke, isn't it?) and studying for the test as the desired response. Suppose you have four tests scheduled during the semester. Your study responses will probably drop to zero immediately after the first test, gradually accelerate, and perhaps reach a frenzied peak just before the next scheduled exam; then your study responses will immediately drop to zero again, and so on. As you may have guessed, the fixed-interval schedule produces the lowest response rate.

THE VARIABLE-INTERVAL SCHEDULE Variable-interval schedules eliminate the pause after reinforcement that is typical of the fixed-interval schedule. On a **variable-interval schedule**, a reinforcer is administered on the basis of an average time after the first correct response following a varying time of non-reinforced responses. Rather than reinforcing a response every 60 seconds, for example, a reinforcer might be

continuous reinforcement: Reinforcement that is administered after every desired or correct response; the most effective method of conditioning a new response.

partial reinforcement: A pattern of reinforcement in which some portion, rather than 100 percent, of the correct responses are reinforced.

schedule of reinforcement: A systematic program for administering reinforcements that has a predictable effect on behaviour.

fixed-ratio schedule: A schedule in which a reinforcer is administered after a fixed number of non-reinforced correct responses.

variable-ratio schedule: A schedule in which a reinforcer is administered on the basis of an average ratio after a varying number of non-reinforced correct responses.

fixed-interval schedule: A schedule in which a reinforcer is administered following the first correct response after a fixed period of time has elapsed.

variable-interval schedule: A schedule in which a reinforcer is administered on the basis of an average time after the first correct response following a varying time of non-reinforcement.

given after a 30-second interval, with others following after 90-, 45-, and 75-second intervals. But the average time elapsing between reinforcers would be 60 seconds (VI-60). Although this schedule maintains remarkably stable and uniform rates of responding, the response rate is typically lower than that of the ratio schedules, because reinforcement is not tied directly to the *number* of responses made.

Again, with another flight into fantasy, we could think of the psychology exam as the reinforcer and studying for the exam as the response. Rather than a regularly scheduled exam, however, we need pop quizzes to illustrate the variable-interval schedule. Because you cannot predict when a pop quiz will be given, your study responses will be more uniform and stable. Also, the response rate tends to be higher with shorter intervals and lower with longer ones. If your professor gives a pop quiz once a week on the average, your study response will be higher than if you average only one quiz per month.

Review & Reflect 5.1 summarizes the characteristics of the four schedules of reinforcement.

The Effect of Continuous and Partial Reinforcement on Extinction

What is the partial-reinforcement effect?

One way to understand extinction in operant conditioning is to consider how consistently a response is followed by reinforcement. On a continuous schedule, a reinforcer is expected without fail after each correct response. When a reinforcer is withheld, it is noticed immediately. But on a partial-reinforcement schedule, a reinforcer is not expected after every response. Thus, no immediate difference is apparent between the partial-reinforcement schedule and the onset of extinction.

When you put money in a vending machine and pull the lever but no candy or pop appears, you know immediately that something is wrong with the machine. But if you are playing a broken slot machine, you could have many non-reinforced responses before suspecting that the machine is malfunctioning.

Partial reinforcement results in a greater resistance to extinction than does continuous reinforcement (Lerman et al., 1996). This result is known as the **partial-reinforcement effect**. There is an inverse relationship between the percentage of responses that have been reinforced and resistance to extinction—that is, the lower the percentage of responses that are reinforced, the longer extinction will take when reinforcement is withheld (Weinstock, 1954). The strongest resistance to extinction that we can find on record occurred in one experiment in which pigeons were conditioned to peck at a disk. According to Holland and Skinner (1961), "After the response had been maintained on a fixed ratio of 900 and reinforcement was then discontinued, the pigeon emitted 73,000 responses during the first 4 $\frac{1}{2}$ hours of extinction" (p. 124).

Parents often wonder why their children continue to nag to get what they want, even though the par-

REVIEW & REFLECT 5.1
Reinforcement Schedules Compared According to Response Rate, Pattern of Responses, and Resistance to Extinction

Schedule of Reinforcement	Response Rate	Pattern of Responses	Resistance to Extinction
Fixed ratio	Very high	Steady response with low ratio. Brief pause after each reinforcement with very high ratio.	The higher the ratio, the more resistant to extinction.
Variable ratio	Highest response rate	Constant response pattern, no pauses.	Most resistant to extinction.
Fixed interval	Lowest response rate	Long pause after reinforcement, followed by gradual acceleration.	The longer the interval, the more resistant to extinction.
Variable interval	Moderate	Stable, uniform response.	More resistant to extinction than fixed-interval schedule with same average interval.

Remember It!

Reinforcement

1. Negative reinforcement (increases/decreases) the likelihood of a response.
2. Many people take aspirin to terminate a painful headache. Taking aspirin is a behaviour that is likely to continue because of the effect of (positive/negative) reinforcement.
3. (Partial/Continuous) reinforcement is most effective in conditioning a new response; afterward, (partial/continuous) reinforcement is best for maintaining the response.
4. Jennifer and Ashley are both employed raking leaves. Jennifer is paid $1 for each bag of leaves she rakes; Ashley is paid $4 per hour. Jennifer is paid according to the _____ schedule; Ashley is paid according to the _____ schedule.
   a. fixed-interval/fixed-ratio
   b. variable-ratio/fixed-interval
   c. variable-ratio/variable-interval
   d. fixed-ratio/fixed-interval
5. Which schedule of reinforcement yields the highest response rate and the greatest resistance to extinction?
   a. variable-ratio
   b. fixed-ratio
   c. variable-interval
   d. fixed-interval
6. Danielle's parents have noticed that she has been making her bed every day, and they would like this to continue. They understand the partial-reinforcement effect, so they will want to reward her *every* time she makes the bed. (true/false)

Answers: 1. increases 2. negative 3. Continuous, partial 4. d 5. a 6. false

ents *usually* do not give in to the nagging. Unwittingly, the parents are reinforcing their children's nagging on a variable-ratio schedule, which results in the most persistent behaviour. For this reason experts always caution parents to be consistent. If parents *never* reward nagging, the behaviour will extinguish; if they give in occasionally, it will persist and be extremely hard to extinguish.

Factors Influencing Operant Conditioning

What three factors, in addition to the schedule of reinforcement, influence operant conditioning?

We know that responses are acquired more quickly with continuous rather than partial reinforcement, and that the schedule of reinforcement influences both response rates and resistance to extinction. Several other factors affect how quickly a response is acquired, response rate, and resistance to extinction.

The first factor is the *magnitude of reinforcement*. In general, as the magnitude of reinforcement increases, acquisition of a response is faster, the rate of responding is higher, and resistance to extinction is greater (Clayton, 1964). People would be motivated to work harder and faster if they were paid $30 for each yard mowed rather than only $10. Other research indicates that level of performance is also influenced by the relationship between the amount of reinforcement expected and what is actually received (Crespi, 1942). For example, your performance on the job would undoubtedly be affected if your salary were suddenly cut in half. Also, it might improve dramatically if your employer doubled your pay.

The second factor affecting operant conditioning is the *immediacy of reinforcement*. In general, responses are conditioned more effectively when reinforcement is immediate. One reason people become addicted to crack cocaine so quickly is that its euphoric effects are felt almost instantly (Medzerian, 1991). As a rule, the longer the delay in reinforcement, the more slowly the response will be acquired (R. A. Church, 1989; Mazur, 1993; and see Figure 5.5 on the next page.) Overweight people have difficulty changing their eating habits because of the long delay between their behaviour change and the rewarding consequences of weight loss and better health.

The third factor influencing conditioning is the *level of motivation* of the learner. If you are highly

partial-reinforcement effect: The greater resistance to extinction that occurs when a portion, rather than 100 percent, of the correct responses have been reinforced.

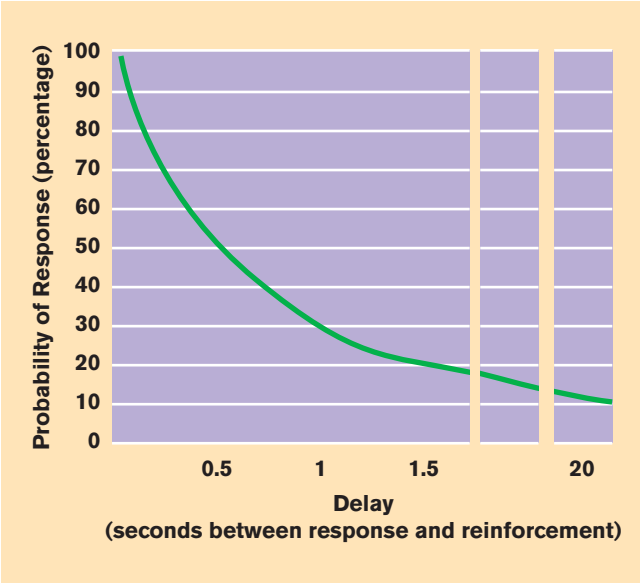


FIGURE 5.5

The Effect of Delay in Reinforcement on Conditioning of a Response **In general, responses are conditioned more effectively when reinforcement is immediate. The longer the delay in reinforcement, the lower the probability that a response will be acquired.**

motivated to learn to play tennis, you will learn faster and practise more than if you have no interest in the game. Skinner found that when food is the reinforcer, a hungry animal will learn faster than a full animal. To maximize motivation, he used rats that had been deprived of food for 24 hours and pigeons that were maintained at 75 to 80 percent of their normal body weight.

Punishment: That Hurts!

How does punishment differ from negative reinforcement?

Punishment is in many ways the opposite of reinforcement. Punishment tends to lower the probability of a response. It can be accomplished by the addition of an unpleasant stimulus or by the removal of a pleasant stimulus. The added unpleasant stimulus might be a scolding, criticism, a disapproving look, a fine, or a prison sentence. The removal of a pleasant stimulus might involve withholding affection and attention, suspending a driver's licence, or taking away a privilege such as watching television.

Students often confuse negative reinforcement and punishment. Unlike punishment, negative reinforcement increases the probability of a desired response by removing an unpleasant stimulus when the correct response is made (see Review & Reflect 5.2). "Grounding" can be used in either punishment or negative reinforcement. When a teenager fails to clean her room after many requests to do so, her parents could ground her for the weekend—a punishment. An alternative approach would be to use negative reinforcement—tell her she is grounded *until* her room is clean. Which approach is likely to be more effective?

The Disadvantages of Punishment: Its Downside

What are some disadvantages of punishment?

Skinner always argued that punishment does not extinguish an undesirable behaviour; rather, it suppresses that behaviour when the punishing agent is present. But the behaviour is likely to continue when the threat of punishment is removed and in settings where punishment is unlikely. There is ample empirical support for Skinner's argument. If punishment (imprisonment, fines, and so on) did extinguish criminal behaviour, there would be fewer repeat offenders in our criminal justice system.

Another problem with punishment is that it indicates which behaviours are unacceptable but does not help people develop more appropriate behaviours. If punishment is used, it should be administered in conjunction with reinforcement or rewards for appropriate behaviour.

Controlling behaviour by punishment has a number of other potential disadvantages. The person who is severely punished often becomes fearful and feels angry and hostile toward the punisher. These reactions may be accompanied by a desire to avoid or escape from the punisher and the punishing situation, or to find a way to retaliate. Many runaway teenagers leave home to escape physical abuse.

Punishment frequently leads to aggression. Those who administer physical punishment may become models of aggressive behaviour—people who demonstrate aggression as a way of solving problems and discharging anger. Children of abusive, punishing parents are at greater risk than other children of becoming aggressive and abusive themselves (Widom, 1989b).

Alternatives to Punishment: There's More Than One Way to Change Behaviour

Because of the many disadvantages of punishment, parents and teachers should explore alternative ways of handling misbehaviour. Often the use of extinction and positive and negative reinforcement leads to the desired outcomes without the negative side effects of punishment.

Many psychologists believe that *removing the rewarding consequences of undesirable behaviour* is the best way to extinguish a problem behaviour. According to this view, parents should extinguish a child's temper tantrums not by punishment but by *never* giving in to the child's demands during a tantrum. A parent might best extinguish problem behaviour that is performed merely to get attention by ignoring it and giving attention to more appropriate behaviour. Sometimes, simply explaining why certain behaviours are not appropriate is all that is required to extinguish the behaviour.

Using positive reinforcement such as praise will make good behaviour more rewarding for children. This approach brings with it the attention that children want and need—attention that too often is given only when they misbehave. And as we saw in our earlier example of grounding, negative reinforcement can often be more effective than punishment in bringing about desired outcomes.

It is probably unrealistic to believe that punishment can be dispensed with entirely. If a young child runs into the street, puts a finger near an electrical outlet, or reaches for a hot pan on the stove, a swift punishment may save the child from a potentially disastrous situation. It is important to be aware of some ways to make punishment more effective.

Review & Reflect 5.2 summarizes the differences between reinforcement and punishment.

Making Punishment More Effective: Some Suggestions

What three factors increase the effectiveness of punishment?

Research has revealed several factors that influence the effectiveness of punishment: its *timing*, its *intensity*, and the *consistency* of its application (Parke, 1977). Punishment is most effective when it is applied during the misbehaviour or as soon afterward as possible. Interrupting the problem behaviour is most effective because it abruptly halts the rewarding aspects of the misbehaviour. The longer the delay between the response and the punishment, the less effective the punishment will be in suppressing the response (Azrin & Holz, 1966; Camp et al., 1967). If the punishment is delayed, the punisher should remind the perpetrator of the incident and explain why the behaviour was inappropriate.

Animal studies have revealed that the more intense the punishment, the greater the suppression of the undesirable behaviour (Church, 1963). But that does not mean that the severity of punishment should be the same for major and minor misbehaviours alike. The intensity of the punishment should match the seriousness of the misdeed. Ideally, punishment should be the minimum necessary to suppress the problem behaviour. Unnecessarily severe punishment is likely to be accompanied by the negative side effects mentioned earlier. But if the initial punishment is too mild, it will have no effect.

What if the intensity of the punishment is gradually increased? The perpetrator will gradually adapt to it, and the unwanted behaviour will persist (Azrin & Holz, 1966; Solomon, 1964). At a minimum, if a behaviour is to be suppressed, the punishment must be more punishing than the misbehaviour is rewarding. In human terms, a $2 speeding ticket would not

punishment: The removal of a pleasant stimulus or the application of an unpleasant stimulus, which tends to suppress a response.

REVIEW & REFLECT 5.2
The Effects of Reinforcement and Punishment

Reinforcement (increases or strengthens a particular behaviour)	Punishment (decreases or suppresses a particular behaviour)
Adding a Positive	*Adding a Negative*
Positive Reinforcement Presenting food, money, praise, attention, or other rewards.	Delivering a pain-producing or otherwise aversive stimulus such as a spanking or an electric shock.
Subtracting a Negative	*Subtracting a Positive*
Negative Reinforcement Removing or terminating some pain-producing or otherwise aversive stimulus, such as electric shock.	Removing some pleasant stimulus or taking away privileges such as TV watching, use of automobile.

be much of a deterrent; a $200 ticket is more likely to suppress the urge to speed.

If it is to be effective, punishment also must be applied consistently. For example, a parent cannot ignore an act of misbehaviour one day and punish the same act the next. There should also be consistency between different people administering the punishment. Both parents ought to react to the same misbehaviour in a consistent manner. And an undesired response will be suppressed more effectively when the probability of punishment is high. Few people would speed while observing a police car in the rear-view mirror.

Finally, punishment should not be administered in anger. The purpose of punishment must always be clearly understood: it is not to vent anger but rather to modify behaviour. Also, punishment meted out in anger is likely to be more intense than necessary to bring about the desired result.

Escape and Avoidance Learning

Learning to perform a behaviour because it terminates an aversive event is called "escape learning," and it reflects the power of negative reinforcement. Running away from a punishing situation and taking aspirin to relieve a pounding headache are examples of escape behaviour. In these situations the aversive event has begun and an attempt is being made to escape it.

Avoidance learning depends on two types of conditioning. First, through classical conditioning, an event or condition comes to signal an aversive state. Drinking and driving may be associated with automobile accidents and death. Then, because of such associations, people may engage in behaviours to avoid the anticipated aversive consequences. Making it a practice to avoid driving with people who have had too much to drink is sensible avoidance behaviour.

Many avoidance behaviours are maladaptive, however, and occur in response to phobias. Students who have had a bad experience speaking in front of a class may begin to fear any situation that involves speaking before a group. Such students may avoid taking classes that require class presentations, or avoid taking leadership roles that require public speaking. Avoiding such situations prevents them from suffering the perceived dreaded consequences. But the avoidance behaviour is negatively reinforced and thus strengthened through operant conditioning. Maladaptive avoidance behaviours are very difficult to extinguish, because people never give themselves a chance to learn that the dreaded consequences probably will not occur or are greatly exaggerated.

Learned Helplessness

It is fortunate that we (like other animals) can easily learn to escape and avoid punishing or aversive situations. Research on learned helplessness, however, suggests that if we are exposed to repeated aversive events that we can neither escape nor avoid, we may learn to do nothing—simply to sit or stand helplessly and suffer the punishment. **Learned helplessness** is a passive resignation to aversive conditions learned by repeated exposure to aversive events that are inescapable and unavoidable.

The initial experiment on learned helplessness was conducted by Overmeier and Seligman (1967), who used dogs as their subjects. The experimental group of dogs were strapped, one at a time, into a harness from which they could not escape and were exposed to electric shocks. Later, these same dogs were placed in a shuttle box with two experimental compartments separated by a low barrier. The dogs then experienced a series of trials in which a warning signal was followed by an electric shock. The floor on one side was electrified, and the dogs should have learned quickly to escape the electric shocks simply by jumping the barrier. Surprisingly, the dogs did not do so; they simply suffered as many shocks as the experimenter chose to deliver, *as if* they could not escape.

Another group of dogs, the control group, had not previously experienced the inescapable shock, and they behaved in an entirely different manner. They quickly learned to escape the shock by jumping the barrier when the warning signal sounded. Seligman reported that the dogs experiencing the inescapable shock were less active, had less appetite, and showed other depression-like symptoms.

Seligman (1975, 1991) later reasoned that humans who have suffered painful and negative experiences they could not avoid and from which they could not escape may experience learned helplessness. Having experienced helplessness, they may simply give up and react to disappointment in life by becoming inactive, withdrawn, and depressed. Learned helplessness has been suggested as one cause of depression.

REVIEW & REFLECT 5.3
Classical and Operant Conditioning Compared

Characteristics	Classical Conditioning	Operant Conditioning
Type of association	Between two stimuli	Between a response and its consequence
State of subject	Passive	Active
Focus of attention	On what precedes response	On what follows response
Type of response typically involved	Involuntary or reflexive response	Voluntary response
Bodily response typically involved	Internal responses: emotional and glandular reactions	External responses: muscular and skeletal movement and verbal responses
Range of responses	Relatively simple	Simple to highly complex
Responses learned	Emotional reactions: fears, likes, dislikes	Goal-oriented responses

LINK IT!

www.psych.upenn.edu/~fresco/helplessness.html
The Learned Helplessness Forum

Comparing Classical and Operant Conditioning: What's the Difference?

In summary, the processes of generalization, discrimination, extinction, and spontaneous recovery occur in both classical and operant conditioning. Both types of conditioning depend on associative learning. In classical conditioning, an association is formed between two stimuli—for example, a tone and food, a white rat and a loud noise, or a product and a celebrity. In operant conditioning, the association is established between a response and its consequences—studying hard and a high test grade, good table manners and praise from a parent, or (in the world of rats and pigeons) bar pressing and food, or disk pecking and food.

In classical conditioning, the focus is on what precedes the response. Pavlov focused on what led up to the salivation in his dogs, not on what happened after they salivated. In operant conditioning, the focus is on what follows the response. If a rat's bar pressing or your studying is followed by a reinforcer, that response is more likely to occur in the future.

Generally, in classical conditioning, the subject is passive and responds to the environment rather than acting upon it. In operant conditioning, the subject is active and *operates* on the environment. Children *do* something to get their parents' attention or their praise. Review & Reflect 5.3 highlights the major differences between classical and operant conditioning.

Exceptions can be found to most general principles. Research in biofeedback indicates that internal responses, once believed to be completely involuntary, can be brought under a person's voluntary control.

Behaviour Modification: Changing Our Act

What is behaviour modification?

Behaviour modification is a method of changing behaviour through a systematic program based on the principles of learning—classical conditioning, operant conditioning, or observational learning (which we will discuss soon). Most behaviour modification programs use the principles of operant conditioning.

avoidance learning: Learning to avoid events or conditions associated with dreaded or aversive outcomes.

learned helplessness: The learned response of resigning oneself passively to aversive conditions, rather than taking action to change, escape, or avoid them; learned through repeated exposure to inescapable or unavoidable aversive events.

behaviour modification: The systematic application of the learning principles of operant conditioning, classical conditioning, or observational learning to individuals or groups in order to eliminate undesirable behaviour and/or encourage desirable behaviour.

Many institutions—schools, mental hospitals, homes for young offenders, prisons—have used behaviour modification programs with varying degrees of success. Institutions lend themselves well to such techniques because they provide a restricted environment where the consequences of behaviour can be more strictly controlled. Some institutions such as prisons or mental hospitals use a **token economy**—a program that motivates socially desirable behaviour by reinforcing it with tokens. The tokens (poker chips or coupons) may later be exchanged for desired goods like candy or cigarettes and privileges such as weekend passes, free time, or participation in desired activities. People in the program know in advance exactly what behaviours will be reinforced and how they will be reinforced. Token economies have been used effectively in mental hospitals to encourage patients to attend to grooming, to interact with other patients, and to carry out housekeeping tasks (Ayllon & Azrin, 1965, 1968). Although the positive behaviours generally stop when the tokens are discontinued, this does not mean that the programs are not worthwhile. After all, most people who are employed would probably quit their jobs if they were no longer paid.

Classroom teachers have used behaviour modification to modify undesirable behaviour and to encourage learning. "Time out" is a useful technique in which a child who is misbehaving is removed for a short time from sources of positive reinforcement. (Remember that according to operant conditioning, a behaviour that is no longer reinforced will be extinguished.)

Some research indicates, however, that it may be unwise to reward students for participating in learning activities they already enjoy. Reinforcement in such cases may lessen students' natural interest in the tasks, so that when reinforcers are withdrawn, it may disappear (Deci, 1975; Lepper et al., 1973).

Behaviour modification has been used successfully in business and industry to increase profits and to modify employee behaviour in health, safety, and learning. To reduce costs associated with automobile accidents and auto theft, automobile insurance companies attempt to modify the behaviour of their policyholders. They offer incentives in the form of reduced insurance premiums for installing airbags and burglar alarm systems. To encourage their employees to take company-approved college and university courses, many companies offer tuition reimbursement contingent on course grades. Many companies promote sales by giving salespeople special bonuses, awards, trips, and other prizes for increasing sales.

Remember It!

Learning Paradigms and Punishment

1. Punishment is roughly the same as negative reinforcement (true/false)
2. Which of the following is *not* presented in the text as one of the major factors influencing the effectiveness of punishment?
   a. timing
   b. consistency
   c. intensity
   d. frequency
3. Punishment usually does *not* extinguish undesirable behaviour. (true/false)
4. People often engage in behaviour that is reinforcing in the short term but not in their long-term interest. This reflects the influence of
   a. the magnitude of reinforcement.
   b. level of motivation.
   c. the immediacy of reinforcement.
   d. the schedule of reinforcement.
5. Recall what you have learned about classical and operant conditioning. Which of the following is descriptive of operant conditioning?
   a. An association is formed between a response and its consequence.
   b. The responses acquired are usually emotional reactions.
   c. The subject is usually passive.
   d. The response acquired is usually an involuntary or reflexive response.
6. Applying the principles of learning to eliminate undesirable behaviour and/or encourage desirable behaviour is called (operant conditioning/behaviour modification).

Answers: 1. false 2. d 3. true 4. c 5. a 6. behaviour modification

One of the most successful applications of behaviour modification has been in the treatment of psychological problems ranging from phobias to addictive behaviours. In this context, behaviour modification is called "behaviour therapy." This kind of therapy is discussed in Chapter 13.

You can learn how to use behaviour modification in shaping your own behaviour in the *Apply It!* box at the end of this chapter.

Cognitive Learning

So far, we have explored relatively simple types of learning. In classical and operant conditioning, learning is defined in terms of observable or measurable changes in behaviour. Early behaviourists believed that learning through operant and classical conditioning could be explained without reference to internal mental processes. Today, however, a growing number of psychologists stress the role of mental processes. They choose to broaden the study of learning to include such **cognitive processes** as thinking, knowing, problem solving, remembering, and forming mental representations. According to cognitive theorists, these processes are critically important to a more complete understanding of learning.

Here we will focus on observational learning and the work of Albert Bandura.

Observational Learning: Watching and Learning

What is observational learning?

In our exploration of operant conditioning, you read how people and other animals learn by directly experiencing the consequences, positive or negative, of their behaviour. But must we experience rewards and punishments directly in order to learn? Not according to Albert Bandura (1986), who contends that many of our behaviours or responses are acquired through observational learning. **Observational learning**, sometimes called **modelling**, is learning that results when we observe the behaviour of others and the consequences of that behaviour.

The person who demonstrates a behaviour or whose behaviour is imitated is called the **model**. Parents, movie stars, and sports personalities are often powerful models. The effectiveness of a model is related to his or her status, competence, and power. Other important factors are the age, sex, attractiveness, and ethnic status of the model. Whether or not learned behaviour is actually performed depends largely on whether the observed models are rewarded or punished for their behaviour and whether the individual expects to be rewarded for the behaviour (Bandura, 1969a, 1977a).

We use observational learning to acquire new responses or to strengthen or weaken existing responses. Consider your native language or accent, your attitudes, gestures, personality traits, good habits (or bad habits, for that matter), moral values, food preferences, and so on. Do you share any of these with your parents? While you were growing up, their example probably influenced your behaviour for better or worse. Look around the classroom and observe the clothes, hairstyles, and verbal patterns of the other students. Most people have been greatly influenced by observing others.

Children can learn effectively by observing and imitating others.

token economy: A program that motivates and reinforces socially acceptable behaviours with tokens that can be exchanged for desired items or privileges.

cognitive processes (COG-nuh-tiv): Mental processes such as thinking, knowing, problem solving, and remembering.

observational learning: Learning by observing the behaviour of others and the consequences of that behaviour; learning by imitation.

modelling: Another name for observational learning.

model: The individual who demonstrates a behaviour or serves as an example in observational learning.

Observational learning is particularly useful when we find ourselves in unusual situations. Picture yourself as a guest at an elaborate dinner with the prime minister. More pieces of silverware extend from the plate than you have ever seen before. Which fork should be used for what? How should you proceed? You might decide to take your cue from the other guests—observational learning.

Inhibitions can be weakened or lost as a result of our observation of the behaviour of others. Adolescents can lose whatever resistance they may have to drinking, drug use, or sexual activity by seeing or hearing about peers engaging in these behaviours. With peer pressure, there is often an overwhelming tendency to conform to the behaviour and accept the values of the peer group. But inhibitions can also be strengthened through observational learning. A person does not need to experience the unfortunate consequences of dangerous behaviour to avoid it.

Fears, too, can be acquired through observational learning. A parent with an extreme fear of the dentist or of thunderstorms might serve as a model for these fears in a child. For instance, Muris and his colleagues (1996) found that children whose mothers expressed fears of animals, injuries, or medical problems had significantly higher levels of fear than children whose mothers did not express such fears. Note too that observational learning is not restricted to humans, as it has been shown by research on monkeys (Cook et al., 1985), octopuses (Fiorito & Scotto, 1992), and pigeons.

Learning Aggression: Copying What We See

Albert Bandura suspected that aggressive behaviour is particularly subject to observational learning and that aggression and violence on television and in cartoons tend to increase aggression in children. His pioneering work has greatly influenced current thinking on these issues. In several classic experiments, Bandura demonstrated how children are influenced by exposure to aggressive models.

One study (Bandura et al., 1961) involved three groups of preschool children. Children in one group individually observed an adult model punching, kicking, and hitting an inflated plastic "Bobo Doll" (a large, plastic doll that is weighted at the bottom so that it doesn't fall over) with a mallet, while uttering aggressive words such as "Sock him in the nose …" "Throw him in the air …" "Kick him …" "Pow …" (p. 576). Children in the second group observed a non-aggressive model who ignored the Bobo Doll and sat quietly assembling Tinker Toys. Children in the control group were placed in the same setting as those in the two other groups, but with no adult present. Later, each child was observed through a one-way mirror. Participants exposed to the aggressive model imitated much of the aggression and also engaged in significantly more non-imitative aggression than either of the other groups. Participants in the second group, who had observed the non-aggressive model, showed less aggressive behaviour than the control group.

A further study (Bandura et al., 1963) compared the degree of aggression in children following exposure to (1) a live aggressive model, (2) a filmed version of the episode, and (3) a film depicting an aggressive cartoon character using the same aggressive behaviours in a fantasy-like setting. A control group was

Try It!

Learning in Everyday Life

Think about everything you did yesterday from the time you woke up until the time you went to sleep. List 10 behaviours and indicate whether observational learning (OL), operant conditioning (OC), and/or classical conditioning (CC) played some role in the acquisition of each one. Remember, a behaviour may originally have been learned by some combination of the three types of learning and then been maintained by one or more of the types.

You probably learned to brush your teeth through a combination of observational learning (watching a parent demonstrate) and operant conditioning (being praised as your technique improved–shaping). Now the behaviour is maintained through operant conditioning, specifically negative reinforcement (getting rid of the terrible taste in your mouth). Avoiding cavities and the scorn of everyone around you is an extra bonus.

Which kind of learning had the most checks on your chart?

	Acquired through:			Maintained through:		
Behaviour	**OL**	**OC**	**CC**	**OL**	**OC**	**CC**
Brushing teeth	X	X			X	

not exposed to any of the three situations of aggression. The groups exposed to aggressive models used significantly more aggression than the control group. The researchers concluded that "of the three experimental conditions, exposure to humans on film portraying aggression was the most influential in eliciting and shaping aggressive behaviour" (p. 7).

Bandura's research provided the impetus for studying the effects of television violence and aggression in both cartoons and regular programming. Although there has been some consciousness-raising about the negative impact of media violence, the amount of television violence is still excessive. The problem is compounded by the fact that the average family watches more than seven hours of television each day. Watching excessive violence gives people an exaggerated view of the pervasiveness of violence in our society, while making them less sensitive to the victims of violence. Media violence also encourages aggressive behaviour in children by portraying aggression as an acceptable and effective way to solve problems and by teaching new forms of aggression (Wood et al., 1991). But just as children imitate the aggressive behaviour they observe on television, they also imitate the prosocial, or helping, behaviour they observe. Programs like *Sesame Street* have been found to have a positive influence on children (Coates et al., 1976).

Of course, learning principles can also have many positive outcomes, such as those described in the *Apply It!* box below.

Apply It!

Steps to Take in Overcoming Procrastination

Procrastinators of all types can profit from the following 10 steps for overcoming procrastination. We'll use studying as our example in each step:

- Identify the environmental cues that habitually interfere with your studying. What competing interests are most likely to cause you to put off studying or to interrupt your studying—television, bed, refrigerator, telephone, friends, family members?
- Select a place to study that you associate only with studying, preferably away from the distracting environmental cues you have identified.
- Schedule your study time in advance so your decisions about when to start work will not be ruled by the whim of the moment.
- The most difficult part is getting started. Give yourself an extra reward for starting on time and, perhaps, a penalty for not starting on time.
- Much procrastination results from a failure to consider its negative consequences. Visualizing the consequences of not studying can be an effective tool. Suppose you are considering going out of town with friends for the weekend instead of studying for a midterm test on Monday. Picture this! You walk into the classroom Monday morning unprepared; you know the answers to very few questions; you flunk the test. Now visualize the outcome if you stay home for the weekend and study.
- Estimate how long it will take to complete an assignment, and then keep track of how long it actually takes.
- Avoid jumping to another task when you reach a difficult part of an assignment.
- Avoid preparation overkill. Busy procrastinators may spend hours preparing for the task rather than on the task itself. This enables them to postpone the task.
- Keep a record of the reasons you give yourself for postponing studying or completing important assignments.
- Procrastinators are notorious for breaking their own promises to get to work. How much confidence would you have in a friend who made promises to you but never followed through?

  "*I'll do this tomorrow.*" Why is tomorrow going to be a better day? You told yourself this yesterday, and now you are not following through.
  "I'll go out with my friends, but only for a few hours." As a rule, does your time with friends turn out to be a few hours or the whole day or night?
  "I'll get some sleep and set my alarm for 3:00 a.m. and then study." Are you usually able to get up at 3:00 a.m.?
  "I'll watch TV for a few minutes and then get back to studying." Does a few minutes often turn into several hours?
  "I'll rest for a few minutes and clear my mind so I can think better." Does your ability to think *really* improve?

Apply the steps outlined here to gain more control over your behaviour. A good source for finding other suggestions on this topic is *Overcoming Procrastination* by Albert Ellis and William J. Knaus (1977).

KEY TERMS

avoidance learning, p. 166
behaviour modification, p. 167
classical conditioning, p. 145
cognitive processes, p. 169
conditioned reflex, p. 146
conditioned response (CR), p. 147
conditioned stimulus (CS), p. 147
continuous reinforcement, p. 160
discrimination, p. 149
discriminative stimulus, p. 158
drug tolerance, p. 153
extinction, pp. 148 and 157
fixed-interval schedule, p. 161
fixed-ratio schedule, p. 160
generalization, p. 148
higher-order conditioning, p. 150
learned helplessness, p. 166
learning, p. 144
model, p. 169
modelling, p. 169
negative reinforcement, p. 158
observational learning, p. 169
operant conditioning, p. 155
partial reinforcement, p. 160
partial-reinforcement effect, p. 162
positive reinforcement, p. 158
primary reinforcer, p. 159
punishment, p. 164
reflex, p. 146
reinforcement, p. 158
reinforcer, p. 155
schedule of reinforcement, p. 160
secondary reinforcer, p. 159
shaping, p. 156
Skinner box, p. 156
spontaneous recovery, p. 148
stimulus, p. 144
successive approximations, p. 156
taste aversion, p. 154
token economy, p. 168
unconditioned response (UR), p. 146
unconditioned stimulus (US), p. 146
variable-interval schedule, p. 161
variable-ratio schedule, p. 160

THINKING CRITICALLY

Evaluation

Prepare statements outlining the strengths and limitations of classical conditioning, operant conditioning, and observational learning in explaining how behaviours are acquired and maintained.

Point/Counterpoint

The use of behaviour modification has been a source of controversy among psychologists and others. Prepare arguments supporting each of the following positions:

a. Behaviour modification should be used in society to shape the behaviour of others.
b. Behaviour modification should not be used in society to shape the behaviour of others.

Psychology in Your Life

Think of a behaviour of a friend, a family member, or a professor that you would like to change. Using what you know about classical conditioning, operant conditioning, and observational learning, formulate a detailed plan for changing the behaviour of the target person.

SUMMARY & REVIEW

Classical Conditioning

What was Pavlov's major contribution to psychology?

Ivan Pavlov's study of the conditioned reflex provided psychology with a model of learning called *classical conditioning*.

How is classical conditioning accomplished?

During classical conditioning, a neutral stimulus (tone) is presented shortly before an unconditioned stimulus (food), which naturally elicits, or brings forth, an unconditioned response (salivation). After repeated pairings, the conditioned stimulus (tone) by itself will elicit the conditioned response (salivation).

How does extinction occur in classical conditioning?

If the conditioned stimulus (tone) is presented repeatedly without the unconditioned stimulus (food), the conditioned response (salivation) will become progressively weaker and eventually disappear—a process called *extinction*.

What is generalization?

Generalization occurs when an organism makes a conditioned response to a stimulus that is similar to the original conditioned stimulus.

What is discrimination in classical conditioning?

Discrimination is the ability to distinguish between similar stimuli, so that the conditioned response is made only to the original conditioned stimulus.

How did John B. Watson demonstrate that fear could be classically conditioned?

John Watson demonstrated that fear could be classically conditioned when, by presenting a white rat along with a loud, frightening noise, he conditioned Little Albert to fear the white rat.

What are four factors that influence classical conditioning?

Four factors influencing classical conditioning are (1) the number of pairings of conditioned stimulus and unconditioned stimulus, (2) the intensity of the unconditioned stimulus, (3) how reliably the conditioned stimulus predicts the unconditioned stimulus, and (4) the temporal relationship between the conditioned stimulus and the unconditioned stimulus.

What types of responses can be learned through classical conditioning?

Positive and negative emotional responses (including likes, dislikes, fears, and phobias), conditioned immune responses, and conditioned drug tolerance in drug users are some types of responses acquired through classical conditioning.

Operant Conditioning

How are responses acquired through operant conditioning?

Operant conditioning is a method for conditioning voluntary responses. The consequences of behaviour are manipulated to shape a new response or to increase or decrease the frequency of an existing response.

How is shaping used to condition a response?

In shaping, rather than waiting for the desired response to be produced, we selectively reinforce successive approximations toward the goal response until the desired response is achieved.

How does extinction occur in operant conditioning?

In operant conditioning, extinction occurs when reinforcement is withheld.

What are the goals of both positive and negative reinforcement, and how are the goals accomplished for each?

Both positive reinforcement and negative reinforcement are used to strengthen or increase the probability of a response. With positive reinforcement the desired response is followed with a reward; with negative reinforcement it is followed with the termination of an aversive stimulus.

What are the four major schedules of reinforcement, and which schedule yields the highest response rate and the greatest resistance to extinction?

The four major schedules of reinforcement are the fixed-ratio, variable-ratio, fixed-interval, and variable-interval schedules. The variable-ratio schedule provides the highest response rate and the greatest resistance to extinction.

What is the partial-reinforcement effect?

The partial-reinforcement effect is the greater resistance to extinction that occurs when responses are maintained under partial reinforcement rather than under continuous reinforcement.

What three factors, in addition to the schedule of reinforcement, influence operant conditioning?

In operant conditioning, the acquisition of a response, the response rate, and the resistance to extinction are influenced by the magnitude of reinforcement, the immediacy of reinforcement, and the motivation of the organism.

How does punishment differ from negative reinforcement?

Punishment is used to decrease the frequency of a response; negative reinforcement is used to increase the frequency of a response.

What are some disadvantages of punishment?

Punishment generally suppresses rather than extinguishes behaviour; it does not help people develop more appropriate behaviours; and it can cause fear, anger, hostility, and aggression in the punished person.

What three factors increase the effectiveness of punishment?

Punishment is most effective when it is administered immediately after undesirable behaviour, when it is consistently applied, and when it is fairly intense.

What is behaviour modification?

Behaviour modification involves the systematic application of learning principles to individuals or groups in order to eliminate undesirable behaviour and/or encourage desirable behaviour.

Cognitive Learning

What is observational learning?

Observational learning is learning by observing the behaviour of others, called models, and the consequences of that behaviour.