CHAPTER

5 Models to explain learning

KEY KNOWLEDGE

- classical conditioning as a three-phase process (before conditioning, during conditioning and after conditioning) that results in the involuntary association between a neutral stimulus and unconditioned stimulus to produce a conditioned response, including stimulus generation, stimulus discrimination, extinction and spontaneous recovery
- operant conditioning as a three-phase model (antecedent, behaviour, consequence) involving reinforcers (positive and negative) and punishment (including response cost) that can be used to change voluntary behaviours, including stimulus generalisation, stimulus discrimination and spontaneous recovery (excluding schedules of reinforcement)
- observational learning as a method of social learning, particularly in children, involving attention, retention, reproduction, motivation and reinforcement
- the 'Little Albert' experiment as illustrating how classical conditioning can be used to condition an emotional response, including ethical implications of the experiment.

Learning is commonly defined as a relatively permanent change in behaviour that occurs as a result of experience. It is an ongoing process that continues throughout the lifespan, enabling us to adapt and cope in an ever-changing world. Learning can occur *intentionally*, such as when someone takes piano lessons, or *unintentionally*, such as when watching or hearing someone else playing the piano. Similarly, learning can be *active*, such as when reciting multiplication tables, or *passive*, such as when hearing about Australia's performance in the Olympic Games.

The concept of *change* is an important part of the definition of learning, because something must be different about an organism after learning has taken place. The change in behaviour may be immediate (e.g. changing a tennis serve immediately after a coach suggests a way to improve it), or it may be delayed and actually occur some time after learning has taken place (e.g. changing a tennis serve the next time you play tennis after watching an instructional video). Furthermore, the change may be possible but not evident because of a lack of opportunity (e.g. by watching a tennis pro serving on TV you know how to improve your serve but you never again play tennis). Consequently, learning refers to the potential to behave in a particular way, as well as behaviour that is observed to take place.

Learned behaviour is also defined as *relatively permanent* because it cannot be something that is present one moment and gone the next, or 'here today and gone tomorrow'. It must have a continuing or lasting effect for a time, but it does not necessarily have to produce a permanent (lifelong) change. Thus, information you recalled when correctly answering a question in a SAC test a week ago is said to have been learned even if you can't recall that information now. Learning is regarded as *relatively* permanent because most, if not all, learned behaviours can be modified. For example, someone who has learned to fear spiders can subsequently learn not to fear them.

Temporary changes in behaviour that are caused by illness, prescription and illegal drugs, injury, fatigue and alcohol are not classified as learning. Such changes in behaviour tend to be brief compared with those that result from learning. For example, the effects on behaviour of a sleepless night will typically wear off after a night or two of rest. Similarly, the effects of medication will usually disappear after a certain period.

Like intelligence, personality, memory, consciousness and many other psychological characteristics and processes, learning is a psychological *construct* — a concept used to describe or explain something that is believed to exist or occur but cannot be directly observed or measured. Because it is not possible to observe or measure learning actually taking place during the learning process, psychologists observe behaviour, or *performance*, to gain an understanding of what is occurring. Inferences are then made about the learning that has (or has not) taken place. For example, it is not possible to see learning take place as you read this book. In this case, the change referred to as part of the definition of learning may not be immediately evident. But a test of your recall of the material (such as your performance on a test) will provide information about whether learning has occurred and how much learning has taken place.

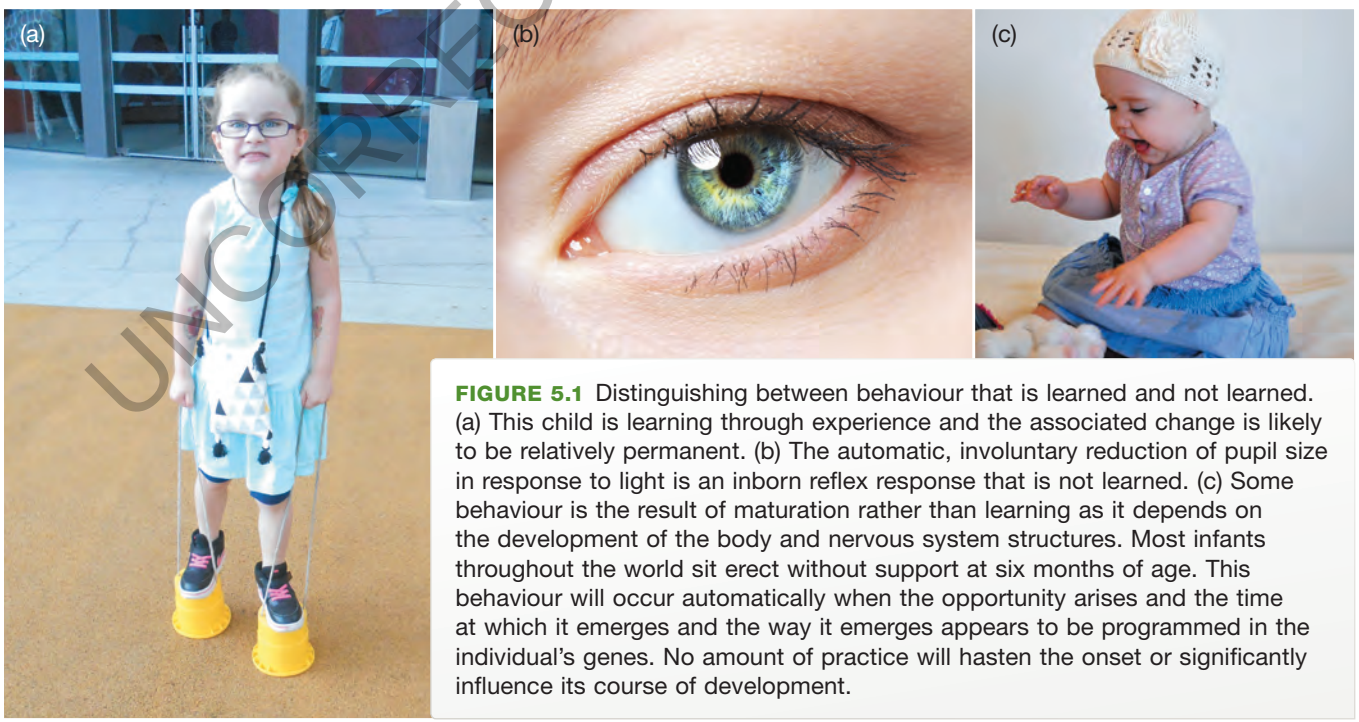

FIGURE 5.1 Distinguishing between behaviour that is learned and not learned. (a) This child is learning through experience and the associated change is likely to be relatively permanent. (b) The automatic, involuntary reduction of pupil size in response to light is an inborn reflex response that is not learned. (c) Some behaviour is the result of maturation rather than learning as it depends on the development of the body and nervous system structures. Most infants throughout the world sit erect without support at six months of age. This behaviour will occur automatically when the opportunity arises and the time at which it emerges and the way it emerges appears to be programmed in the individual's genes. No amount of practice will hasten the onset or significantly influence its course of development.

Psychologists have developed many different models and theories to describe and explain human learning in terms of psychological processes. Most of these are based on studies involving observations of the learning experiences of animals in laboratory experiments. Through such studies, psychologists have identified many principles of learning that apply across a wide range of species, including humans. Collectively, the models indicate that there are many ways that we learn and that different types of learning share common elements. The models also suggest that how we learn can vary from situation to situation and from individual to individual. We may also shift between different types of learning depending on personal factors, what we are learning and the context in which the learning is occurring.

One of the most basic learning processes involves linking two events that occur close together. **Conditioning** is the process of learning associations between a stimulus in the environment (one event) and a behavioural response (another event). For example, associating a smile with friendly behaviour and associating working at a supermarket with getting paid involve learning through conditioning by linking events that occur together. A conditioned response is any type of learned response. Similarly, anything can be a stimulus, as long as our senses can detect it. For example, it can be a phone, light, insect or house, a sound, an odour, a puff of air, a touch, a change in temperature, an event we see happening or an event we read or hear about.

The term 'conditioning' is often used interchangeably with 'learning', but conditioning is more to do with the learning process; that is, *how* the learning occurs. However, as well as being considered as an element of other types of learning, conditioning is viewed by many psychologists as a type of learning in its own right.

The two main types of conditioning on which psychologists have tended to focus are classical conditioning and operant conditioning. In *classical conditioning* we learn that two events go together after we experience them occurring together on a number of occasions; for example, walking in the rain and getting wet. In *operant conditioning* we learn by forming a three-way association between a specific stimulus, a response and the consequence of the response. Therefore, in response to an upcoming VCE exam (the stimulus), we are likely to repeat behaviour (studying) associated with a satisfying consequence (passing). Conversely, the upcoming exam (the stimulus) will also make us more likely to avoid behaviour (partying) associated with an unsatisfying consequence (failing).

Other types of learning that are similar to and different from classical and operant conditioning in varying degrees have also been described and explained. For instance, we can learn by watching and/or listening to others. This is called *observational learning* and reflects the widely held belief that learning involves cognitive processes that often occur in a social context, as well as associations between behaviour and consequences. Unlike classical and operant conditioning, the observational learning model is primarily based on studies with people, particularly children.

In this chapter, we examine each of these three models that have been used to explain learning. We start with classical conditioning, which was first reported at the end of the 19th century.

CLASSICAL CONDITIONING

What do the following three people have in common: Annie, a former cigarette smoker who always has the urge to light up a cigarette whenever she has coffee; Samir, who will no longer travel anywhere by plane after his previous two interstate flights were caught in a violent thunderstorm; and Jack, who broke up with his girlfriend a year ago but still feels sad whenever he catches sight of her? The answer is classical conditioning. Annie, Samir and Jack have all changed their behaviour by learning through classical conditioning, sometimes called *respondent conditioning*.

FIGURE 5.2 Pavlov observing one of the dogs on which he conducted his experiments.

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Video on Pavlov's experiments 3m 54s

Classical conditioning was first described by Russian physiologist Ivan Pavlov in 1899 while he was conducting research into the digestive system of dogs. Pavlov was particularly interested in the role of salivary secretions in the digestion of food and was awarded the Nobel Prize in Physiology or Medicine in 1904 for his work in this field. He used apparatus like those shown in figures 5.3 and 5.4 to measure the amount of saliva produced when a dog ate. The flow of saliva occurred naturally whenever food (meat powder) was placed in the dog's mouth, as salivation is an involuntary reflex response.

FIGURE 5.3 This sketch shows the simple apparatus used by Pavlov to collect the dog's saliva in his initial experiments.

To minimise the influence of potential confounding variables, the dog was restrained in a harness that held it in the desired position. Food (meat powder) was placed directly on the dog's tongue or in its bowl. A tube was surgically attached to the dog's cheek near one of the salivary glands. This drained saliva straight out into a type of test tube that enabled precise measurements of the amount of saliva secreted.

In later experiments, more sophisticated measuring devices were used, some of which measured the rate (speed) of the saliva flow as well as the quantity produced. The dog was observed by using a series of mirrors, as shown in figure 5.4, so that it could not see or be distracted by the observer. In the course of his research, Pavlov observed that the dogs salivated not only at the sight of the food and when food entered their mouths, but also at the sight or sound of the laboratory technician who had been preparing their food. For example, the dogs salivated when they heard the rattling sound of the spoon against the container as the food was being prepared. These unintentional observations intrigued Pavlov and he decided to conduct further experiments under controlled conditions in order to systematically investigate the dogs' behaviour.

Pavlov's subsequent experiments provided clear evidence of a type of learning that occurred through association of two different stimuli. In relation to learning, a **stimulus** is any object or event that elicits (produces) a response from an organism. A **response** is a reaction by an organism to a stimulus.

In Pavlov's experiment, the stimulus of *food* initially produced the response of *salivation*. Eventually however, the sight or sound of the technician became the stimulus that produced the salivation response. The salivation response is controlled by the autonomic nervous system so it occurs involuntarily. It is a reflex response over which the dog has no control. Salivation had become associated with, and conditioned to, a new stimulus — the sight or sound of the technician. This new stimulus was originally a 'neutral' stimulus because it did not produce any specific response other than attention when the technician was seen or heard before he was associated with food. The process through which the dog learned to associate the sight or sound of the technician with food is basically the process of classical conditioning.

Classical conditioning refers to a type of learning that occurs through the repeated association of two (or more) different stimuli. Learning is only said to have occurred when a particular stimulus consistently produces a response that it did not previously produce. Learning results from the involuntary linking of this stimulus, over a number of trials, with a stimulus that normally produces the response automatically. In classical conditioning, a response that is automatically produced by one stimulus becomes associated, or linked, with another stimulus that would not normally produce this response.

In later experiments, Pavlov varied the stimulus that had been conditioned to test whether it would still produce the same response (salivation). He found that the salivation response could be brought on after repeated associations of the meat powder with a range of different stimuli such as a bell, the musical tone of a tuning fork, a light, a tug on the hind leg or even the sight of a circle.

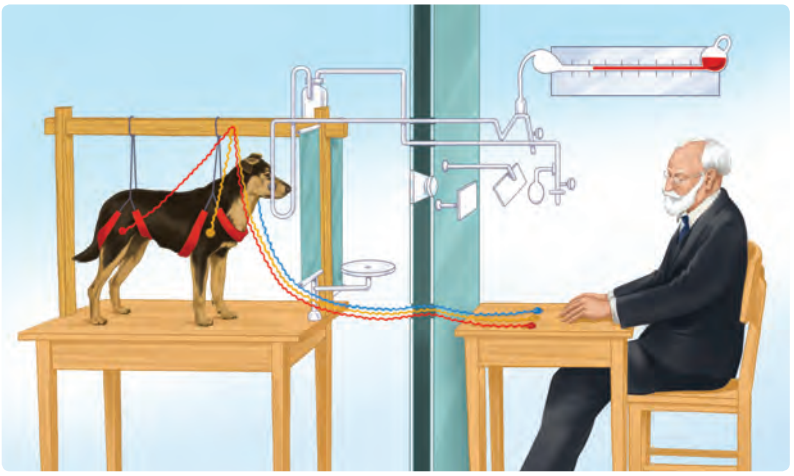

FIGURE 5.4 This sketch of Pavlov's apparatus is one that appeared in his published lectures and shows a more elaborate saliva-measuring device than that used in his earlier experiments (as shown in figure 5.3).

BOX 5.1

Habituation — the simplest type of learning

A sudden, unexpected noise usually startles us and causes an orienting response. When the orienting response occurs, we become alert and turn our head towards the source of the sound. However, if the same noise occurs over and over again, we gradually cease to respond to it until we ignore it altogether. This is an example of *habituation* — learning not to respond to a stimulus that occurs repeatedly. With habituation, the response to an unchanging stimulus weakens or decreases over time. Consequently, it is often described as a type of 'non-associative' learning because it does not involve the association of two stimuli to produce behaviour change.

Habituation is often described as the simplest of all forms of learning and reflects the fact that an organism has become familiar with or accustomed to a particular stimulus over time, usually without awareness or any intention to learn.

Habituation may occur with all our senses and is evident for many everyday events. For example, people living near main roads in the Melbourne suburbs become habituated to the noise of passing traffic but can be woken early in the morning by the sounds of birds when they take a holiday in the country. Similarly, when you first put on a shoe, you 'feel' it on your foot, but very shortly it is as if the shoe is no longer there and you ignore the sensation of pressure on your foot. However, you do not develop an 'insensitivity' to the sensation. You stop noticing the 'feel' of the shoe and habituate to it. If later in the day someone steps on your foot, you will still feel the pressure.

Habituation is observed among almost all animal species. Even animals with very primitive nervous systems are capable of habituation. For example, if you tap the shell of a snail with a pencil, it will withdraw its body into its shell (known as *avoidance behaviour*). After a while, it will extend its body out of its shell and continue with whatever it was doing. If you tap again it will again withdraw, but this time it will tend to stay within its shell a shorter time. After several repetitions, it will eventually stop responding to the tap. The organism will have habituated.

Consider how distracting it would be to have your attention diverted every time a common noise occurred. Habituation is believed to be adaptive — it allows us to ignore a stimulus that has no significance and to focus our attention on more important things, relatively free from distraction.

Habituated learning typically occurs without conscious awareness and therefore also involves memories which we can recall without conscious awareness. Consequently, memories based on this simple form of learning are considered to be 'implicit' memories (as compared to 'explicit' memories which involve conscious awareness).

FIGURE 5.5 People who live or work in big cities become habituated to the sound of traffic or low-flying planes and other city noises.

Classical conditioning as a three-phase process

Classical conditioning if often described as a learning process that occurs in a series of three phases or stages — before conditioning, during conditioning and after conditioning. These are shown in figure 5.7. Five key terms are used to explain the entire process and are applied whenever describing or analysing any simple response or more complex behaviour acquired through classical conditioning. These are known as the unconditioned stimulus, the unconditioned response, the neutral stimulus that becomes a conditioned stimulus, and the conditioned response.

The **unconditioned stimulus (UCS)** is any stimulus that consistently produces a particular, naturally occurring, automatic response. In Pavlov's experiments, the UCS was the food. Another example of a UCS is the placement of a nipple in a newborn

infant's mouth. With no learning whatsoever, and assuming it is 'maturationally ready', the infant will automatically commence sucking. This is a naturally occurring, automatic sucking reflex response.

The **unconditioned response (UCR)** is the response that occurs automatically when the UCS is presented. A UCR is a reflexive involuntary response that is predictably caused by a UCS. In Pavlov's experiments, the UCR was the salivation by the dogs to the presence of food. In the example of the newborn infant, the infant's sucking is the UCR to the mother's nipple being placed in its mouth.

The **neutral stimulus (NS)** is any stimulus that does that does not normally produce a predictable response. In particular, this stimulus is 'neutral' to the UCR. For example, dogs do not normally salivate in response to the ringing of a bell. Pavlov's dogs had to be conditioned to do so through repeated pairing of the bell ring with meat powder, a food stimulus that does produce the particular response. Through repeated association with the meat powder (UCS), the originally neutral stimulus (the bell ring) becomes a conditioned stimulus that triggers a very similar or identical response to that caused by the UCS. Therefore, the **conditioned stimulus (CS)** is the stimulus that is 'neutral' at the start of the conditioning process but eventually triggers a very similar response to that caused by the UCS — a response that has become a conditioned response.

FIGURE 5.6 Many pets, like the dog shown here, form an association between the sight or sound of the food package (CS) and the presentation of the food (UCS). Such examples demonstrate the development of anticipatory behaviour through repeated pairings of two stimuli.

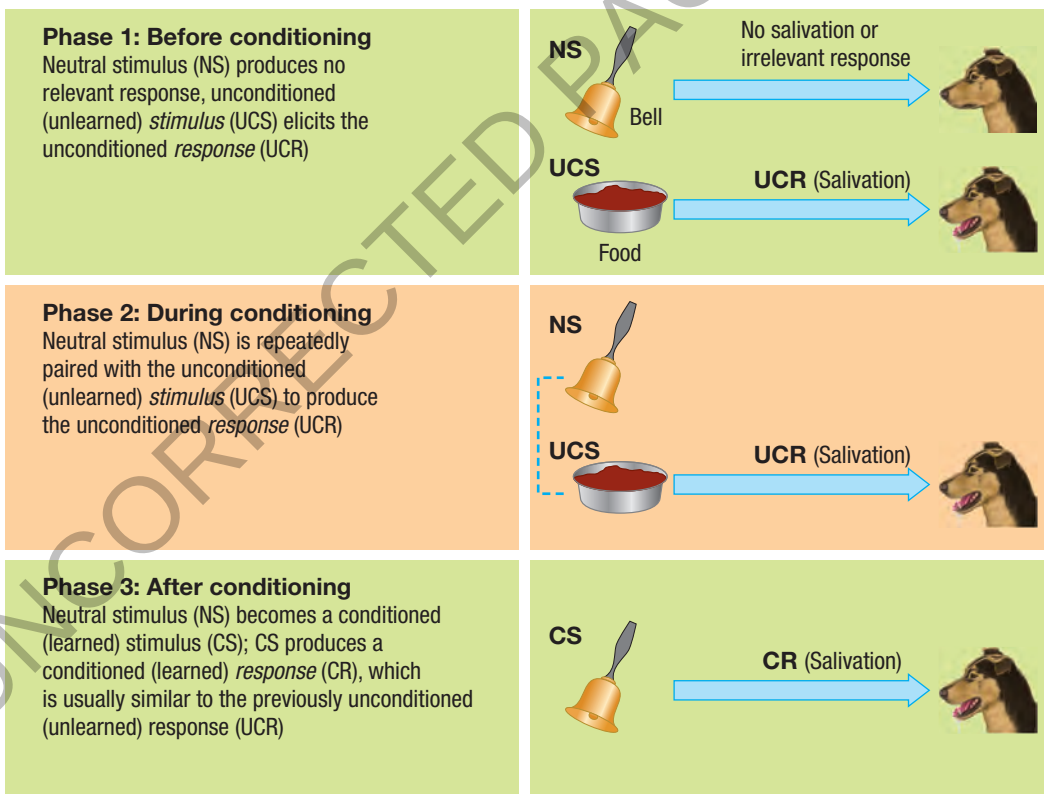

FIGURE 5.7 The three-phase process of classical conditioning in Pavlov's experiments. Classical conditioning is learning through involuntary paired associations between a neutral stimulus and an unconditioned stimulus to produce a conditioned response. Dogs do not normally salivate in response to the ringing of a bell. Pavlov's dogs had to be conditioned to do so through repeated pairing of the NS (the bell ring) with the UCS (the meat powder), a stimulus that does produce the particular response.

The **conditioned response (CR)** is the learned response that is produced by the CS. The CR occurs after the NS has been associated with the UCS and has become a CS. The behaviour involved in a CR is very similar to that of the UCR, but it is triggered by the CS alone. Pavlov's dogs displayed a CR (salivation) only when they began to salivate to a CS. When a dog responded to a CS such as the sound of a bell, classical conditioning had taken place because salivation would not be a usual response to the sound of a bell. Similarly, we would not expect the newborn infant to begin sucking merely at the sight or smell of the mother's breast unless an association between these stimuli and the feeding process had been made.

The acquisition of the conditioned response is evident in the anticipatory behaviour in the learner. For example, Pavlov's dogs could anticipate the arrival of the meat powder (UCS) by the sound of the bell (CS). Similarly, the newborn infant soon learns to anticipate the arrival of the milk well before the nipple enters their mouth. In bottle-fed babies, this may be even more evident, as they anticipate food at the sight of the bottle, even before it has been filled with milk.

During classical conditioning, each paired presentation of the NS with the UCS is referred to as a *trial*. The term *acquisition* is used to describe the overall process during which an organism learns to associate two events — the NS and the UCS — until the NS alone has become a CS that produces the CR. During acquisition, the presentations of the NS and the UCS occur close together in time and always in the same sequence. The duration of the acquisition stage is usually measured by the number of trials it takes for the CR to be acquired (learned). This may vary considerably. The rate of learning is often very fast in the early stages of the acquisition phase (see figure 5.8).

One of the important considerations in classical conditioning is the *timing* of the NS and UCS pairing. Pavlov examined how much time should elapse between the presentation of the NS (e.g. the bell) and the UCS (the meat powder) in order to maximise the speed with which they would be associated so that the CS alone would elicit the conditioned response.

Pavlov found that the NS should be presented *before* the UCS and that there should be a very short time between their presentations. Ideally, the NS should occur not more than half a second before the UCS in order for the association to be most effectively made. According to Pavlov's research, longer time intervals were less effective for the dogs in establishing the links.

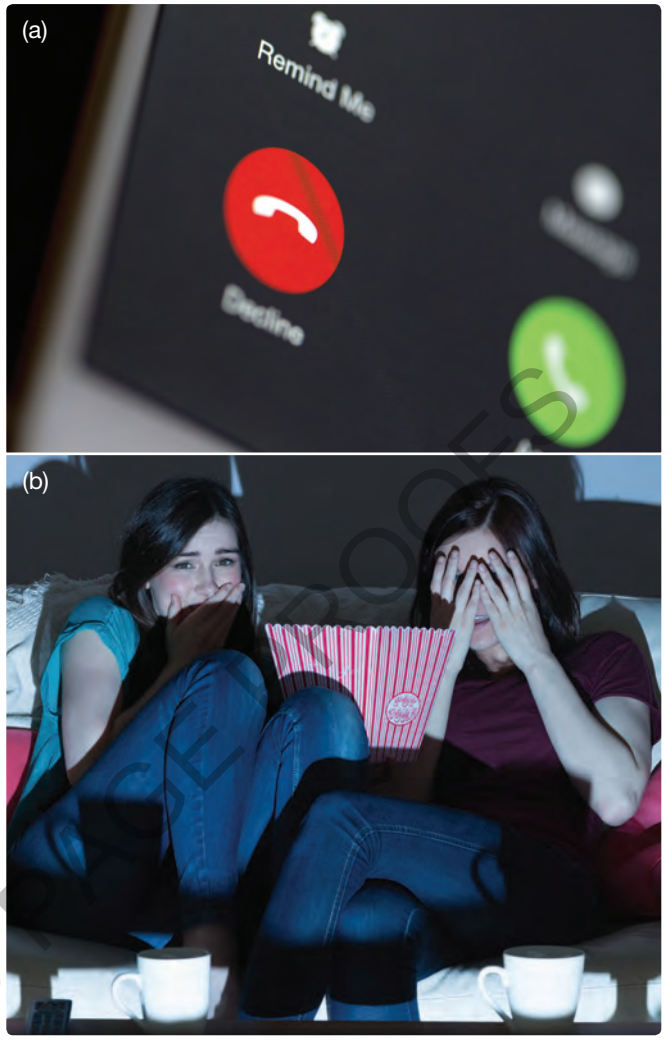

FIGURE 5.8 (a) The ring tone is the conditioned stimulus (CS) that triggers the conditioned response (CR) of reaching to pick up the phone. (b) In many scary movies, the soundtrack music becomes intense just before something horrible happens. When we hear the music we became tense, anxious or even fearful. This technique has led us to form the association after having watched several scary movies. The intense music is the conditioned stimulus (CS) that triggers the conditioned response (CR) of tension, anxiety or fear.

TABLE 5.1 In models that explain learning through conditioning, the term 'conditioned' simply means 'learned', as described below.

Key term	Learned or not learned
Unconditioned stimulus	Stimulus that is *not learned*
Neutral stimulus	Stimulus that is *not learned*
Conditioned stimulus	Stimulus that is *learned*
Unconditioned response	Response that is *not learned*
Conditioned response	Response that is *learned*

BOX 5.2

Eye-blink conditioning

Classical conditioning of the eye-blink reflexive response is perhaps the most thoroughly studied form of classical conditioning of mammals over the past 100 years or so. For example, you could condition an eye-blink response in a volunteer participant using simple apparatus such as drinking straw and a pencil. The procedure would generally involve pairing a puff of air blown through the straw (directed at the bridge of your participant's nose) with the tapping sound made by the pencil on a table. When the correct procedure is used, this can usually be achieved within 20 or so trials (pairings). Despite the relative simplicity of eye-blink conditioning, some of the early research procedures used with humans were unusual. For example, figure 5.9a shows eminent American psychologist Clark Hull (1884–1952) during an experiment in which he is conditioning one of his students to blink in anticipation of a slap to the face.

For practical as well as ethical reasons, researchers no longer use the face slap as a UCS in human eye-blink conditioning. Instead, they use an air-puff and electronic devices that can precisely deliver stimuli and record responses. For example, in an experiment using the rabbit shown in figure 5.9b, a tube (upper right) delivers a puff of air (UCS) and a photo beam measures the eye-blink CR and UCR. An electromyograph which detects electrical activity of muscles is also used to accurately record the reflexive response.

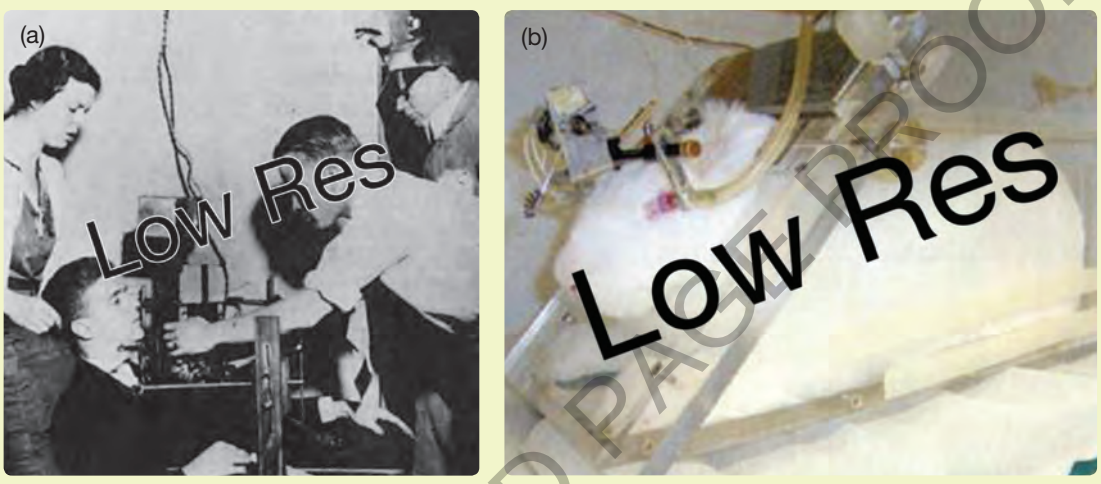

FIGURE 5.9

LEARNING ACTIVITY 5.1

Review questions

1 (a) Define the meaning of the term learning.
(b) Briefly describe three key characteristics of behaviour that is learned.
(c) Compare and contrast the concepts of learning and conditioning.

2 Smiling, laughing and crying have all been observed in deaf–blind children who cannot have learned these responses by seeing or hearing them in others. What is a possible explanation of these responses?

2 What observation led Pavlov to study classical conditioning?

3 In what way(s) did restraining the dogs in his experiments help to control potential confounding variables?

4 (a) Define classical conditioning with reference to the neutral stimulus, unconditioned stimulus, conditioned stimulus and conditioned response.
(b) Suggest an explanation for why Pavlov actually used the term 'conditioned reflex' rather than conditioned response.
(c) Briefly describe how classical conditioning occurs, with reference to the three phases, but not to any other 'technical' terms.

5 (a) Define and explain the role of each of the different kinds of stimuli and responses in classical conditioning: UCS, NS, CS, CR, UCR.
(b) Describe the relationship between the neutral stimulus and conditioned stimulus in classical conditioning.
(c) Explain the importance of each of the following in classical conditioning:
(i) nature of the response that is conditioned
(ii) frequency and timing of stimulus presentation during conditioning
(iii) timing of stimulus presentation during conditioning.

6 When can it be said that a response has been learned and the final phase is evident?

7 Make a copy of table 5.1, but with a third column headed 'Meaning'. For each key term, add a brief, 'non-technical' definition or description.

8 Draw and label a diagram like figure 5.7, showing the elements in classical conditioning as they occur for the conditioned response to the sight or sound of the food container demonstrated by the dog/cat in figure 5.6, the person in figure 5.8a or the XYZ in figure 5.8b.

LEARNING ACTIVITY 5.2

Identifying elements of classical conditioning

Identify the NS, CS, UCS, CR and UCR in each of these three scenarios.

Scenario A

During Christmas Eve in 1974, Cyclone Tracey — one of the most destructive cyclones in Australia's history — struck Darwin. People sought shelter in the smallest room of their house because it was structurally the strongest. Many families therefore huddled together in bathrooms as the cyclone destroyed the area. After the cyclone, some children feared going to the bathroom — a fear that persisted for a several years. These children had learned to associate going to the bathroom with the noise and destruction of a cyclone.

Scenario B

On 11 September 2001, terrorists crashed two passenger planes into the twin towers of the World Trade Center in New York. The noise, destruction and loss of life witnessed on that day has led many New Yorkers to become anxious whenever they see or hear low-flying aircraft.

Scenario C

A participant is seated in an experimental chamber. A buzzer is sounded and the participant is given a mild electric shock to the left hand through a metal plate on the armrest of the chair. After several trials, the buzzer is sounded without the electric shock being given, but the participant still moves their hand.

LEARNING ACTIVITY 5.3

Reflection

By learning to associate stimuli through everyday experience, we gain information about our environment, some of which we take for granted but which is nevertheless valuable. Classical conditioning can account for the learning of many relatively simple responses in everyday life, such as learning to pack up your books at the sound of the bell to end the lesson, to leave your umbrella at home when there is a clear blue sky, that a flash of lightning signals an impending crack of thunder and that a specific tone means that you have just received a text message on your mobile phone. What are some other relatively simple responses you believe you may have acquired through classical conditioning?

Classical conditioning can also account for the acquisition of more complex behaviours. Think of an example and briefly explain how it could be acquired through classical conditioning.

Stimulus generalisation

Once a person or an animal has learned to respond to a conditioned stimulus, other stimuli that are similar to the CS may also trigger the CR, but usually at a reduced level. For instance, Pavlov observed that his dogs salivated to other noises that sounded like the bell. This is called stimulus generalisation.

Stimulus generalisation is the tendency for another stimulus that is similar to the original CS to produce a response that is similar, but not necessarily identical, to the CR. In stimulus generalisation, the greater the similarity between stimuli, the greater the possibility that a generalisation will occur. For example, if stimulus generalisation to the sound of a bell occurred with one of Pavlov's dogs, the dog might also salivate in response to the ringing of a front doorbell. However, the amount of saliva produced by the dog would tend to be less than the amount produced by the original bell to which the dog was conditioned.

Stimulus generalisation is evident in various aspects of everyday life. Many kinds of loud noises can make us flinch, and many kinds of food can make us salivate, even if it's something we've never eaten before. While stimulus generalisation is rarely an intentional or even a conscious process, it has a valuable adaptive role. For example, consider the child who burns a finger while playing with matches. A lit match will probably become a conditioned fear stimulus. It is also likely that the child will develop a healthy fear of flames from other potentially harmful sources, such as lighters, fireplaces, stoves, and so on. In this case, it is fortunate that stimulus generalisation extends learning to related situations. Otherwise, it would be far less useful for adaptive purposes.

In some situations, stimulus generalisation can be non-adaptive or even harmful. For example, a dog that instinctively snaps at annoying flies may also snap at a wasp, with painful consequences. Similarly, people are also susceptible to non-adaptive stimulus generalisation. For example, a young girl who was pecked by her family's pet duck developed a bird phobia as an adult. Her fear and anxiety were so strong that she could not even tolerate being near caged birds such as a pet canary or hens at the market. This example also illustrates how stimulus generalisation can help us understand why some fear responses can be triggered by non-threatening stimuli.

FIGURE 5.10

Stimulus discrimination

In classical conditioning, **stimulus discrimination** occurs when a person or animal responds to the CS only, but not to any other stimulus that is similar to the CS. For example, in a classical conditioning experiment, stimulus discrimination would be observed when a dog salivated *only* in response to the sound of the 'experimental' bell, and not in response to any other similar sound such as a front doorbell, the sound of a telephone ringing or the bell of an ice-cream van.

Stimulus discrimination would be evident in everyday life if someone who has a fear of a particular dog that has frightened them doesn't flinch at the sight of other breeds of dog. This occurs because the person has learnt to discriminate between the two similar stimuli.

FIGURE 5.11

Extinction

A conditioned stimulus–response association is not necessarily permanent. The strength of the association may fade over time or disappear altogether. **Extinction** is the gradual decrease in the strength or rate of a CR that occurs when the UCS is no longer presented. Extinction is said to have occurred when a CR no longer occurs following presentation of the CS. For example, Pavlov's dogs eventually ceased salivating (CR) in response to the bell (CS) presented alone after a number of trials in which the food (UCS) did not follow the sound of the bell (see figure 5.12, trials 16–22).

There is some variation between individuals (people or animals) in the rate at which extinction of the same conditioned response will occur. There is also considerable variation between the rates at which different responses will be extinguished. For example, the simple behaviour of blinking in response to a pencil being tapped on a table (as described in box 5.2) will be extinguished relatively quickly. However, a more complex behaviour pattern, such as an intense fear response to being in bathrooms because they are associated with cyclones (as in learning activity 5.2), is likely to take longer to extinguish.

Spontaneous recovery

Extinction of a conditioned response is not always permanent. In classical conditioning, **spontaneous recovery** is the reappearance of a CR when the CS is presented, following a rest period (i.e. when no

CS is presented) after the CR appears to have been extinguished. For example, spontaneous recovery would occur if one of Pavlov's dogs started salivating again to the sound of a bell after extinction is intentionally achieved as part of the experimental research. Spontaneous recovery does not always occur, and when it does it is often short-lived. Furthermore, the CR tends to be weaker than it was originally (during acquisition). If the extinction procedure is repeated several times, eventually the CR will disappear altogether and spontaneous recovery will not occur. The two separate instances of spontaneous recovery shown in figure 5.12 illustrate the relative weakness of the conditioned response compared with its strength during the acquisition phase.

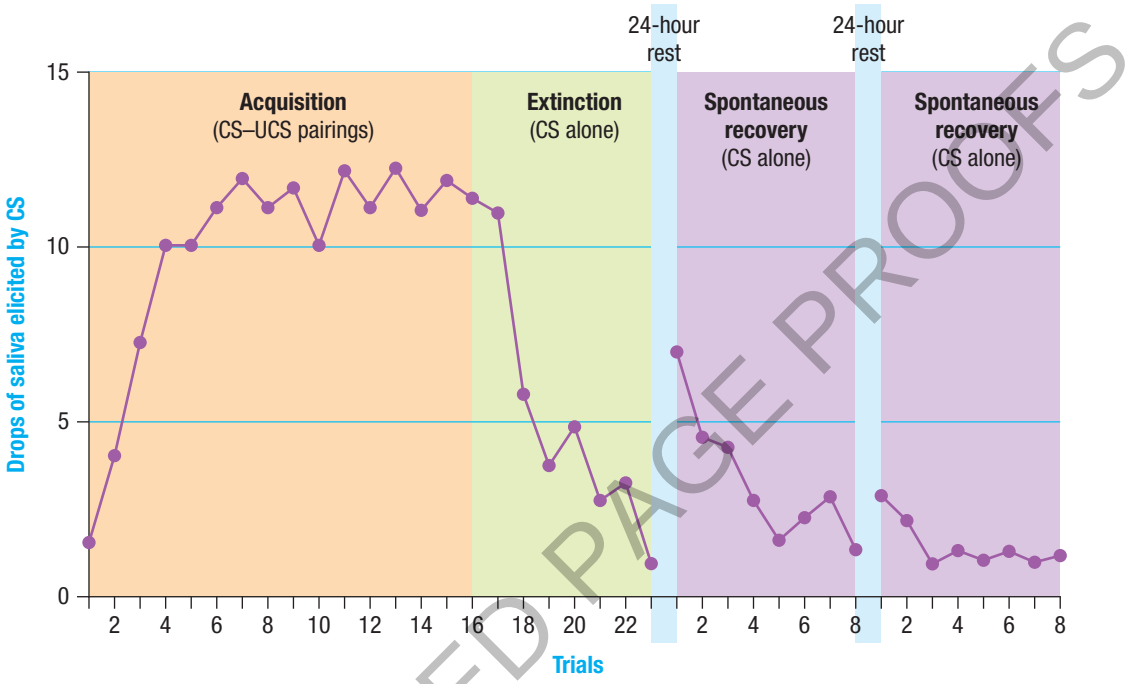

FIGURE 5.12 The results reported by Pavlov (1927) for one of his experiments. Note the amount of saliva produced by a dog in response to the conditioned stimulus (CS) and the unconditioned stimulus (UCS) during the first 15 trials in the acquisition phase. The strength of the CR rapidly increases then levels off near its maximum. In trials 16 to 22 when the UCS is removed and the CS is presented alone, the CR declines irregularly until extinguished. The graph then shows two separate instances of spontaneous recovery, each of which is punctuated by a 24-hour 'rest' period. Note that the CR drops back to the extinction level following each spontaneous recovery.

LEARNING ACTIVITY 5.4

Summarising principles of classical conditioning

Complete the following table to summarise key principles of classical conditioning.

Principle	Description	Example in Pavlov's experiments	Example in everyday life
stimulus generalisation			
stimulus discrimination			
extinction			
spontaneous recovery			

LEARNING ACTIVITY 5.5

Analysing classical conditioning scenarios

Part A. Select the correct terms from the following list to complete the sentences in each of the following scenarios.

- conditioned response
- extinction
- unconditioned stimulus
- spontaneous recovery
- conditioned stimulus
- stimulus generalisation
- stimulus discrimination
- neutral stimulus

Scenario 1

When she was about eight years old, Olivia decided to help her mother at the florist's store where her mother worked. She first helped on Valentine's Day. Olivia did such a good job bringing in all the red roses for her mother to arrange that she was paid $20. But at the end of the day, nearly every finger on Olivia's hands was bleeding because of the thorns on the red roses. On Mother's Day that year, Olivia worked at the florist's store again. Although she earned another $20, her hands were again very sore at the end of the day from the thorns on the red roses.

The following week when her mother asked Olivia to assist with preparing flowers for a large wedding, Olivia replied that she would help as long as there were no red flowers involved.

Olivia's refusal to handle red flowers is an example of _____ .

Scenario 2

One group of dogs was exposed to two different experimental conditions:

- In condition 1, an experimenter who always wore a white coat regularly fed the dogs.
- In condition 2, an experimenter who always wore a black coat prepared the food and got the feed bowls ready, but another experimenter then came in and actually gave the food to the dogs.

The dogs were exposed to these conditions in random order twice daily for ten days. The amount of saliva produced by the dogs each time the experimenter approached was measured and recorded. These results, together with the baseline data that were collected before the experiment began, are shown in the following table.

Baseline condition (before conditioning)	Experimental condition 1 (white coat)	Experimental condition 2 (black coat)
3.2 mL	6.8 mL	3.5 mL

The results in the table show that the dogs demonstrated _____.

Scenario 3

a In attempting to classically condition an eye-blink response to the sound of a pencil tap, Sophia was the experimenter and Isabelle was the participant. During conditioning, Sophia noticed that Isabelle's conditioned response (the eye-blink to the pencil tap alone) was becoming stronger as the number of pairings of the _____ and _____ increased.

b Once the experiment was over, Sophia was concerned that Isabelle might continue to blink every time she heard a pencil tap. Sophia made sure this wouldn't happen by presenting the pencil tap alone for some time until she was sure that _____ _____ had been achieved.

c The following week in their Psychology class, Sophia accidentally tapped her pencil and noticed that Isabelle blinked. This suggests that _____ may have occurred.

Part B. Explain how classical conditioning may account for acquisition of the conditioned response referred to in each of the following scenarios.

Scenario 4

A person under treatment for a gambling addiction often feels an urge to play the pokies whenever he again encounters cues such as driving past a gaming venue where he experienced a huge 'buzz' after hitting a jackpot, and hearing about someone else's big win on the machines.

Scenario 5

After swimming in the lake near his home one day, Glen emerged from the water covered with slimy blood-sucking leeches all over his back and legs. He was revolted as he removed the leeches. The next time he swam there, a leech attached itself to his cheek. Now, every time he passes the lake, Glen shudders in disgust.

Scenario 6

When Mardi and her sisters were toddlers, their mother frequently used their nap time to vacuum. Now, when Mardi and her sisters hear vacuum cleaners, they feel sleepy.

Scenario 7

Every time three-year-old Sienna heard the doorbell ring, she raced to open the front door. On Halloween night, Sienna answered the doorbell and encountered a scary monster that intentionally startled her. Sienna screamed in fear and ran away. Her parents calmed her down but it happened again later that evening. Now Sienna whimpers and hides whenever the doorbell rings.

Scenario 8

A flashing light suddenly appearing on the control panel triggers a burst of adrenaline in a plane pilot.

The ‘Little Albert’ experiment

Sometimes, an emotional reaction such as fear or anger in response to a specific stimulus is learned through classical conditioning. When this occurs, it is often called a *conditioned emotional response.* This type of response is observed when the autonomic nervous system produces a reaction to a stimulus that did not previously trigger that reaction. For example, many people cringe at the sound of the dentist’s drill. This is not a naturally occurring response to the noise. One reason for the fear of the sound of the dentist’s drill is the association we make between the sound and potential pain. In this case, the sound of the dentist’s drill has become a conditioned stimulus, which, through association with the unconditioned stimulus (the drilling of the tooth), produces a conditioned emotional response (fear).

While it may be beneficial to develop a fear of something that could harm you, such as poisonous spiders, it may be mentally unhealthy to develop a fear of something that does not normally harm you, such as cotton wool or soft, furry animals. The latter is what happened in an experiment reported in 1920 to illustrate how classical conditioning can be used to condition an emotional response.

In their report, American psychologist John B. Watson and his graduate student Rosalie Rayner (1920) explained how they had intentionally conditioned an emotional response and gave detailed descriptions of their procedures and participant reactions. Their research was designed to test the belief that fears can be acquired through classical conditioning. Watson wanted to demonstrate experimentally that humans undergo the same process in acquiring fears as animals do. Their sole participant was Albert B. (‘Little Albert’), the 11-month-old son of a woman who lived and worked at a hospital on the university campus where the experiment was conducted (APA, 2010). Watson and Rayner considered Albert to be a suitable participant for their experiment because, in their terms, he was:

> *on the whole stolid and unemotional . . . No-one had ever seen him in a state of fear and rage. The infant practically never cried . . . His stability was one of the principal reasons for using him as a subject. We felt that we could do him relatively little harm by carrying out [these] experiments.*

After pre-testing Albert to ensure he was actually capable of producing a fear response (UCR), Watson and Rayner placed him on a mattress in a room where a white laboratory rat (CS) was within reaching distance. Albert showed no initial fear of the furry animal and played with it contentedly. As the infant was playing with the white rat, one of the experimenters distracted him, while the other experimenter stood behind Albert and:

> *struck a hammer upon a suspended steel bar four feet [about 1 metre] in length and three-fourths of an inch [about 2 centimetres] in diameter.*

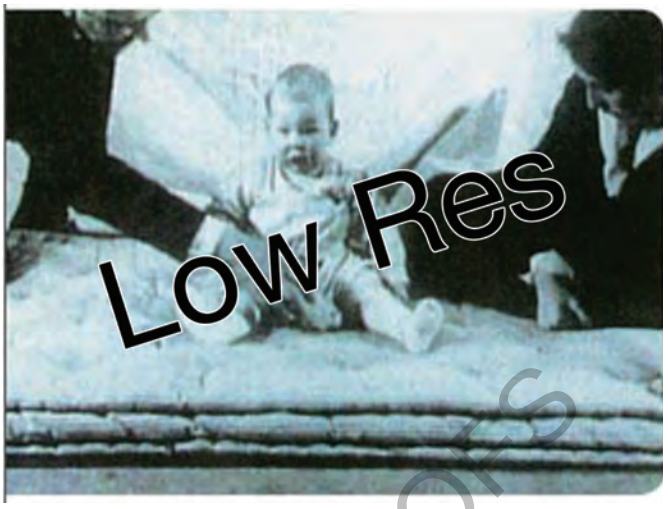

FIGURE 5.13 Watson and Rayner introduce ‘Little Albert’ to the white rat as he sits placidly on a mattress.

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Videos showing ‘Little Albert’ experiment 3m 27s

This produced a loud noise (UCS) that would startle most people regardless of what they were doing. Albert responded as follows:

> *The child started violently, his breathing was checked and the arms were raised in a characteristic manner. On the second stimulation the same thing occurred, and in addition the lips began to pucker and tremble. On the third stimulation the child broke into a sudden crying fit. This is the first time an emotional situation in the laboratory has produced any fear in Albert.*

Encouraged by this result, Watson and Rayner conducted a series of fear-conditioning procedures with Albert when he was 11 months and three days old. These were held irregularly over a 17-day period. Following are the laboratory notes describing the first procedure:

> *1 White rat suddenly taken from the basket and presented to Albert. He began to reach for rat with left hand. Just as his hand touched the animal the bar was struck immediately behind Albert’s head. The infant jumped violently and fell forward, burying his face in the mattress. He did not cry, however.*
>
> *2 Just as the right hand touched the rat the bar was again struck. Again the infant jumped violently, fell forward and began to whimper.*

In the next procedure, conducted one week later, the loud noise was again sounded every time Albert attempted to play with the white rat. After seven

pairings, Albert showed a distinct fear (CR) in response to the rat (CS) being placed anywhere near him.

> *The instant the rat was shown the baby began to cry. Almost instantly he turned sharply to the left, fell over on the left side, raised himself on all fours and began to crawl away so rapidly that he was caught with difficulty before reaching the edge of the table.*

Watson and Rayner concluded that this response by Albert:

> *was as convincing a case of a completely conditioned fear response as could have been theoretically pictured. [Furthermore] it is not unlikely, had the sound been of greater intensity or of a more complex clang character, that the number of joint stimulations might have been materially reduced.*

Watson and Rayner also conducted 'tests' to find out if Albert's fear response would be generalised to other stimuli that were similar in some way to the white laboratory rat. They reported that Albert produced quite fearful reactions to a white rabbit, a dog and a sealskin coat. He showed slightly less fearful reactions to cottonwool balls and a Santa Claus mask, but showed reactions nonetheless.

FIGURE 5.14 Watson tests Albert's reaction to a scary mask.

Eventually, Albert's mother left her job at the clinic and the city of Baltimore where the experiments were being conducted. Watson and Rayner reported that they were denied the opportunity:

> *of building up an experimental technique by means of which we could remove the conditioned emotional responses.*

Other psychologists, however, have disputed this, stating that Watson and Rayner knew a month in advance that Albert's mother would be leaving, yet took no steps to extinguish Albert's fear response (Cornwell & Hobbs, 1976; Harris, 1979).

It is believed that Albert's mother may not have been fully aware that her son was to be used in an experiment on conditioning a fear response. This raises the ethical question of whether informed consent was obtained. However, the issue of informed consent is not referred to in the original journal article reporting the experiment, so it is difficult to make a judgment about this. It is also not clear whether any allowance was made for participant withdrawal rights to be exercised. To not explain this option to Albert's mother would be a breach of ethical standards.

It is possible also that Albert was more vulnerable to psychological harm as a result of the experimental procedures than another infant might have been. This is suggested by the notes the researchers made in their 1920 journal article (below). Yet Albert was subjected to severe distress and anxiety, and the experimenters made no attempt to end the experiment and appropriately attend to his distress. Watson and Rayner reported an observation during the research that whenever Albert was emotionally upset he would:

> *continually thrust his thumb into his mouth [thus becoming] impervious to the stimuli producing fear. Again and again . . . we had to remove the thumb from his mouth before the conditioned response could be obtained.*

This seems to contradict Watson and Rayner's description of Albert as a suitable research participant on the grounds that he was 'stolid and unemotional'.

Although some psychologists have suggested that Albert's conditioned fears might have disappeared over time (if, in fact, he had acquired conditioned fears), it is reasonable to assume that Albert was not only emotionally traumatised by the experimental procedures to which he was subjected, but was also likely to have suffered some kind of lasting psychological harm.

Watson and Rayner had apparently demonstrated that an emotional response such as fear can sometimes result from classical conditioning, although results of later experiments by other researchers who attempted to replicate the procedure indicated that the learning process is not as simple as reported by Watson and Rayner (Samelson, 1980).

Importantly, experiments using any human participant in this way would be considered unethical today and would not be permitted. At the time of Watson and Rayner's experiment with Albert, professional organisations for psychologists such as the American Psychological Association were only in their formative stages, and ethical guidelines and

standards for the professional conduct of researchers and practising psychologists had not yet been fully established. Ethical values such as *research merit and integrity, beneficence, justice and respect for human beings,* which all guide and safeguard the proper conduct and reporting of contemporary psychological research, would all undoubtedly have been breached if they were in place at the time of the 'Little Albert' experiment.

FIGURE 5.15 John Watson conducted the Little Albert experiment at the Johns Hopkins University's Phipps Psychology Clinic.

BOX 5.3

Whatever happened to 'Little Albert'?

Many students of psychology ask 'Whatever happened to 'Little Albert'?' In 2009, American psychologist Hall Beck and two colleagues published a journal article in which they identified 'Albert'. They reported that he was Douglas Merritte, the foster son of a wet nurse (a woman employed to suckle another woman's baby) named Arvilla Merritte who received $1 for her child's participation in the 'Little Albert' experiment (APA, 2010). They also reported that 'Albert' died at age six from the brain disease hydrocephalus (not from an animal phobia as some people believe). The disease can be present at birth or acquired soon after, suggesting that 'Albert' was far from the healthy boy shown in various videos of the experiments that can be seen on YouTube.

Other researchers have since challenged these findings about 'Albert'. In 2014, American psychologist Russell Powell and his colleagues presented evidence that a boy named William Barger might actually have been the real 'Little Albert'. They found that Barger was born on the same day as Merritte to a wet nurse who worked at the same hospital as Merritte's mother. While his first name was William, he was known his entire life by his middle name, Albert. He died in 2007, at the age of 87. The researchers also analysed the online videos of the 'Little Albert' experiment and found no evidence of health issues or developmental problems in 'Albert'.

While some psychologists continue to debate the true identity and health of 'Little Albert', there is little doubt that the young boy has left a lasting impression in the discipline.

FIGURE 5.16 (a) Douglas Merritte's grave. He is buried in a cemetery about 45 minutes west of Baltimore. (b) William Barger died in 2007, at age 87.

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Media article on 'The search for Psychology's lost boy'

LEARNING ACTIVITY 5.6

Review questions

1. Draw a diagram like that in figure 5.7 to illustrate the classical conditioning of 'Little Albert's' fear response to the white rat.
2. To which objects did 'Little Albert' demonstrate stimulus generalisation?
3. Consider Watson and Rayner's (1920) study from an ethical perspective. To what extent were ethical standards and guidelines for psychological research applied in the 'Little Albert' experiment? Explain with reference to procedures used by Watson and Rayner and relevant ethical standards.
4. Suggest an ethically acceptable procedure involving classical conditioning that could be used to extinguish 'Little Albert's' fear response to white furry objects. Present your answer in diagram form and indicate the NS/CS, UCS, UCR and CR.

LEARNING ACTIVITY 5.7

Reflection

Consider the efforts by psychologists to find out 'Whatever happened to 'Little Albert'?' which are outlined in box 5.3.

Comment on whether research to answer this question is appropriate use of resources and explain why you hold this view.

OPERANT CONDITIONING

Classical conditioning is one of two types of associative learning. The other type is operant conditioning (also known as instrumental conditioning). Unlike classical conditioning which involves associating stimuli, operant conditioning involves associating stimuli with responses (behaviours) which are in turn influenced by consequences.

The term operant conditioning was first used in the 1930s by American psychologist Burrhus Frederic Skinner (1904–1990). **Operant conditioning** is a type of learning whereby the consequences of behaviour determine the likelihood that it will be performed again in the future. More specifically, operant conditioning theory proposes that an organism will tend to repeat a behaviour (operants) that has desirable consequences (such as receiving a treat), or that will enable it to avoid undesirable consequences (such as being given detention). Furthermore, organisms will tend *not* to repeat a behaviour that has undesirable consequences (such as disapproval or a fine).

An **operant** is any response (or set of responses) that acts ('operates') on the environment to produce some kind of consequence. Essentially, it is behaviour that has an impact on the environment in some way. In turn, the environment provides an event that makes the behaviour more or less likely to recur. Positive consequences strengthen the behaviour and make it more likely to recur and adverse consequences weaken the behaviour and make it less likely to recur. Since the consequence occurs in the environment, the environment determines whether or not the operant occurs (Skinner, 1953).

Unlike the classical conditioning process which involves *involuntary*, reflexive responses that are automatically elicited by a stimulus, operant conditioning involves *voluntary* responses. An operant is voluntary action that people and animals initiate and often perform on a daily basis. Smiling, drinking water, listening to music, watching TV, Googling for information and liking on Facebook are common human operants. Although operants first appear spontaneously and can be controlled by the organism, they are greatly influenced by their consequences.

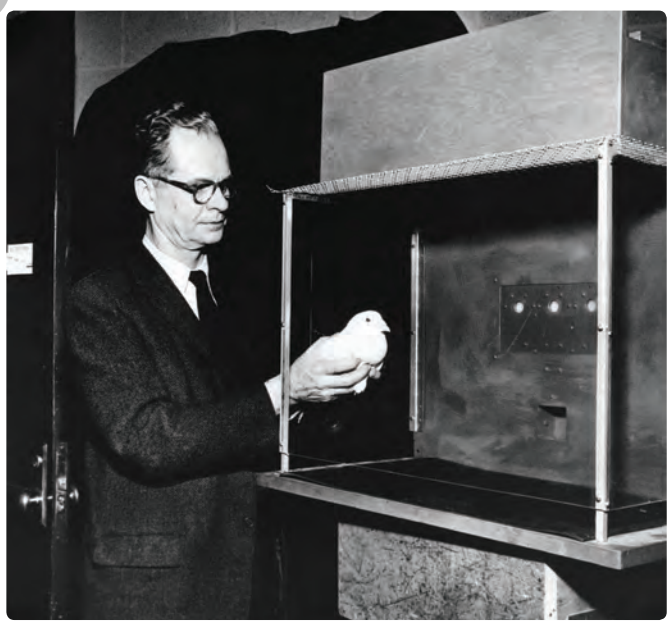

FIGURE 5.17 B. F. Skinner conducting an experiment on operant conditioning.

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Video on operant conditioning with pigeons 3m 57s

Operant conditioning as a three-phase model

Skinner believed that virtually all behaviour can be analysed and explained by the relationship between the behaviour, its antecedents (what happens just before it) and its consequences (what happens just after it). The three-way relationship between these elements and the order in which they occur is called the three-phase model of operant conditioning.

The **three-phase model of operant conditioning** has three parts that occur in a specific sequence:

1. antecedent (A), a stimulus that occurs before the behaviour
2. the behaviour (B) that occurs due to the antecedent
3. the consequence (C) to the behaviour.

This is usually expressed as antecedent (A) → behaviour (B) → consequence (C) and is therefore sometimes called the *A-B-C model of operant conditioning*. Basically, a specific antecedent prompts relevant behaviour that is followed by a specific consequence.

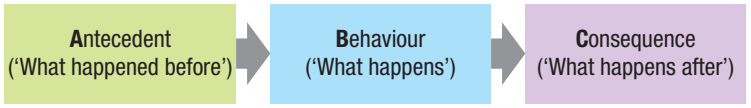

FIGURE 5.18 The three-phase model of operant conditioning

Anything in the organism's environment can be an antecedent. These stimuli are already in place before any behaviour occurs. Some are essentially neutral in the sense that they do not have any effect on behaviour at all, at least as far as the relevant operant conditioning behaviour is concerned. Other antecedents may signal that behaving in a particular way is likely to have a specific consequence. They are like cues ('prompts') in the environment that tell us what to do and set us up to behave in a particular way. When an antecedent does influence the likelihood of specific behaviour occurring, it is technically called an *antecedent stimulus*.

The antecedent stimulus must be present for the relevant behaviour to occur. The **antecedent** (A) is the stimulus (object or event) that precedes a specific behaviour, signals the probable consequence for the behaviour and therefore influences the occurrence of the behaviour. For example, your mobile phone ring tone when you are expecting a call from a friend is the antecedent stimulus that sets up the specific behavioural response of tapping 'Accept' on the screen for the desirable consequence of chatting with your friend.

Through its association with a consequence, the antecedent stimulus signals whether certain behaviour will lead to a particular consequence (but does not actually elicit a response as in classical conditioning). In this way, the antecedent stimulus enables the organism to predict the likely outcome of their behaviour. In the example above, your mobile phone ring tone indicates that the behaviour of tapping 'Accept' is very likely to be followed by the desired chat with your friend. Consider another example of a car stopped at a red traffic light at a busy intersection. When the traffic light turns green, the car is driven through the intersection. In this situation, the green traffic light is the antecedent stimulus that prompts the behaviour of gently pressing on the accelerator for the known, likely and desirable consequence of safely travelling across the intersection.

The antecedent stimulus is sometimes referred to as the *antecedent condition* to emphasise that it occurs before the relevant behaviour. It may also be called a *discriminative stimulus* because it helps us distinguish between the consequences we've associated with different behaviours in different situations, for example, to tell the difference between the likely consequences of driving through a red or green traffic light at a busy intersection. We learn from experience to associate certain environmental cues with particular behaviours (operant responses). In this way, according to Skinner (1974), our behaviour is determined and controlled by stimuli that are present in the environment and our prior experience with the consequences of responding in particular ways to different stimuli.

In the A-B-C model, **behaviour** is the voluntary action that occurs in the presence of the antecedent stimulus. It may be one specific action (e.g. tapping 'Accept' on your mobile's screen) or a pattern of actions (e.g. checking the number of the incoming call, tapping 'Accept' and speaking). In all cases, it involves activity that has an effect on the environment in the form of a consequence that follows it.

The **consequence** is the environmental event that occurs immediately after the behaviour and has an effect on the occurrence of the behaviour. Skinner argued that any behaviour which is followed by a consequence will change in strength (become more, or less, established) and frequency (occur more, or less, often) depending on the nature of that consequence (reward or punishment). Behaviour that is followed by a reward strengthens the behaviour and makes it more likely to occur again, whereas behaviour followed by punishment weakens the behaviour and makes it less likely to occur again. For example, if you wear a particular T-shirt and get lots of compliments (reward), you are likely to wear it more often. If people give you strange looks or make uncomplimentary comments, you will probably wear it less often.

The nature of the consequence can often depend on the individual. For example, consider bungee

jumping, for which a person dives off a very high tower (or place) with their feet connected to an elastic cord. The antecedent stimulus is the sight of the bungee tower and the behaviour is diving off the tower. The consequence, however, will be a reward in the form of a thrill for some people and punishing in the form of terror for others.

In more formal terms, the three-phase model of operant conditioning means that the probability of particular behaviour occurring in response (B) to an antecedent stimulus (A) is a function of ('depends on') the consequence (C) that has followed (B) in the past. For example, when waiting for a friend's call, tapping 'Accept' on your mobile phone's screen and speaking (B) when you hear your mobile's ring tone (A) leads to the consequence (C) of connecting with someone with whom you may wish to chat.

TABLE 5.2 The three-phase model of operant conditioning

	Antecedent (A)	Behaviour (B)	Consequence (C)	Effect on future behaviour
Definition	The environmental stimulus that precedes the relevant behaviour and indicates the consequence	Voluntary activity that has an effect on the environment	The environmental event that follows the behaviour	Reinforcement (positive or negative) increases the likelihood of the behaviour being repeated. Punishment decreases the likelihood of the behaviour being repeated.
Examples	The word 'Men' on a toilet door	Enter if a male	Empty a full bladder	Positive reinforcement — more likely to enter again when bladder is full
	Petrol gauge almost on empty	Fill car with petrol	Avoid running out of petrol	Negative reinforcement — more likely to fill car when petrol gauge on empty
	Drink vending machine	Put in $2	Get no drink and lose money	Punishment (negative) — less likely to use that vending machine again
	In a small group in the schoolyard	Tell a 'bad' joke	Ridiculed by others	Punishment (positive) — less likely to tell 'bad' jokes to the group

FIGURE 5.19 Antecedent: the trainer presents a stimulus — a ball

Behaviour: The sea lion immediately responds with the correct behaviour — leaping a rope with ball balanced on its nose

Consequence: The outcome is a tasty treat immediately after the behaviour which strengthens the behaviour and makes it more likely to be repeated in the future when the stimulus is presented.

BOX 5.4

Skinner's experiments with rats

For his pioneering experiments on operant conditioning, Skinner created an apparatus that eventually came to be known as a 'Skinner box' (as shown in figures 5.20 and 5.21). A Skinner box is a small operant conditioning chamber in which an experimental animal learns to make a particular response for which the consequences can be controlled by the researcher. It is equipped with a lever that delivers food (or water) into a dish when pressed. Some boxes are also equipped with lights and buzzers, and some have grid floors for delivering a mild electric shock. The lever is usually wired to a cumulative recorder, an instrument with constantly moving chart paper on which a pen makes a special mark each time a desired response (usually lever-pressing) is made. The recorder can indicate how often each response is made (frequency) and the rate of response (speed).

Most of Skinner's early experiments using the Skinner box were done with rats, while his later experiments were conducted with pigeons. Rats were usually conditioned to press the lever, and pigeons were conditioned to peck at a disk.

In 1938, Skinner used the box in a well-known experiment to demonstrate operant conditioning. When a hungry rat was placed in the box, it scurried around it and randomly touched parts of the floor and walls. Eventually, the rat accidentally pressed a lever mounted on one wall. Immediately, a pellet of rat food dropped into the food dish and the rat ate it. The rat continued its random movements and eventually pressed the lever again. Another pellet dropped immediately and was eaten. With additional repetitions of lever-pressing followed by food, the rat's random movements began to disappear and were replaced by more consistent lever-pressing. Eventually, the rat was pressing the lever as fast as it could eat each pellet. The pellet was a reward for making the correct response. Skinner referred to different types of rewards as *reinforcers*.

FIGURE 5.20 A rat in a Skinner box

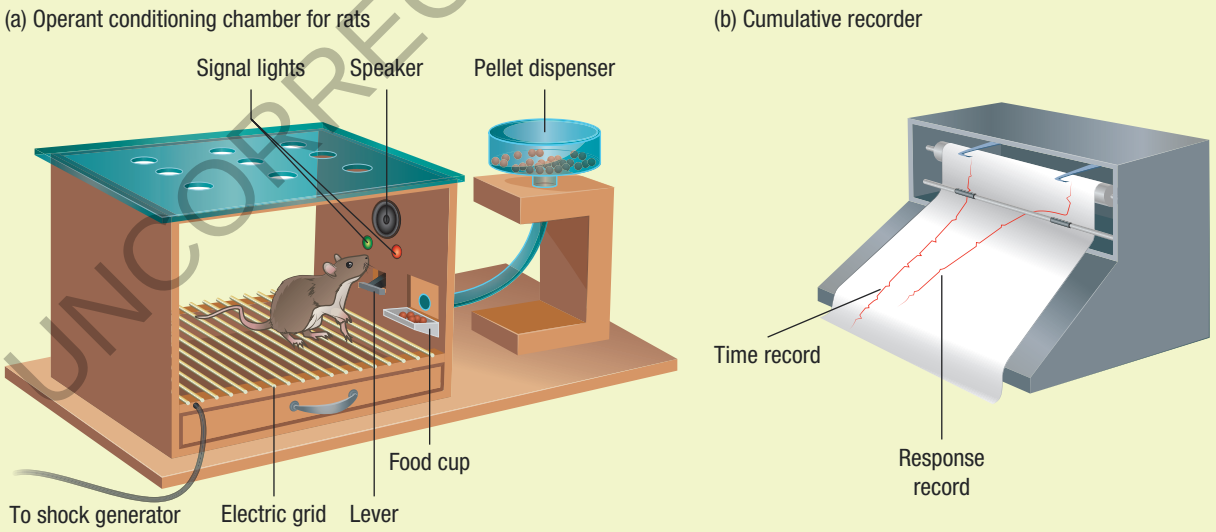

FIGURE 5.21 (a) The key components of an operant conditioning chamber, commonly referred to as a Skinner box; (b) A cumulative recorder that is connected to the lever in the box. It electronically records the correct responses and the rate at which they occur (their frequency). This type of cumulative recorder has been replaced with a computer.

(continued)

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Skinner had an interest in demonstrating the impact of reinforcers and his laboratory apparatus was able to reward the animals according to different types of programs or schedules of reinforcement; for example, providing a reinforcer every time a correct response was made as compared with every second correct response or several seconds after a correct response was made.

Skinner intentionally used hungry rats (and other laboratory animals) in his experiments. Their hunger was the motivation for responding in the desired way when they chanced upon the discovery of a reinforcer such as food pellets.

Skinner believed that there was no need to search for factors within the organism to explain changes in behaviour. This view was based on the notion that behaviour can be understood in terms of environmental, or external, influences, without any consideration of internal mental processes.

The fundamental procedure used by Skinner in his 1938 experiment has been repeated thousands of times by Skinner, his colleagues and subsequent researchers. The records of their observations and measurements enabled Skinner and other researchers to identify reliable principles of operant conditioning that have been generalised to humans.

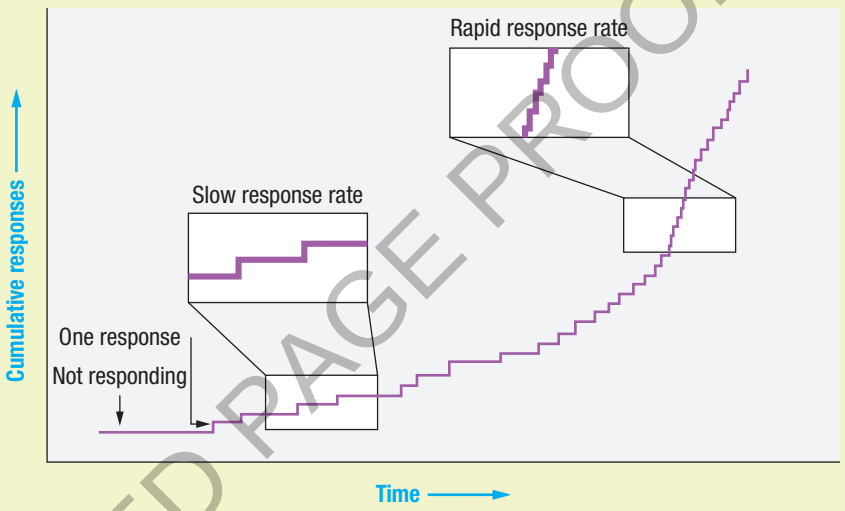


FIGURE 5.22 Typical response curve for a rat in a Skinner box learning to press a lever in order to get a reward

LEARNING ACTIVITY 5.8

Review questions

1. (a) What is operant conditioning?
   (b) In what way is it a form of associative learning?
2. Explain what an operant is with reference to an example not used in the text.
3. (a) In what way do classical and operant conditioning differ in terms of the organism's control over the behaviour that may be elicited by a stimulus?
   (b) Explain how classical conditioning occurs with reference to an antecedent stimulus.
4. (a) Explain what the three-phase model of operant conditioning is with reference to the relationship between each phase.
   (b) What is the main difference between an antecedent and a consequence in relation to timing?
   (c) Make a copy of the three-phase model in figure 5.18 and include a more detailed description for each phase.
5. In what way is an antecedent stimulus a 'discriminative stimulus'?
6. Charlotte experienced the 'runner's high' (due to endorphin release) when she ran a mini-marathon and as a result has started running 10 kilometres three times a week. Explain Charlotte's changed behaviour using the three-phase model of operant conditioning.
7. Consider toddler Alex who is being toilet-trained by her parents using operant conditioning. Her parents wait until after Alex has had a drink and her bladder is full, then put her on a potty seat and wait for nature to take its course. When Alex urinates in the potty, her parents provide verbal praise ('What a good girl you are, Alex!') or even some stickers that she loves. She is also punished when she has a wetting accident by verbal disapproval ('Mummy is very disappointed in you, Alex'). Gradually, Alex learns enough bladder control to recognise when urination is imminent, and to withhold the response long enough for a quick trip to the potty seat — thus obtaining a reward and avoiding punishment. Eventually, the behaviour becomes automatic enough that Alex continues to use the potty seat.

   Explain Alex's successful toilet training using the three-phase model of operant conditioning. Ensure you refer to each component with reference to the relevant aspect(s) of Alex's toilet training.

LEARNING ACTIVITY 5.9

Reflection

Skinner believed our behaviour is determined by environmental events in the form of consequences for our actions that are sourced in the environment. In describing operant conditioning, he therefore avoided the term 'voluntary' because it would suggest that our behaviour was due to conscious choice or intention.

Comment on whether our behaviour is truly voluntary or determined by consequences using an example to illustrate your view.

LEARNING ACTIVITY 5.10

Evaluation of research by Skinner

Consider Skinner's experiments with rats summarised in box 5.4 and answer the following questions.

1. Briefly outline a procedure for an experiment using a Skinner box to:
   (a) operantly condition a rat to produce a particular response
   (b) operantly condition a rat *not* to produce a particular response.
2. In Skinner's view, what are the main driving forces behind behaviour?
3. (a) Identify the operationalised independent and dependent variables in Skinner's (1938) experiment with the hungry rat.
   (b) Formulate a research hypothesis that would be supported by the results.
   (c) Explain the rat's learning through operant conditioning using the three-phase model of conditioning.
4. What conclusion did Skinner draw about the main driving forces behind behaviour?

Reinforcers

When you are training your dog to 'shake hands' and you give it a treat, pat it on the head or say 'good dog' when it behaves the way you want it to, you are using reinforcement. Similarly, using an umbrella to prevent yourself from getting wet when it rains is a kind of reinforcement. So, reinforcement may involve receiving a pleasant stimulus (the dog receiving a treat) or 'escaping' an unpleasant stimulus (avoiding getting wet by using an umbrella). In either case, the consequence or outcome is one that is desired by the organism performing the behaviour.

Reinforcement is said to occur when a stimulus strengthens or increases the frequency or likelihood of a response that it follows. This may involve using a positive stimulus or removing a negative stimulus to subsequently strengthen or increase the frequency or likelihood of a preceding response or operant. An essential feature of reinforcement is that it is only used *after* the desired or correct response is made.

A **reinforcer** is any stimulus that strengthens or increases the frequency or likelihood of a response that it follows.

The terms 'reinforcer' is often used interchangeably with the term 'reward'. Although they are not technically the same, many psychologists accept that they are similar enough to be used interchangeably. One difference is that a reward suggests a consequence that is positive, such as satisfaction or pleasure. A stimulus is a reinforcer if it *strengthens* the preceding behaviour. In addition, a stimulus can be rewarding because it is pleasurable, but it cannot be said to be a reinforcer unless it increases the frequency of a response or the likelihood of a response occurring. For example, a person might enjoy eating chocolate and find it pleasurable, but chocolate cannot be considered to be a reinforcer unless it promotes or strengthens a particular response.

Positive reinforcer

Many of Skinner's early experiments on operant conditioning were conducted with hungry rats in an apparatus that has come to be known as a 'Skinner box (see box 5.4). In some experiments, the rats were conditioned to press a lever to obtain a food pellet. This was used as a positive reinforcer for making the correct response — pressing the lever would achieve a satisfying consequence, especially when hungry. Similarly, a high grade on a SAC is a positive reinforcer for a student who works hard, as is the thanking of a friend for doing you a favour. These examples also illustrate why the term *reward* is often used to describe a positive reinforcer.

A **positive reinforcer** is a stimulus that strengthens or increases the frequency or likelihood of a desired response by providing a satisfying consequence. **Positive reinforcement** involves giving or applying a positive reinforcer after the desired response has been made.

FIGURE 5.23 A positive reinforcer strengthens or increases the frequency or likelihood of a desired response by providing a satisfying consequence.

Negative reinforcer

On a rainy day, if you want to avoid the unpleasant experience of having wet clothes, you could use an umbrella. If the umbrella successfully kept you dry, the next time it rained you would probably use it again. The increased likelihood of using an umbrella makes this behaviour one that has been negatively reinforced. The increase in its likelihood is based on the avoidance of something unpleasant (wearing wet clothes).

A **negative reinforcer** is any unpleasant or aversive stimulus that, when removed or avoided, strengthens or increases the frequency or likelihood of a desired response. For example, a Skinner box has a grid on the floor through which a mild electrical current can be passed continuously. If a rat is placed in the box it can be given a foot shock that is an unpleasant stimulus. When the rat presses the lever on a wall of the box, the electric current is switched off and the mild shock is taken away. The removal of the shock (negative reinforcer) is referred to as negative reinforcement.

Negative reinforcement involves the removal or avoidance of an unpleasant stimulus. It has the effect of increasing the likelihood of a response being repeated and thereby strengthening the response. Thus, the likelihood of the lever-pressing response will increase because the negative reinforcer (the shock) is removed as a consequence of this lever-pressing behaviour.

The important distinction between positive and negative reinforcement is that positive reinforcers are *given* and negative reinforcers are *removed* or *avoided*. However, because both procedures lead to desirable or satisfying consequences, each procedure strengthens ('reinforces') the behaviour that produced the consequence.

Negative reinforcers are evident in many aspects of everyday life. For example, when you turn off a scary movie, cover your eyes or walk away, you remove a negative event (fear associated with the movie) and the avoidance behaviour is negatively reinforced. The next time you watch a movie and a frightening scene comes on, you are more likely to repeat your avoidance behaviour. Similarly, if after taking an aspirin the pain from a headache subsides, the behaviour of taking an aspirin has been negatively reinforced and it is likely you will take an aspirin the next time you have a headache. And when a P-plate driver decides not to drink alcohol at a party for fear of losing their licence if caught driving, a negative reinforcer (loss of licence) is at work. In these examples, the *removal* of the negative reinforcer is providing a satisfying or desirable consequence.

Positive and negative mean good and bad. But don't fall into the trap of giving them these meanings when using them in relation to operant conditioning. In operant conditioning, 'positive' and 'negative' mean 'added' and 'subtracted'.

To help you remember this difference, consider linking the terms with mathematical symbols:

- positive (+) reinforcer = adding something pleasant
- negative (−) reinforcer = subtracting something unpleasant.

FIGURE 5.24 In real life, reinforcement is not necessarily a one-way street. Children and parents continually reinforce each other. By stopping a tantrum when they get their way, the child negatively reinforces the parent. However, by giving in to the child and providing what was sought, the parent is positively reinforcing the tantrum-throwing behaviour.

FIGURE 5.25 Vasco drives safely and obeys all the road laws so that he can become a 'Rating 1' driver and save on his insurance premium (positive reinforcement). Emma drives safely and obeys all the road laws to avoid getting any more traffic fines and licence demerit points (negative reinforcement).

LEARNING ACTIVITY 5.11

Review questions

1. Define the term reinforcement with reference to an example.
2. Explain the meaning of the terms positive reinforcer and negative reinforcer.
3. In what way are positive reinforcers and rewards similar and in what way are they different?
4. (a) What do positive and negative reinforcers have in common in relation to their consequences?
   (b) Identify three positive and negative reinforcers that you have observed teachers use in the classroom and three that you have observed in other real-life contexts.
   (c) How are positive and negative reinforcers different?

Punishment

If you are caught exceeding a speed limit while driving, you will receive a fine and one or more demerit points. This is an unpleasant consequence intended to reduce this type of speeding behaviour in future. Alternatively, if you continue to exceed a speed limit after receiving a number of speeding fines and demerit points, you may have your licence taken away (an unpleasant consequence). In both examples, the consequence is punishment of the unwanted behaviour with the intention of weakening, reducing the frequency of or eliminating the behaviour.

Punishment is the delivery of an unpleasant consequence following a response, or the removal of a pleasant consequence following a response. Punishment has the same unpleasant quality as a negative reinforcer, but unlike a negative reinforcer, the punishment is given or applied, whereas the negative reinforcer is prevented or avoided. The consequence or outcome of punishment is the opposite to removal of a negative reinforcer. When closely associated with a response, punishment *weakens* the response or *decreases* the probability of that response occurring again over time.

As with reinforcement, Skinner (1953) distinguished between positive and negative punishment. Again, as with reinforcement, consider the mathematical terms of adding (+) and taking away (–), rather than good and bad or the 'feelings' of the recipient.

Positive punishment involves the presentation (or introduction) of a stimulus, thereby decreasing (or weakening) the likelihood of a response occurring again. For example, an electric shock for a rat in a Skinner box, or having to run extra laps around a basketball court for being late to training, or being given extra chores at home for doing something wrong all involve positive punishment.

Negative punishment involves the removal or loss of a stimulus and thereby decreasing (or weakening) the likelihood of a response occurring again. For example, taking food away from a hungry rat, not being allowed to join basketball training because you are late, or your parents taking away your internet access for doing something wrong all involve negative punishment. Note that in *both* positive and negative punishment, the intended effect on the punished behaviour is to weaken and prevent it from recurring.

Response cost

Since negative punishment involves taking a stimulus away as a consequence of a particular response, it is often referred to as response cost. More specifically, **response cost** may be described as involving removal of any valued stimulus, whether or not it causes the behaviour. There is a 'cost' for making a 'response'; therefore, the term 'response cost'.

For example, if you get a speeding fine, your money (a valued stimulus) is taken away from you. In addition, the stimulus of money was unlikely to have been the reason (or 'cause') for your speeding! Therefore, a speeding fine is considered to be a response cost, but also negative punishment, as something of value has been taken away. It is a form of punishment because it decreases the likelihood of a behaviour occurring.

Response cost does not necessarily involve something of *monetary* value. For example, loss of a grade or two for late submission of school work (without medical evidence) is a response cost that can decrease the likelihood of lateness in the future. Similarly, making a rude comment during a conversation might result in the loss of a smile. This would be the response cost if the smile is a valued stimulus.

FIGURE 5.26 A speeding fine is negative punishment involving response cost.

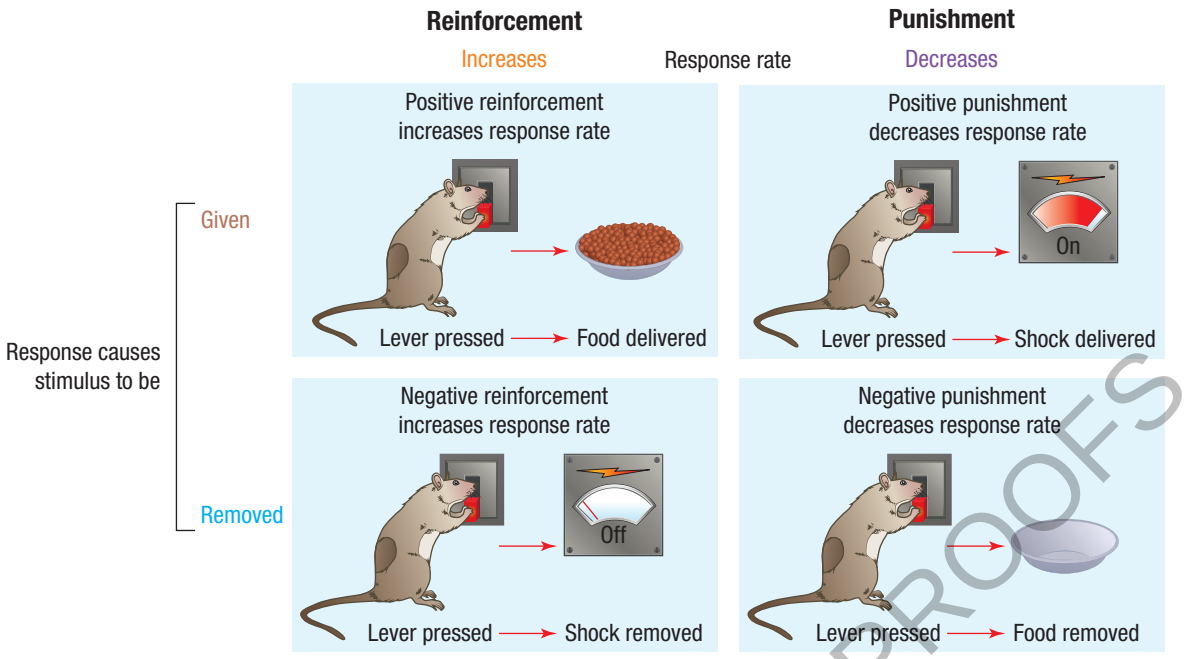


FIGURE 5.27 Comparing types of reinforcement and punishment

BOX 5.5

Factors that influence the effectiveness of reinforcement and punishment

In operant conditioning, what happens *after* the correct or desired response is performed is very important in determining the strength of learning and the rate at which it occurs. In addition, it is not just *whether* a response is reinforced or punished that influences the learning process. Other factors associated with reinforcement also play important roles in affecting learning. For instance, *when* in the process of operant conditioning the consequence (reinforcer or punisher) is presented, the *time lapse* between the response and consequence, and the *appropriateness* of the consequence are all important in determining the effectiveness of reinforcement and punishment, and therefore learning through operant conditioning.

Order of presentation

To use a reinforcer and punisher effectively it is essential that either be presented *after* a desired response, never before. This helps to ensure that the organism learns the consequences of a particular response.

Timing

Use of either reinforcement or punishment is most effective when given *immediately after* the response has occurred. This timing helps to ensure that the organism associates the response with the reinforcer or punisher, without interference from other factors during the time delay. Timing also influences the strength of the response. If there is a considerable *delay* between the response and the consequence, learning will generally be very slow to progress and in some cases may not occur at all.

Appropriateness

For any stimulus to be a reinforcer, it must provide a pleasing or satisfying consequence for its recipient. For example, a place in a course at a university would not be an effective reward to a student who intends to work in their family's business at the end of Year 12. However, a holiday at a tropical resort before the student started paid work might be considered much more desirable, and would therefore be a more effective reinforcer.

Similarly, for any stimulus to be an appropriate punisher, it must provide a consequence that is unpleasant and therefore likely to decrease the likelihood of the undesirable behaviour. An inappropriate punisher can have the opposite effect and produce the same consequence as a reinforcer. For example, a talkative, attention-starved Year 8 boy may respond to being verbally reprimanded in class — his teacher's intended punisher — by increasing his talkative behaviour. For him, the verbal scolding at least gives him the attention he craves, and this attention then acts as a reinforcer for the talkative behaviour.

Although punishment may temporarily decrease the occurrence of unwanted responses or behaviour, it doesn't promote more desirable or appropriate behaviour in its place. Throughout his career as a behavioural psychologist, Skinner remained strongly opposed to the use of punishment in everyday life. Instead, he advocated the greater use of positive reinforcement to strengthen desirable behaviours or to promote the learning of alternative behaviours to punishable behaviours (Hockenbury & Hockenbury, 2006; Skinner, 1974).

FIGURE 5.28 For any stimulus to be a reinforcer, it must provide a pleasing or satisfying consequence for its recipient, such as fruit provides for this monkey. Similarly, for any stimulus to be a punisher, it must provide a consequence that is unpleasant for its recipient, such as loss of access to their mobile phone.

LEARNING ACTIVITY 5.12

Review questions

1 (a) Define the term punishment.
(b) Explain what punishment involves and why it is used, with reference to an example not given in the text.

2 Distinguish between positive and negative punishment with reference to an example not used in the text.

3 (a) What is response cost?
(b) Explain why it is a form of negative punishment with reference to an example not used in the text.
(c) 'Time out' involving removal of a child from a situation is sometimes used as a punisher by parents and teachers. Explain how it can be a form of response cost at home and in a classroom.

4 How does punishment differ from negative reinforcement? Explain with reference to an example.

5 (a) Describe a situation in which a punisher might *reinforce* a behaviour rather than weaken it or reduce its frequency.
(b) Describe a situation where an effective punisher could *reduce* the incidence of behaviour recurring.

6 Analyse and describe the following scenario in terms of the three-phase model of operant conditioning. Also indicate whether the scenario is an example of positive or negative reinforcement or punishment.

Zeta's dog Belle keeps escaping from the backyard by crawling through a gap under the fence. Zeta purchases a small detector that she places either side of the gap and puts a collar on Belle that makes a high-pitched noise whenever she gets too close to the gap. The first time Belle tries to escape under the gap, the noise plays and distresses her. Soon Belle learns to avoid the noise by staying inside the backyard.

LEARNING ACTIVITY 5.13

Distinguishing between reinforcement and punishment

Identify the operant conditioning process that is being illustrated in each of the following examples. Choose from positive reinforcement (PR), negative reinforcement (NR), positive punishment (PP) and negative punishment (NP). Write the initials of the correct responses in the spaces provided.

1. When Lina turns the shopping trolley down the lolly aisle, her two-year-old son, Ali, starts screaming, 'Want lollies! Lollies!' Lina moves to another aisle, but Ali continues to scream. As other customers begin staring and Lina starts to feel embarrassed, she finally gives Ali a bag of lollies. Ali is now more likely to scream in a supermarket when he wants lollies because he has experienced _____.
2. If Lina is more likely to give in to Ali's temper tantrums in public situations in the future, it is because she has experienced _____.
3. Feeling sorry for an apparently homeless person sitting outside a bakery, Christopher offers him a $2 coin. The person snarls at Christopher and tries to grab his leg in a threatening manner. Christopher no longer offers money to homeless people in the street because of _____.
4. Justin is caught using Facebook on his work computer and is reprimanded by his team leader. Justin no longer accesses Facebook on his work computer because of _____.
5. As you walk down the corridor between classes, you spot a student you greatly dislike. You immediately duck into an empty classroom to avoid an unpleasant interaction with them. Because _____ has occurred, you are more likely to take evasive action when you encounter people you dislike in the future.
6. Having watched Superman fly in a movie, three-year-old Tran climbs onto the kitchen table, then launches himself into the air, only to fall onto the tiles and hurt himself. Because Tran experienced _____, he tried this stunt only once.
7. Thinking she was making a good impression in her new job by showing how knowledgeable she was, Sana corrected her team leader in two different meetings. Not long after the second meeting, Sana lost her job because the company said it was making her position redundant. Because she experienced _____, Sana no longer publicly corrects her superiors.

Source: adapted from Hockenbury, D.H. & Hockenbury, S.E. (2006). *Psychology* (4th ed.). New York: Worth. p. 218.

LEARNING ACTIVITY 5.14

Concept summary

Complete the following table to summarise reinforcers and punishers.

Concept	Description	Example
Positive reinforcer		
Negative reinforcer		
Positive punisher		
Negative punisher		
Response cost		

LEARNING ACTIVITY 5.15

Reflection

On the basis of relevant operant conditioning theory, comment on which you believe to be most effective — reinforcement, punishment or a combination of both — in promoting desirable behaviour by children.

Stimulus generalisation

In operant conditioning, **stimulus generalisation** occurs when the correct response is made to another stimulus that is similar (but not necessarily identical) to the stimulus that was present when the conditioned response was reinforced. This response usually occurs at a reduced level (frequency or strength), as illustrated by the following experiment.

In one experiment, a pigeon was trained to peck at a switch mounted on the wall of a Skinner box. The switch was lit by a green light. When the pigeon was presented with lights of varying colours, it generalised the original stimulus (pecking the switch lit by a green light) and pecked at the other coloured switches as well. However, as shown in figure 5.29, as the stimulus (light) shifted further away from the original colour (green), the less frequent was the pigeon's response (Olson & King, 1962).

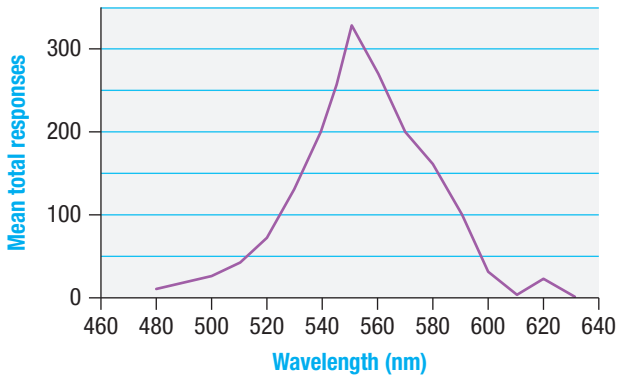


FIGURE 5.29 Results showing the pigeon's generalisation of the original stimulus of a green light to other colours. The numbers for wavelengths of light indicate different colours.

Outside the laboratory, in our everyday life, we frequently generalise our responses from one stimulus to another. For example, our generalisations from past experiences with people, events and situations influence many of our likes and dislikes of new people, events and situations.

Stimulus discrimination

In operant conditioning, **stimulus discrimination** occurs when an organism makes the correct response to a stimulus and is reinforced, but does not respond to any other stimulus, even when stimuli are similar (but not identical).

Skinner taught laboratory animals to discriminate between similar stimuli by reinforcing some responses and not others. For example, a pigeon in a Skinner box could be taught to discriminate between a red and a green light. If the pigeon was reinforced every time it pecked at a disk while a green light was illuminated, but never reinforced for pecking the disk when a red light shone, it would soon learn to discriminate by responding only when the green light was on. When this occurs, the green light has become an antecedent or discriminative stimulus.

A useful application of conditioning an animal to learn and then use an antecedent (discriminative) stimulus is with sniffer dogs by police, customs and border protection officers to find hidden drugs, explosives and other illegal goods.

Extinction

In operant conditioning, extinction may also occur, and the process is similar to its occurrence in classical conditioning. In operant conditioning, **extinction** is the gradual decrease in the strength or rate of a conditioned (learned) response following consistent non-reinforcement of the response. Extinction is said to have occurred when a conditioned response is no longer present.

In classical conditioning, extinction takes place over a period when the unconditioned stimulus (UCS) is withdrawn or is no longer present. With operant conditioning, extinction also occurs over time, but after reinforcement is no longer given. For instance, when Skinner stopped reinforcing his rats or pigeons with food pellets, their conditioned response (e.g. of lever-pressing or turning circles) was eventually extinguished.

Spontaneous recovery

As in classical conditioning, extinction is often not permanent in operant conditioning. After the apparent extinction of a conditioned response, **spontaneous recovery** can occur and the organism will once again show the response in the absence of any reinforcement. The response is likely to be weaker and will probably not last very long. A spontaneously recovered response is often stronger when it occurs after a lengthy period following extinction of the response than when it occurs relatively soon after extinction.

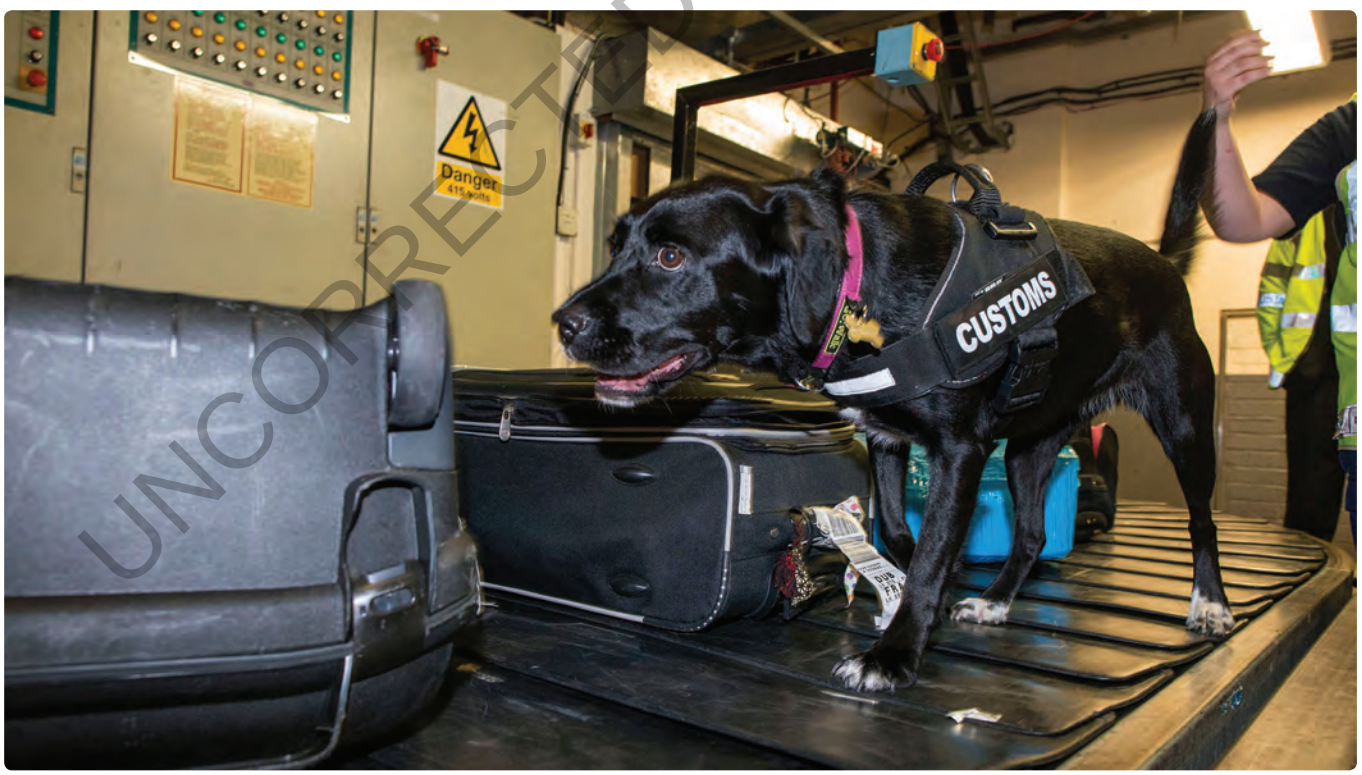


FIGURE 5.30 Stimulus discrimination is demonstrated by sniffer dogs trained to detect the presence of illegal drugs or banned produce.

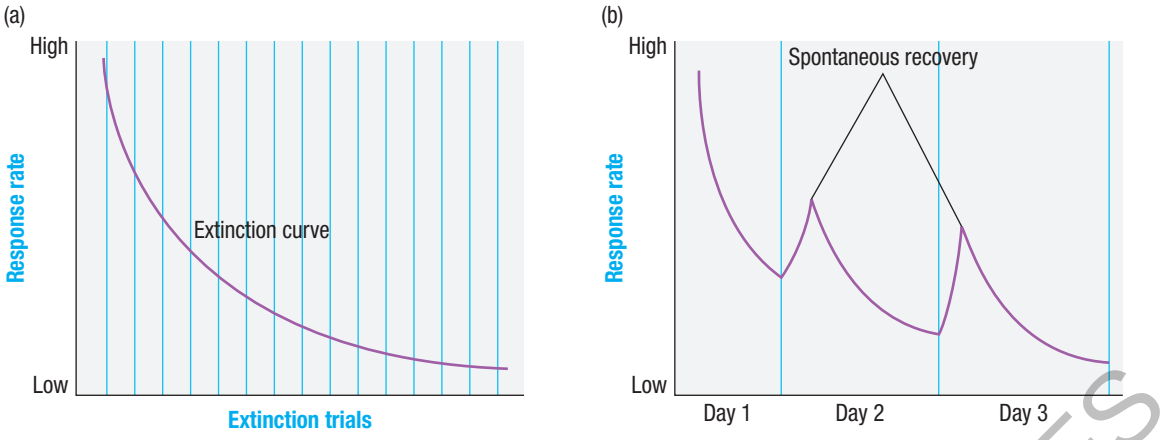


FIGURE 5.31 (a) The curve for the extinction of an operantly conditioned response following the withdrawal of the positive reinforcer. (b) The spontaneous recovery of a conditioned response following the extinction of that response. Note that the recovered response does not last very long and appears to be weaker than the original response.

BOX 5.6

Comparing classical and operant conditioning

While classical and operant conditioning are two different types of learning, they have some common features. In both classical and operant conditioning there is an *acquisition* process whereby a response is conditioned or learned. In classical conditioning, the association of two stimuli, the NS and UCS, provides the basis of learning. In operant conditioning, behaviour is associated with consequences that follow it. In addition, both types of conditioning are achieved as a result of the repeated *association* of two events that follow each other closely in time.

FIGURE 5.32 Is this an example of classical or operant conditioning?

In both types of conditioning, *extinction* of the learned response can occur. In classical conditioning, extinction takes place over a period when the UCS is withdrawn or is no longer present and the CS is repeatedly presented alone. For instance, when this happened in Pavlov's experiments, the dog eventually ceased salivation (CR) in response to the bell (CS) alone (which had been previously paired with the UCS). In operant conditioning, extinction also occurs over time, but after reinforcement is no longer given. For instance, when Skinner stopped reinforcing his rats with food, their lever-pressing was eventually extinguished. In both classical and operant conditioning, extinction can be interrupted by *spontaneous recovery*. In addition, *stimulus generalisation* and *stimulus discrimination* can occur with both types of conditioning.

These similarities in the two types of conditioning have led some psychologists to propose that both classical and operant conditioning are variants of a single learning process, especially as classical and operant conditioning often occur in the same situation. For instance, when 'Little Albert' learned to fear the rat, his response (trembling) was classically conditioned. But when he learned to avoid the rat by crawling away (a response that had the effect of reducing his fear), that was an example of operant conditioning. In relation to the acquisition of conditioned emotional responses, psychologists now use classical conditioning to account for the *acquisition* of the response and operant conditioning to account for the *perpetuation* (or maintenance) of the response (see pages 000<Insert cross-ref to relevant pages in ch 13>).

There are a number of other major differences between classical and operant conditioning. In operant conditioning the *consequence* of a response is a vital component of the learning process in that a behaviour becomes more or less likely, more or less frequent, or strengthened, depending on its consequence. In classical conditioning, the behaviour of the organism does *not*

have any environmental consequence. For example, in Pavlov's experiments, the dog receives food whether or not it salivated. But in operant conditioning, the organism's response (such as lever-pressing) operates or produces effects on the environment (such as the dispensing of a food pellet). These effects or consequences, in turn, influence the recurrence of the response.

Classical and operant conditioning also generally involve different types of responses. In classical conditioning, the response is *involuntary*; an automatic reaction to something happening in the environment (such as the sight of food or the sound of a bell). Operant conditioning, however, involves *voluntary* responses that are initiated by the organism (such as throwing a tantrum or doing homework), as well as involuntary responses.

The role of the learner

In classical conditioning, the learner is a *passive* participant in the conditioning process. The learner does not have to do anything for the NS, CS or UCS to be presented. Furthermore, the response made by the learner occurs automatically without them having to make any effort or actively do anything. The learner essentially has no control over the learning process. In operant conditioning, the learner is an *active* participant in the learning process. The learner must operate on the environment before reinforcement or punishment is received. The learner is neither reinforced nor punished without performing the behaviour that produces the consequence. In this sense, the learner has control over the learning process.

Timing of the stimulus and response

In classical conditioning, the response (e.g. salivation) depends on the presentation of the UCS (meat powder) occurring first. In operant conditioning, the presentation of the reinforcer or punisher depends on the response occurring first. The response (e.g. pushing the lever) occurs in the presence of a stimulus (e.g. the lever). The reinforcement (e.g. the food pellet) or punisher received as a consequence of the response strengthens or weakens the stimulus–response association.

In classical conditioning, the timing of the two stimuli (NS, then UCS) produces an association between them that conditions the learner to anticipate the UCS and respond to it even if it is not presented. In operant conditioning, the association that is conditioned is between the stimulus (i.e. the lever in a Skinner box) and the response (to push the lever). The response is either strengthened by reinforcement or weakened through punishment.

In classical conditioning the timing of the two stimuli (NS, then UCS) needs to be very close (ideally about half a second) and the sequencing is vital — the NS must come before the UCS. In operant conditioning, while learning generally occurs faster when the reinforcement or punishment occurs soon after the response (behaviour), there can be a considerable time difference between them (especially in humans).

The nature of the response

In classical conditioning, the response by the learner is usually a reflexive involuntary one (e.g. salivating or blinking). In operant conditioning, the response by the learner is usually a voluntary one (e.g. pressing a lever, using an umbrella) but may also be involuntary.

In classical conditioning, the response is often one involving the action of the autonomic nervous system, and the association of the two stimuli is often not conscious or deliberate. In operant conditioning, the response may involve the autonomic nervous system but often involves higher order brain processes because the response is conscious, intentional and often goal-directed.

FIGURE 5.33 In operant conditioning, the learner is an 'active' participant in the learning process; in classical conditioning, the learner is a 'passive' participant.

LEARNING ACTIVITY 5.16

Review questions

1 Define each of the following terms in relation to operant conditioning and give an example of their occurrence in (a) a laboratory experiment, and (b) everyday life:
- stimulus generalisation
- stimulus discrimination
- extinction
- spontaneous recovery

2 How does punishment differ from extinction? Explain with reference to an example.

3 Which of the following scenarios involve stimulus generalisation? Which involve stimulus discrimination?
(a) Lauren asks Gino out on a date but he declines. Lauren decides that she won't ask another boy out again.
(b) Toula is paid for doing chores around the home and expects to be paid for doing chores at her aunty's place when she stays there.
(c) Jackson is scared of the sound of a lawnmower but not the sound of an electric toothbrush.
(d) Sam is scared of the sound of his dad's electric drill. When his dad stops using the drill Sam relaxes. Sam's dad then reaches for the electric saw. As soon as Sam sees this, he is scared and runs inside.

4 A teacher cannot conduct her lesson because the students are rowdy and inattentive in the last period, so she lets them out early.
(a) What are the students learning?
(b) Explain with reference to operant conditioning processes.

5 Maria had enjoyed attending the same P–12 college for ten years. Quite suddenly this year, her friendship group drifted away from her. She is now being bullied by some other girls because she has become a 'loner'. After an unsuccessful attempt to solve her problems by speaking with her year-level coordinator, Maria started to take days off school, telling her mother she wasn't feeling well. Her absenteeism increased. Although she was concerned about missing school, she couldn't face the unpleasant actions of the bullies.
(a) Which operant conditioning process explains the increase in Maria's behaviour of deceiving her mother and staying home from school? Explain how this process worked in Maria's situation.
(b) Which operant conditioning process describes the consequence of the bullying behaviour for Maria? Explain its effect on Maria's attendance behaviour.

6 Choose one of the following examples and briefly explain how operant conditioning could be used for a solution. Your explanation should use operant conditioning terms where relevant.
- increase the number of people who use a car-pooling arrangement to travel to and from work
- encourage energy conservation in homes and at work
- encourage drivers and passengers to use seatbelts
- encourage students to use rubbish bins in the schoolyard during recess and lunchtime
- discourage cigarette smoking by teenagers
- discourage gambling on pokie machines
- improve the study habits of a VCE student.

LEARNING ACTIVITY 5.17

Analysis of data

An inexperienced teacher was having difficulties controlling the behaviour of students in his Year 10 English class. This was stressing him considerably so he consulted a psychologist, who agreed to help him. In order to precisely identify the nature of the difficulties experienced by the teacher, the psychologist unobtrusively observed him in the classroom for twelve 50-minute lessons over three weeks. He prepared a report from which extracts are presented below.

Read the report and answer the questions that follow.

Teacher: male, 24-years-old, fully qualified with a Bachelor of Arts and a Diploma of Education, one month's experience as a replacement teacher and four months' full-time teaching experience

Students: 14 boys and 16 girls with a mean age of 16.2 years; many have reading difficulties or other language problems; two students are repeating Year 10; all live locally

Class behaviour: measurements of students' behaviour during class time included:
- inappropriate talking: 29% of class time
- inappropriate turning around: 17% of class time
- walking around the classroom without permission: 12% of class time
- calling out to the teacher: 9% of class time.

Teacher's behaviour: responded to inappropriate talking about 25% of the time, usually with 'shhh' and 'be quiet' (most of these responses were directed at the whole class and rarely to offending individual students); responded to 6% of the turning around behaviour, always with the comment 'turn around'. Other inappropriate student behaviour was generally ignored and he continued trying to teach 'over the top' of this. On eight occasions he made general threats; for example, detention for the class, not allowing the class to go on a planned excursion. These were never carried out. During the observation period in which the baseline data was recorded, he was never observed to take notice of appropriate behaviour; for example, give praise for not talking.

1 What is the purpose of baseline data?

2 Explain the difficulties experienced by the teacher with reference to the data and three operant conditioning processes.

3 Make two suggestions involving operant conditioning processes to help the teacher overcome the difficulties with his class.

LEARNING ACTIVITY 5.18

Evaluation of research and procedures to change a student's behaviour

A group of preschool teachers worked with a team of psychologists in applying operant conditioning processes to help a young girl overcome her shyness when playing with her peers. The girl spent most of her time at the preschool standing close to her teachers rather than playing with children her own age, and the teachers were concerned that this was interfering with her social development. Like most young children, the girl enjoyed teacher praise, so it was decided that the teachers would only praise her when she played with her peers, and ignore her when she stayed close to them. The results of using praise in this way are shown in figure 5.34.

In order to measure learning of the desired response, the teachers initially recorded the frequency with which the little girl played with other children and the frequency with which she interacted with adults. They then began using praise whenever she played with her peers, but gave her very little attention for other interactions.

To be certain that the praise alone was responsible for the behavioural change, the teachers stopped using it for a time and then reintroduced it. This is shown in the third and fourth sections of figure 5.34. These graphs indicate that the little girl began interacting with adults again once the praise ceased (third section), and recommenced interacting with her peers once the praise was used again (fourth section).

1. What is the operationalised independent variable?
2. On which days was the 'control' condition conducted? What was the purpose of this?
3. Identify the key elements of operant conditioning evident in this scenario.
4. In which condition was the young girl's interaction with other children at its lowest? At its highest? What do these data tell you about the success or failure of the program devised by the team of psychologists and undertaken by the teachers?
5. Why did the teachers stop using praise with the young girl for a time and then recommence its use?

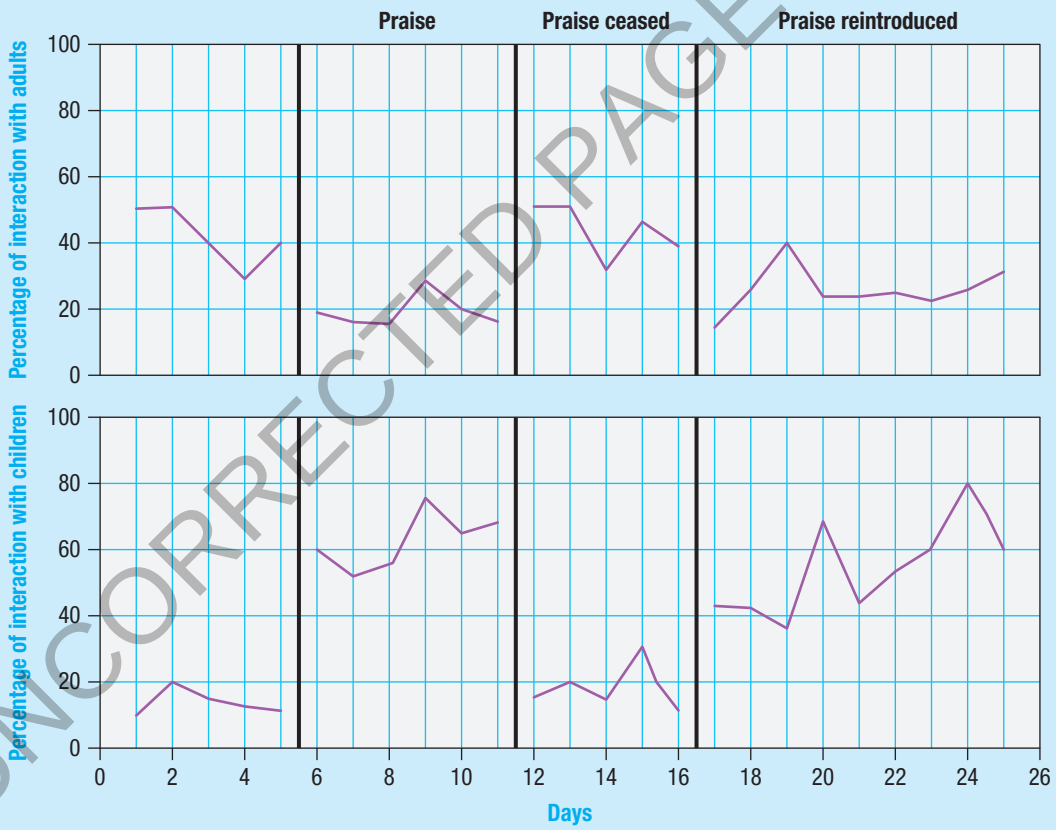


FIGURE 5.34 Effect of praise on social interaction

Source: based on Allen, et al. (1964). Effects of social reinforcement on isolate behaviour of a nursery school child. *Child Development, 35*, 511–518.

LEARNING ACTIVITY 5.19

Comparing classical and operant conditioning

Copy the table below and complete each row to summarise similarities and differences between classical and operant conditioning.

Feature	Classical conditioning	Operant conditioning
Process of acquisition		
Stimulus generalisation		
Stimulus discrimination		
Extinction		
Spontaneous recovery		
Role of learner		
Timing of stimulus and response		
Nature of response (reflexive/voluntary)		

LEARNING ACTIVITY 5.20

Classical versus operant conditioning

Consider each of the following scenarios and state whether the behaviour that is described is best explained by classical conditioning, operant conditioning or a combination of both these types of learning. Give a reason for each answer.

1. Stephanie cries whenever she hears a barking dog. Before this, Stephanie had reached out to pat a stray dog and the dog barked and bit her hand. The next time Stephanie tried to pat the dog, it barked and bit her hand.
2. Hamish's ex-girlfriend always wore a musk perfume. Hamish still cringes whenever he comes across someone wearing musk perfume.
3. A father refuses to let his daughter borrow his car after she has 'borrowed' it previously and returned it with a near-empty petrol tank.
4. Emilia arrives home on time after having been grounded for being home late the last time she went out with her friends.

OBSERVATIONAL LEARNING

We also learn by watching and/or listening to others. The 'others' may be people with whom we directly interact such as parents, friends and teachers, or real or fictional characters in the media. Through observation, we can acquire new behaviours without having to personally experience them. Watching others helps us avoid dangerous stimuli in our environment, teaches us how to think and feel, and show us how to act and interact socially.

Behaviour acquired by observing what others do include physical routines such as a particular dance style, socially appropriate behaviours such as shaking hands when being introduced to someone, and emotional reactions such as a fear at the sight of a spider. Furthermore, many of the behaviours expected of us in the roles we undertake throughout life as females or males, students, friends, employees, partners, parents and so on are established by observing others performing those roles. Watching the actions of others can help us to learn skills such as how to make a milkshake, take a screenshot with an iPad or drive a car. This has obvious value. Imagine trying to *tell* someone how to do these things.

FIGURE 5.35 We learn much of our behaviour by imitating others, especially those who are attractive, successful or of higher status than we are.

Similarly, in many work situations the most effective learning takes place through observing more experienced staff. For example, medical students learn surgery by watching and listening while competent surgeons perform various procedures on patients, and trainee teachers observe qualified teachers in the classroom. Apprenticeship programs for trades such as carpentry, pastry cooking and plumbing involve learning by watching and listening to qualified tradespeople. It is not only responses in the form of behaviour that are acquired by observing others. Many of our attitudes, values and beliefs are also the products of observing others.

This type of learning is called observational learning. **Observational learning** occurs when someone uses observation of a model's actions and the consequences of those actions to guide their future actions. A *model* is who or what is being observed and may be live or symbolic. A *live* model is a real-life person who may be demonstrating, acting out and/or describing or explaining a behaviour. A *symbolic model* is a real or fictional character displaying behaviour in books, movies, television programs, online and other media. As observational learning involves watching models, it is often called *modelling*.

Observational learning has been extensively researched and described by Canadian-born psychologist Albert Bandura. Bandura's studies of observational learning processes, particularly with children, led him to develop social learning theory and explain observational learning as a method of social learning.

FIGURE 5.36 Albert Bandura (1925–) has extensively researched and described observational learning and explained how it occurs. His studies of observational learning processes with children led him to develop social learning theory and explain observational learning as a method of social learning.

Bandura's (1977a) *social learning theory* emphasises the importance of the environment, or 'social context', in which learning occurs. Bandura proposed that from the time we are born we are surrounded by other people displaying a huge variety of behaviours, all of which we are able to observe. This provides us with a rich source of information about our environment. Through observation we learn many behaviours, not by actually carrying out the behaviour and experiencing the consequences, but simply by watching the behaviour and its consequences being experienced by someone else. Moreover, we are more likely to model, learn and reproduce responses that are observed to be desirable and reinforcing. According to Bandura (p. 22):

> *Learning would be exceedingly laborious, not to mention hazardous, if people had to rely solely on the effects of their own actions to inform them what to do.*

Bandura believes that observational learning is not a totally separate form of learning from conditioning. His experiments have demonstrated that both classical and operant conditioning can occur vicariously through observational learning. This means that observational learning involves being conditioned *indirectly* by observing someone else's conditioning. During **vicarious conditioning**, the individual watches a model's behaviour being either reinforced or punished, and then subsequently behaves in exactly the same way or in a modified way, or refrains from the behaviour, as a result of what they have observed. Bandura uses the terms 'vicarious reinforcement' and 'vicarious punishment' to describe the different processes of vicarious conditioning.

Vicarious reinforcement increases the likelihood of the observer behaving in a similar way to a model whose behaviour is reinforced. Thus, the observer is conditioned through observing someone else being reinforced without personally experiencing the reinforcement or consequence directly. For example, a student who sees another student being allowed to leave a class early after correctly finishing all their work may be more inclined in another class to model the behaviour and respond in a similar way if they consider leaving class early a desirable outcome (a reinforcer).

Similarly, **vicarious punishment** occurs when the likelihood of an observer performing a particular behaviour decreases after having seen a model's behaviour being punished. For example, a student may observe someone else in class receiving detention for calling out without permission. The observer is likely to refrain from that behaviour in the future if they view detention as an undesirable outcome (a punisher).

Bandura emphasised that observational learning involves crucial cognitive processes. A person does not simply 'see' and then automatically reproduce a behaviour without any intervening mental activity. As with the student who observes someone else getting detention for calling out, the observer must become aware of and consciously process information relevant to the observed event. For example, mental processing of information on the consequences for doing what is observed is required, which can in turn influence the observer's expectations of the likely outcome of reproducing the behaviour. A mental representation

must also be stored in memory of what was observed so that it is available for reproduction if the learner chooses to do so. This means that we sometimes learn through observation but what is learnt remains latent (unexpressed or 'hidden') without any immediately observable change in our behaviour simply because there is no motivation or need to reproduce it.

In 1986, Bandura revised his social learning theory and now refers to it as *social cognitive theory* in order to emphasise the importance of cognition in the learning process. Both his initial and revised social learning theories are considered to be a 'bridge' between the purely conditioning theories of Pavlov and Skinner and contemporary cognitive learning theories. This is because social learning theory encompasses cognitive processes such as attention, memory and motivation, as well as learning processes such as conditioning, reinforcement and punishment.

FIGURE 5.37 The reproduction of behaviour modelled by a real-life model (left) and a symbolic model (above)

LEARNING ACTIVITY 5.21

Review questions

1. Define observational learning with reference to an example.
2. Why is observational learning also referred to as modelling?
3. (a) What are two key assumptions of Bandura's social learning theory?
   (b) In what way is observational learning a method of social learning?
4. What does vicarious conditioning involve when observing a model?
5. Distinguish between a live model and symbolic model with reference to relevant examples.
6. Give two examples of learned behaviours that are *not* acquired through observational learning. Explain your choice of examples.

LEARNING ACTIVITY 5.22

Reflection

Try to think of three behaviours, ranging from relatively simple to more complex, that you probably acquired through observational learning.

For each one, what model did you observe, what did you observe, and how similar were your responses to theirs?

Observational learning processes

According to Bandura's social learning theory, observational learning involves a sequence of processes called attention, retention, reproduction, motivation and reinforcement. All are essential if observational learning is to occur. First, the learner must pay *attention* to the model, then *retain* in memory what was seen. Next, the learner must be able *reproduce* (physically perform) the behaviour. If the behaviour is associated with *reinforcement* or punishment, the learner will be more or less *motivated* to imitate the observed behaviour thereafter.

Attention

In order to learn through observation, we must pay attention to or closely watch a model's behaviour and the consequences. If we do not attend to the model's behaviour, we will not recognise the distinctive features of the observed behaviour. And we may fail to notice the consequences.

Attention may be influenced by several factors. These include:

- the perceptual capabilities of the observer
- the motivation and interest level of the observer
- the situation in which the behaviour is being observed
- the kinds of distracters that are present
- the characteristics of the model, such as attractiveness.

Our level of attention is also influenced by such factors as the importance of the behaviour (e.g. whether we consider it to be a necessary behaviour, such as keyboarding skills required to obtain a particular job), its distinctiveness (such as whether it is unique, different, unusual) and the effect it might have on us (such as satisfaction, convenience, security).

According to Bandura (1977a), we pay closer attention and are more likely to imitate models who have the following characteristics:

- the model is perceived positively, is liked and has a high status
- there are perceived similarities between features and traits of the model and the observer, such as age and sex
- the model is familiar to the observer and is known through previous observation
- the model's behaviour is visible and stands out clearly against other 'competing' models
- the model is demonstrating behaviour that the observer perceives themselves as being able to imitate.

In general, the greater the similarity between model and observer, and the more attractive or successful the model, the more likely we are to follow their example. Research studies also indicate that the higher the status of the model, the more the observer will imitate the behaviour — which is why many advertisements feature celebrities. Similarly, a cricket coach advising a batter on how to play a straight drive during a cricket match will suggest the batter pays more attention to a professional cricketer's style than to that of a weekend cricketer at a local oval.

FIGURE 5.38 An Australian batsman for test cricket is a suitable model to whom one could pay attention to develop an excellent batting technique.

Retention

Having observed the model, we must be able to remember the model's behaviour. Behaviour learned through observation is often not needed until some time after it has been acquired. We need to store in memory a mental representation of what we have observed, and the more meaningful we can make that representation, the more accurately we will be able to replicate the behaviour when necessary. For example, linking a visual image with a verbal description of the model's actions is an effective strategy to assist the memory processes.

Therefore, the cricketer in the previous example might try to visualise the batting style of the model cricketer, while describing the action as something like: 'He leans in towards the ball with his front shoulder while his eyes are fixed on the ball. His front foot steps towards the pitch of the ball and he has a high back swing. At the moment of contact his bat is kept straight with wrists relaxed, and his head is over the ball. He also ensures he has a high follow-through after striking the ball.'

Reproduction

When the model's behaviour has been closely attended to and retained in memory, we can attempt to reproduce, or imitate, what has been observed. We must, however, have the ability to put into practice what we observed. For example, we wouldn't be able

to imitate someone riding a surfboard if we were paralysed. Similarly, we must have the potential to be competent enough to develop the necessary skills to imitate the behaviour. For example, no matter how well the cricket stroke-making style of a professional cricket player is lodged in an observer's memory, it is unlikely that this behaviour will be reproduced with the same skill. The professional cricketer may well possess attributes that cannot be learned: his reflexes and agility, his balance and poise, his perceptual judgments of the trajectory and distance of an incoming ball, and his superior motor coordination.

FIGURE 5.39 Observational learning has played an important role in training medical students for well over a century.

FIGURE 5.40 This Guatemalan girl (left) is able to reproduce the weaving skills she has observed from her mother (right).

Motivation

The observer must also be motivated to perform the behaviour; that is, they must want to reproduce what was observed. Unless the behavioural response is useful or provides an incentive or reward for the observer, it is unlikely that they will want to learn it in the first place, let alone perform it or continue to perform it.

Reinforcement

Reinforcement influences the motivation to reproduce the observed behaviour and increases the likelihood of reproduction. Bandura distinguished between different types of reinforcement that impact on motivation, in addition to the standard types described by Skinner.

External reinforcement is comparable to learning by consequences. Thus, if the girl in figure 5.40 receives a reinforcer such as praise or money for her work, then her motivation to become more highly skilled at her craft will be influenced in a positive way.

Vicarious reinforcement, as discussed previously, occurs indirectly by observing the modelled behaviour being reinforced without personally experiencing the reinforcement. For example, a young child observing the positive reinforcement received by an older sibling who works hard at school to get into the tertiary course of her choice may well model the same studious behaviour as a result of vicariously experiencing the reinforcement.

Self-reinforcement occurs when we are reinforced by meeting certain standards of performance we set for ourselves; for example, the sense of pride, achievement or fulfilment you may experience if you achieve the end-of-year VCE results you would like to achieve and believe you are capable of achieving. Although this sense of pride, achievement and fulfilment typifies positive reinforcement, self-reinforcement can also include negative reinforcement. For example, avoiding a future of being bored in a mindless job may also be the self-reinforcement for achieving academic success.

If the modelled behaviour is reinforced, this will motivate the person to repeat those actions; the next time, the person will expect the behaviour to be reinforced. If the behaviour is not reinforced, it is less likely to be repeated. In this case, it could be said that the person lacks the motivation to behave in that particular way. Of course, seeing modelled behaviour being punished also influences a person's motivation to reproduce the observed behaviour — the observer will be less likely to do something when punishment is the observed consequence.

Bandura found that certain personal characteristics of the observer can influence each of the observational learning processes. For example, our perception of a model and whether or not we pay attention to what they are doing, as well as the social context in which the modelled behaviour occurs, can be influenced by perceptions of our 'self'. We are more

likely to imitate a model's behaviour if we have low self-confidence and low self-esteem, as compared with people who do not. Self-confidence and self-esteem influence our level *self-efficacy* — our belief in our ability to accomplish tasks and succeed in particular situations. According to Bandura (1977b), self-efficacy underlies how we think, feel and behave, and plays a major role in how we approach tasks and goals. Individuals high in self-efficacy are those who believe that they are capable of performing well, and are more likely to view challenges as something to be mastered rather than something to be avoided.

LEARNING ACTIVITY 5.23

Review questions

1 What is the role of the learner in observational learning?

2 Describe and explain how one of the following ways of thinking, feeling or behaving may have been acquired by someone through observational learning with reference to the sequence of processes. You may present your answer in a flow chart format, as in figure 5.41.
- littering in public places
- offering one's seat on a crowded train to an elderly person
- abusing umpires as a spectator of a football match
- voting preference at a Federal election
- being empathetic to a friend who is very upset by providing a cuddle, reassurance and an offer of support.

3 Explain, with reference to its processes, why observational learning may be described as a method of social learning.

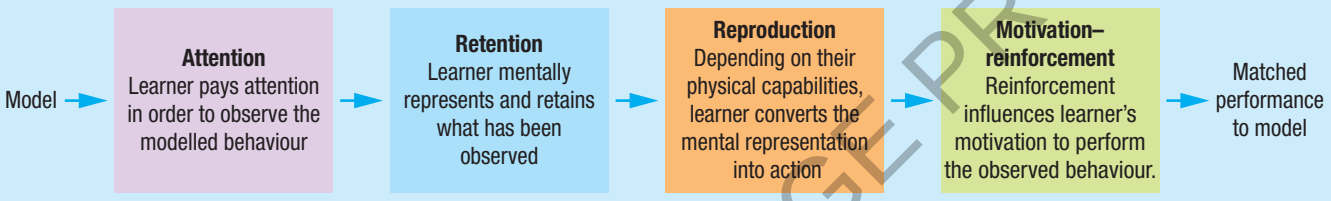


FIGURE 5.41 Observational learning processes

LEARNING ACTIVITY 5.24

Evaluation of research on observational learning

Read the following research and then answer the questions that follow.

A psychologist had four groups of five- to seven-year-olds hear and see an adult engage in specific behaviour. Group 1 heard and saw an adult being generous and saying that it was good to donate things to poor children. The adult was then seen giving some valuable items to charity. Group 2 heard the adult talking generously, but the adult didn't give anything away. Group 3 heard an adult saying that it was all right to be greedy and asking why they should give their money to anyone else. The adult then refused to make a donation. Group 4 heard the greedy adult talking, but then saw the adult being generous.

The children were then each given some stickers that could be traded for lollies. They were asked if they would like to donate some of their lollies to poor children. The results are shown in figure 5.42.

1 Suggest an aim for the research.

2 Formulate a research hypothesis that could have been tested in the experiment.

3 Identify the operationalised independent and dependent variables.

4 Name the type of experimental research design.

5 Draw a conclusion from the results in relation to your hypothesis.

6 Are the results consistent with Bandura's observational learning theory? Explain your answer.

7 Explain the relevance of informed consent and debriefing to this research and how these ethical standards could be adhered to.

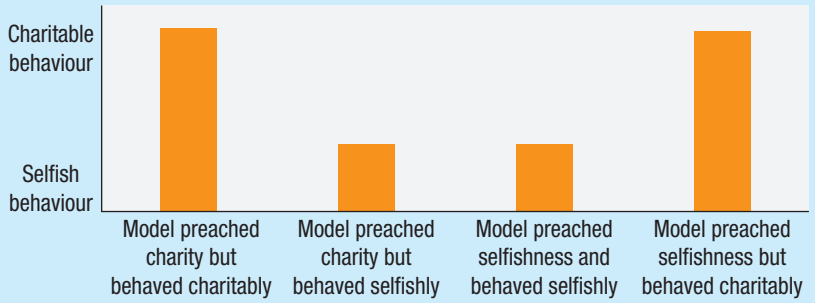


FIGURE 5.42 Children's behaviour after being exposed to different kinds of models

Bandura's experiments with children

In the 1960s, Bandura conducted a series of experiments to investigate different aspects of observational learning by young children. He was particularly interested in observational learning of aggression. In these experiments, preschoolers were required to passively sit and watch a model engaging in aggressive behaviour, and then given an opportunity to imitate the model's behaviour. Their responses were compared with those of preschoolers in a control group who were not exposed to an aggressive model. Different types of models, such as cartoon characters and real-life male and female adults were used, and responses by male and female children were measured to study sex differences in observing male and female models.

In one of the best known experiments, Bandura (1965) used four-year-old preschoolers as participants. The children were allocated one of three groups (in equal numbers of boys and girls) and watched one of three movies. Each movie showed an adult model punching, hitting, kicking and verbally abusing a large air-inflated BoBo doll (shown in figure 5.43). In all versions of the movie, the model walked into a room in which the BoBo doll was placed and shouted 'Clear the way!' The model then knocked down the doll, yelling 'Pow, right in the nose' and struck it with a mallet saying 'Sockeroo, stay down'. Each of the three groups of children, however, saw a different version of the movie. Consequently, the experiment had three conditions:

- Condition 1: The aggressive model was rewarded with lollies, soft drink and praise by another adult.
- Condition 2: The aggressive model was punished with a spanking and verbal criticisms such as 'Hey there, you big bully! Quit picking on that clown.'
- Condition 3: There were no consequences whatsoever for the aggressor's behaviour — the model was neither rewarded nor punished.

Following exposure to the model in the movie, each child was placed individually in a room that had many toys and a BoBo doll. The child's behaviour was then observed through a one-way mirror to see whether they imitated the aggressive model's behaviour in any way. Some children were offered rewards such as fruit juice, stickers and praise for imitating the model's behaviour, while others were not.

FIGURE 5.43 Bandura used a hidden camera to record children's responses in several experiments. These photos were copied from one of the movies. The top series shows the adult model being aggressive with the BoBo doll. The middle series shows a young boy imitating the model. The bottom series shows a young girl imitating the model.

eBook*plus*

BoBo doll experiment a study of aggression 5m 3s

eBook*plus*

Video: Bandura describes a BoBo Doll Experiment 5m 3s

The results, shown in figure 5.44, indicate that the consequences (or lack of them) for the adult model in the movie made a difference to the subsequent behaviour displayed by the children who saw them. This finding supports Bandura's argument that observational learning is not totally separate from conditioning. Children who watched the aggressive model either being reinforced or experiencing no consequences for their aggressive behaviour imitated aggressive behaviour more than the children who watched the aggressive model being punished. When children were offered a reward (positive reinforcer) for imitating the model's aggressive behaviour, even children who had seen the model punished tended to imitate the model's behaviour by behaving more aggressively.

Although the boys were more aggressive than the girls in all three conditions, the girls were nearly as aggressive as the boys if they were offered a reward. Importantly, the results also indicate that observational learning can sometimes occur by simply viewing a model even if the model is neither reinforced nor punished.

Clearly the boys and girls had learned something from observing the model. This highlights an important distinction between *learning* and *performance* (the actual production of a learned response). If someone observes a model's behaviour and does not perform the actions they have observed, it does not mean that the behaviour was not learned. The results of Bandura's experiment indicate that probably all the children learned the model's behaviour, regardless of whether they observed the model being reinforced or punished, or experiencing no consequences for aggressive behaviour.

Some children simply did not perform what they had learned until they were offered an incentive (reward) to do so. As shown in figure 5.44, differences in the level of aggressive responses by children in the three conditions were almost eliminated when the offer of a reward was made.

Bandura suggested that although an individual may make no observable response to a behaviour performed by a model, the acquisition of the modelled response in cognitive form has still occurred and can be elicited with an appropriate reinforcer.

Bandura proposes in his social learning theory that when observers pay attention to something going on around them, they form *cognitive representations* (mental images or codes) of what they observe. What they have learned, therefore, is not so much a response but a cognitive or mental representation of a response.

Bandura also makes a clear distinction between the *acquisition* of a learned response and the *performance* of that response. People can acquire and store many behavioural responses learned by observation. For example, a person who regularly listens to music on the radio may never sing along while they listen, yet they may be acquiring a great deal of information. This can eventually be revealed when the person is asked by a friend for the lyrics to a popular song and they are able to recite them. In Bandura's view, learning has clearly taken place. The individual has formed a mental representation of the lyrics, but has not previously demonstrated this knowledge through performance.

We also learn by observation whether or not a particular behaviour is likely to be rewarded. For example, if a student observes that when their classmates ask questions the teacher reacts approvingly, the student will be more likely to follow suit. However, if the student observes that the questioners are treated disapprovingly, the student will probably learn to avoid asking questions. Thus, we learn by observation not only *how* to acquire or modify behaviour but also about *what* behaviours can be expected to lead to particular consequences. And as demonstrated by Bandura's experiment, those observed behaviours most likely to be performed are the behaviours that will be reinforced.

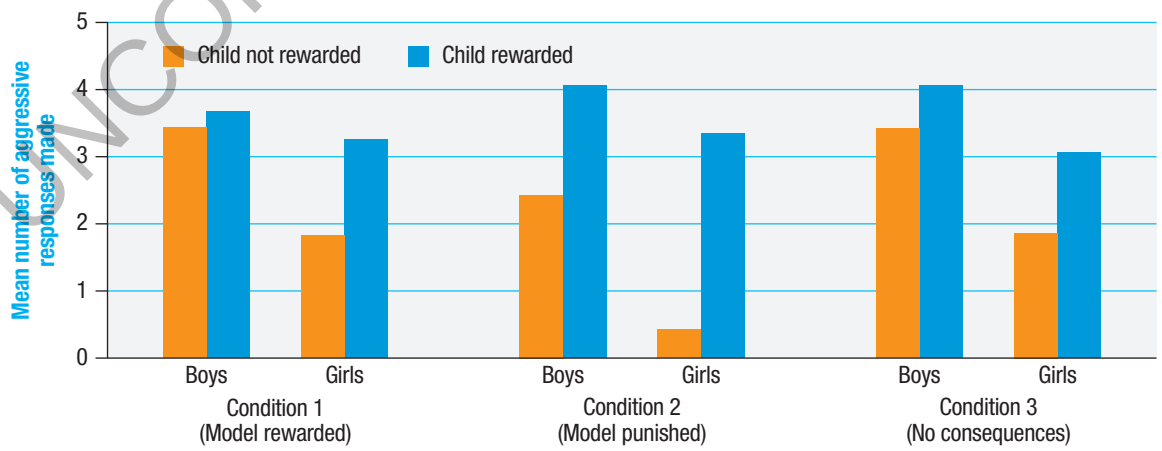


FIGURE 5.44 Results of Bandura's (1965) experiment on observational learning and aggression

BOX 5.7

Observational learning of the Suzuki method

In the 1940s, Japanese violinist and teacher Shinichi Suzuki (1898–1998) developed a successful method for teaching the violin to very young children. Called the Suzuki method, it was brought to Australia in the 1970s and generated a great deal of enthusiasm among children, parents and music teachers. The Suzuki method has since been applied to the learning of all types of musical instruments. Bandura's observational learning processes are evident in the Suzuki method.

Suzuki advised parents to teach violin information only when the child is actually looking at and watching the parent. Parents are told to stop teaching and wait if the child is distracted or talks about unrelated things.

Suzuki had parents present information in ways that a young child can mentally picture or code in some way. Because a three- to four-year-old child does not have fully developed verbal skills, little time is spent giving verbal instructions. Instead, the child is taught to play the violin through games and musical activities. For example, children are taught how to hold the violin, use the bow and press the strings by playing games with their hands. They are taught how to read musical notes only when they have reached a certain stage of technical skill at playing the violin.

Suzuki suggested that children start at the earliest age that they can physically perform the required movements and imitate their parents and teachers. Taking account of the physical capabilities of three- to four-year-olds, the violins used are small replicas. Girls are generally allowed to start learning violin at a younger age than boys as they physically mature earlier.

Suzuki emphasised that the most important role of the parents is to constantly reinforce the child for observing and doing what 'mummy, 'daddy' or 'the teacher' says. Suzuki suggested several ways to maintain motivation at a high level, such as being an active and interested model for the child, playing violin games that are fun for the child, and avoiding games or lessons that involve competition.

FIGURE 5.45

LEARNING ACTIVITY 5.25

Evaluation of Bandura's (1965) experiment with children

1 Prepare a flowchart or written summary of the key features of Bandura's experiment. Include:
- (a) a research hypothesis that could have been tested in the experiment
- (b) the operationalised IV(s) and DV(s)
- (c) identification of the different conditions of the experiment
- (d) outline of key results
- (e) conclusions from results
- (f) ethical concerns of particular relevance to the research.

2 Identify any extraneous or confounding variables that may have influenced the results in an unwanted way.

3 What generalisations can be made:
- (b) to participants of other ages?
- (c) to other types of modelled behaviour?

Explain your answers.

4 Explain why children in Bandura's experiment modelled aggressive behaviour in terms of the sequence of processes in the observational learning model.

< AU: Please Check & suggest if any sublist (a) is missing here? >

LEARNING ACTIVITY 5.26

Applying the observational learning method to the Suzuki method

Describe the processes of Bandura's observational learning theory that are apparent in the Suzuki method described in box 5.7.

Present your description in the form of a diagram or flowchart showing the process as a series of steps in their correct order.

LEARNING ACTIVITY 5.27

Reflection

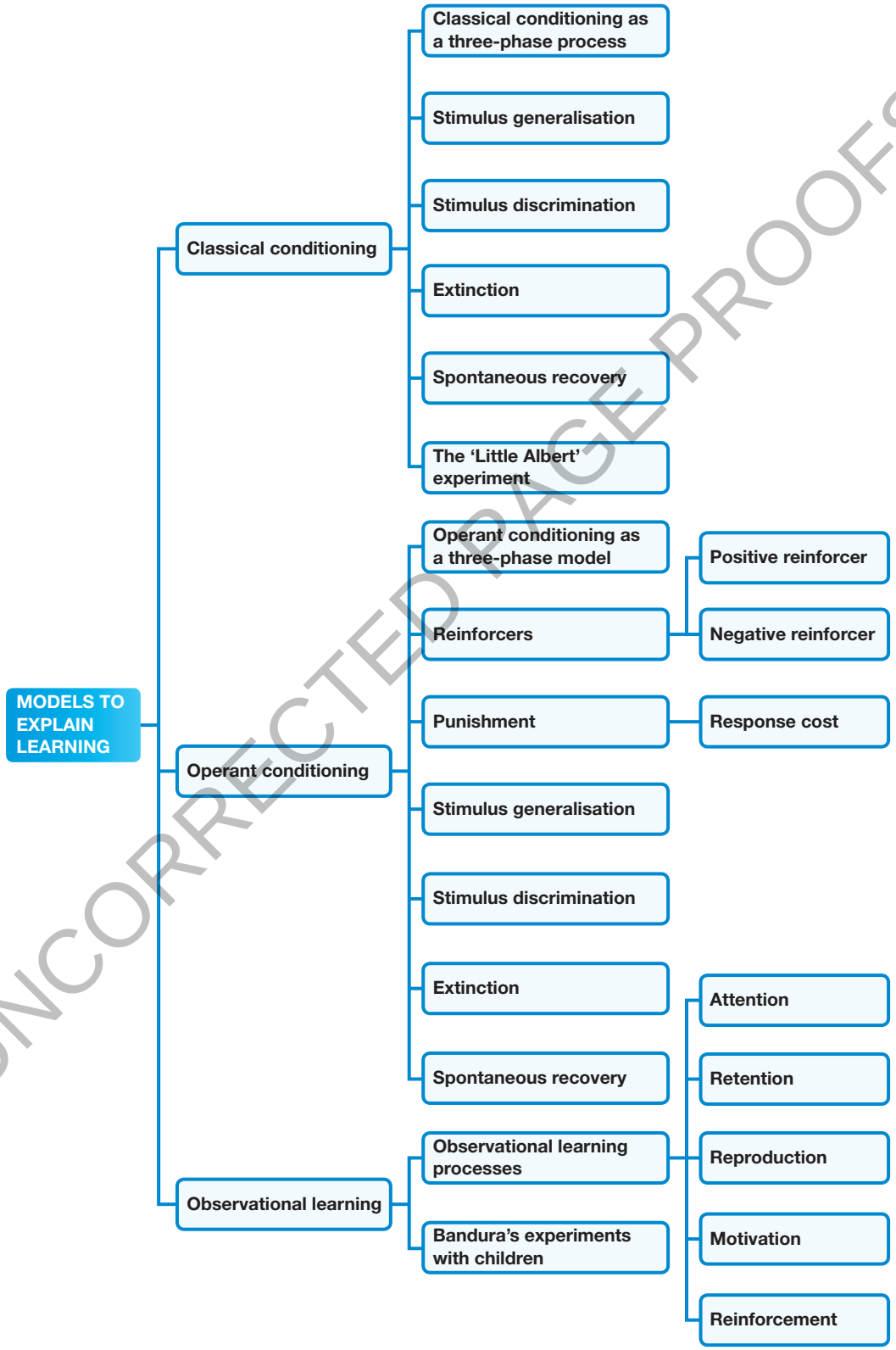
Many people believe that violent behaviour is learnt by observing violence in television programs, movies and other media, and/or through playing violent video games.

(a) What does research evidence suggest about such learning?

(b) What other variables may impact on observational learning of violence?

CHAPTER 5 REVIEW

CHAPTER SUMMARY



KEY TERMS

antecedent p. 000
behaviour p. 000
classical conditioning p. 000
conditioned response (CR) p. 000
conditioned stimulus (CS) p. 000
conditioning p. 000
consequence p. 000
extinction p. 000
learning p. 000
negative punishment p. 000
negative reinforcement p. 000
negative reinforcer p. 000
neutral stimulus (NS) p. 000
observational learning p. 000
operant p. 000
operant conditioning p. 000
positive punishment p. 000
positive reinforcement p. 000
positive reinforcer p. 000
punishment p. 000
reinforcement p. 000
reinforcer p. 000
response p. 000
response cost p. 000
spontaneous recovery p. 000
stimulus p. 000
stimulus discrimination p. 000
stimulus generalisation p. 000
three-phase model of operant conditioning p. 000
unconditioned response (UCR) p. 000
unconditioned stimulus (UCS) p. 000
vicarious conditioning p. 000
vicarious punishment p. 000
vicarious reinforcement p. 000

LEARNING CHECKLIST

Complete the self-assessment checklist below, using ticks and crosses to indicate your understanding of this chapter's key knowledge (a) before and (b) after you attempt the chapter test. Use the 'Comments' column to add notes about your understanding.

Key knowledge I need to know about	Self-assessment of key knowledge I understand *before* chapter test	Self-assessment of key knowledge I need to revisit *after* chapter test	Comments

CHAPTER TEST

SECTION A — Multiple-choice questions

Choose the response that is **correct** or that **best answers** the question.
A correct answer scores 1, an incorrect answer scores 0.
Marks will **not** be deducted for incorrect answers.
No marks will be given if more than one answer is completed for any question.

Question 1
Which of the following is the simplest form of learning?
A. social learning
B. observational learning
C. classical conditioning
D. operant conditioning

Question 2
A young child who has a white guinea pig at home sees a white rabbit in a pet shop and calls the rabbit a 'guinea pig'. This illustrates the process known as
A. stimulus generalisation.
B. stimulus discrimination.
C. conditioning.
D. a conditioned response.

Question 3
In classical conditioning, an unlearned involuntary response to an unconditioned stimulus is called a/an
A. neutral stimulus.
B. conditioned stimulus.
C. unconditioned response.
D. conditioned response.

Question 4
In operant conditioning, an antecedent stimulus enables the organism to
A. respond automatically to a specific stimulus.
B. perform a previously learned response that has remained unexpressed due to the absence of a reinforcer.
C. predict the likely consequence for a specific response.
D. distinguish between responses that will and will not impact on the environment.

Question 5
A mother asks her daughter to switch off the television. The daughter refuses because her favourite program is on. The mother reacts to her daughter's disobedience by sending her to the laundry, where she is required to sit and do nothing for 10 minutes.

In this example, sending the daughter to the laundry is an example of
A. positive reinforcement.
B. negative reinforcement.
C. positive punishment.
D. negative punishment.

Question 6
Social learning theory was devised by
A. Watson.
B. Skinner.
C. Pavlov.
D. Bandura.

Question 7
In classical conditioning, the learner is relatively _____ when either the neutral or unconditioned stimulus is presented; whereas in operant conditioning the learner must be _____ to obtain a reinforcer.
A. active; neutral
B. passive; active
C. passive; neutral
D. active; passive

Question 8
In classical conditioning there is always a specific _____ that elicits the desired response, whereas in operant conditioning the _____ must first produce the desired response.
A. operant; stimulus
B. reflex; learner
C. stimulus; learner
D. reflex; reinforcer

Question 9
A factory worker decides that timing a trip to the toilet to coincide with weekly team meetings with his supervisor and other factory workers allows him to avoid being reprimanded for not working hard enough. In this situation, going to the toilet to avoid being told off is an example of
A. positive reinforcement.
B. negative reinforcement.
C. punishment.
D. stimulus generalisation.

Question 10
Which of the following is **not** an example of observational learning?
A. A new student learns vicariously that Mr Brown puts poorly behaved students on detention.
B. A piano student watches the technique of her instructor to learn how to play a difficult piece of music.
C. A teacher works alongside a school principal for a week to learn about the role.
D. A student whose VCE results are very disappointing learns how much work was required to achieve the university entrance score she needed.

Question 11

As a child you were playing in the backyard one day when a big black crow landed near you. Your father suddenly screamed and snatched you into his arms. His unusual behaviour caused you to cry. You now have a fear of big black birds.

Your reaction of crying when your father grabbed you is the _____ , and the fear of big black birds you now have is the _____ .

A. unconditioned response; conditioned response
B. conditioned response; unconditioned response
C. neutral stimulus; unconditioned response
D. unconditioned stimulus; neutral stimulus

Question 12

During classical conditioning, the _____ is paired with the _____.

A. conditioned stimulus; conditioned response
B. neutral stimulus; unconditioned stimulus
C. unconditioned stimulus; unconditioned response
D. conditioned stimulus; neutral stimulus

Question 13

When spontaneous recovery occurs,

A. the organism demonstrates the conditioned response without the presentation of any stimulus.
B. the conditioned stimulus elicits a conditioned response even though it had previously been extinguished.
C. the organism demonstrates a much stronger conditioned response than it had during acquisition.
D. the conditioned response is elicited by a stimulus that is different from the antecedent or conditioned stimulus.

Question 14

Jason remembers seeing his brother James sustain a serious injury as a result of sticking his arm out of a car window. Since the incident, Jason has never attempted to put his arm, or any other part of his body, out the window of a moving vehicle.

In this example, Jason has observed _____ , and has been vicariously _____ not to repeat his brother's behaviour.

A. reinforcement; punished
B. modelling; conditioned
C. punishment; conditioned
D. reinforcement; conditioned

Question 15

According to social learning theory,

A. learning may be unexpressed unless a person is motivated to reproduce observed behaviour.
B. learning may be described as any change in behaviour.
C. an antecedent must be present for a particular learned response to occur.
D. reinforcement is a vital element of classical conditioning.

Question 16

If a rat in a Skinner box presses a lever for reinforcement when a buzzer is sounded but never when a bell is sounded, then _____ is apparent.

A. involuntary behaviour
B. stimulus discrimination
C. stimulus generalisation
D. extinction

Question 17

Bianca teaches her pet rabbit to come to her when she makes a short, high-pitched whistling sound. At first, she gently approaches the rabbit, whistling and holding a carrot, but stops within half a metre or so of the rabbit. The rabbit approaches and nibbles the carrot. Gradually, Bianca expands the distance between herself and the rabbit. Every time Bianca whistles, she presents the carrot. Eventually, the rabbit learns that approaching Bianca after hearing a whistle generally results in a reward.

This example illustrates the use of

A. spontaneous recovery.
B. negative reinforcement.
C. stimulus generalisation.
D. positive reinforcement.

Question 18

A difference between negative reinforcement and punishment is that negative reinforcement _____ a response, whereas punishment _____ a response.

A. strengthens; weakens
B. always involves an unpleasant consequence for; does not necessarily elicit
C. weakens; strengthens
D. always involves a pleasant consequence for; always elicits

Question 19

Which of the following presents observational learning processes in the correct order?

A. attention, retention, reproduction, motivation, reinforcement
B. attention, retention, motivation, reinforcement, reproduction
C. attention, reproduction, retention, motivation, reinforcement
D. attention, reproduction, retention, reinforcement, motivation

Question 20

An operant is any behaviour that

A. is triggered by a stimulus from the environment.
B. is reflexive or involuntary.
C. elicits a response.
D. affects the environment.

SECTION B — Short-answer questions

Answer **all** questions in the spaces provided. Write using blue or black pen.

Question 1 (2 marks)
Define the meaning of learning.

Question 2 (1 mark)
What distinguishes response cost from other forms of punishment?

Question 3 (2 marks)
Distinguish between classical and operant conditioning in relation to each of the following features.
(a) Timing of the stimulus and response 1 mark

(b) Nature of the response. 1 mark

Question 4 (5 marks)
Research studies have found that adolescents are more likely to begin smoking cigarettes if their parents, siblings and friends smoke. Explain this finding in terms of the observational learning model.

Question 5 (4 marks)
Mr Ying is a young, handsome Psychology teacher who has just been appointed to a girls' college. Unfortunately, his Psychology class is so distracted by his appearance that they find it difficult to focus on their work and on his instructions. There is a lot of giggling, whispering and a general lack of attention. Mr Ying is determined to make a good impression with his classroom control and with his teaching methods. He decides to use detention as a means of pulling the girls' behaviour into line. He runs a lunchtime detention session for six girls whose behaviour has been the worst. In the next class, not only do these six girls misbehave, but they are joined at the next detention by four others. This trend continues until it's not long before almost the entire class is on detention.
(a) Which operant conditioning procedure is Mr Ying trying to use to change the girls' behaviour? 1 mark

(b) Explain whether this procedure will be effective. 2 marks

(c) How could Mr Ying change his strategy with the girls and still use operant conditioning? 1 mark

Question 6 (8 marks)

During a close soccer match, an opponent tackles Jack roughly. Jack retaliates by starting a fight with the opponent. Jack's coach considers the behaviour unacceptable and suspends him for one match, which also means Jack won't get paid for playing at a time when he needs the money. When Jack next plays and is again tackled roughly, he reacts by telling off the player and complaining to the referee, stopping short of starting another fight.

(a) Explain whether the scenario is an example of positive or negative reinforcement or punishment. 2 marks

(b) Analyse and describe the scenario in terms of the three-phase model of operant conditioning. 6 marks

Question 7 (2 marks)

What do the experimental results in the following graph suggest about timing of reinforcement as a variable that influences its effectiveness?

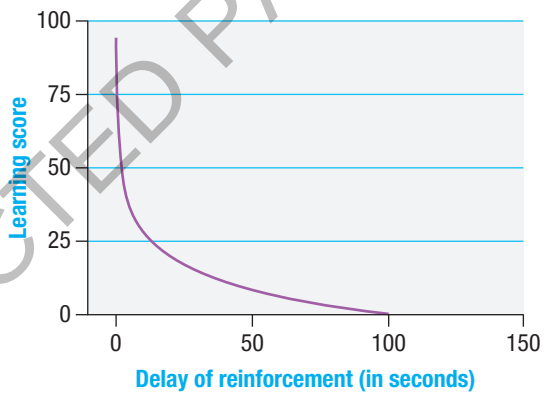


FIGURE 5.46

The following information relates to questions 8–11. (7 marks)

A researcher wanted to demonstrate that children of three and four years of age could be influenced by behaviour they observed around them.

The researcher selected two groups of ten children, ensuring that they were as alike as possible in age, intelligence and personality. The children were then randomly allocated to each of two different groups. Each group watched a different Punch and Judy puppet show. Group A, which consisted of seven girls and three boys, saw Punch behaving very badly. He laughed when he saw Judy fall over and wouldn't help her to stand up. Group B, which consisted of six girls and four boys, saw Punch become upset when Judy fell over and went to help her straight away.

The children were then observed in their playgroups for the next week and the number of times each child ignored another who was upset or went to help was counted.

The results are shown in the following table.

Group	Offers to help	Times ignored
Group A	7	18
Group B	21	5

Question 8 (1 mark)
Name the experimental research design.

Question 9 (2 marks)
Identify the operationalised independent and dependent variables.

Question 10 (2 marks)
Formulate a research hypothesis for the experiment that would be supported by the results obtained.

Question 11 (2 marks)
Explain whether the results support Bandura's observational learning model.

Return to the checklist on page 16 and complete your self-assessment of areas of key knowledge where you need to do more work to improve your understanding.

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The answers to the multiple-choice questions are in the answer section at the end of this book and in eBookPLUS.

The answers to the short-answer questions are in eBookPLUS.

Note that you can also complete Section A of the chapter test online through eBookPLUS and get automatic feedback. **int-0000**