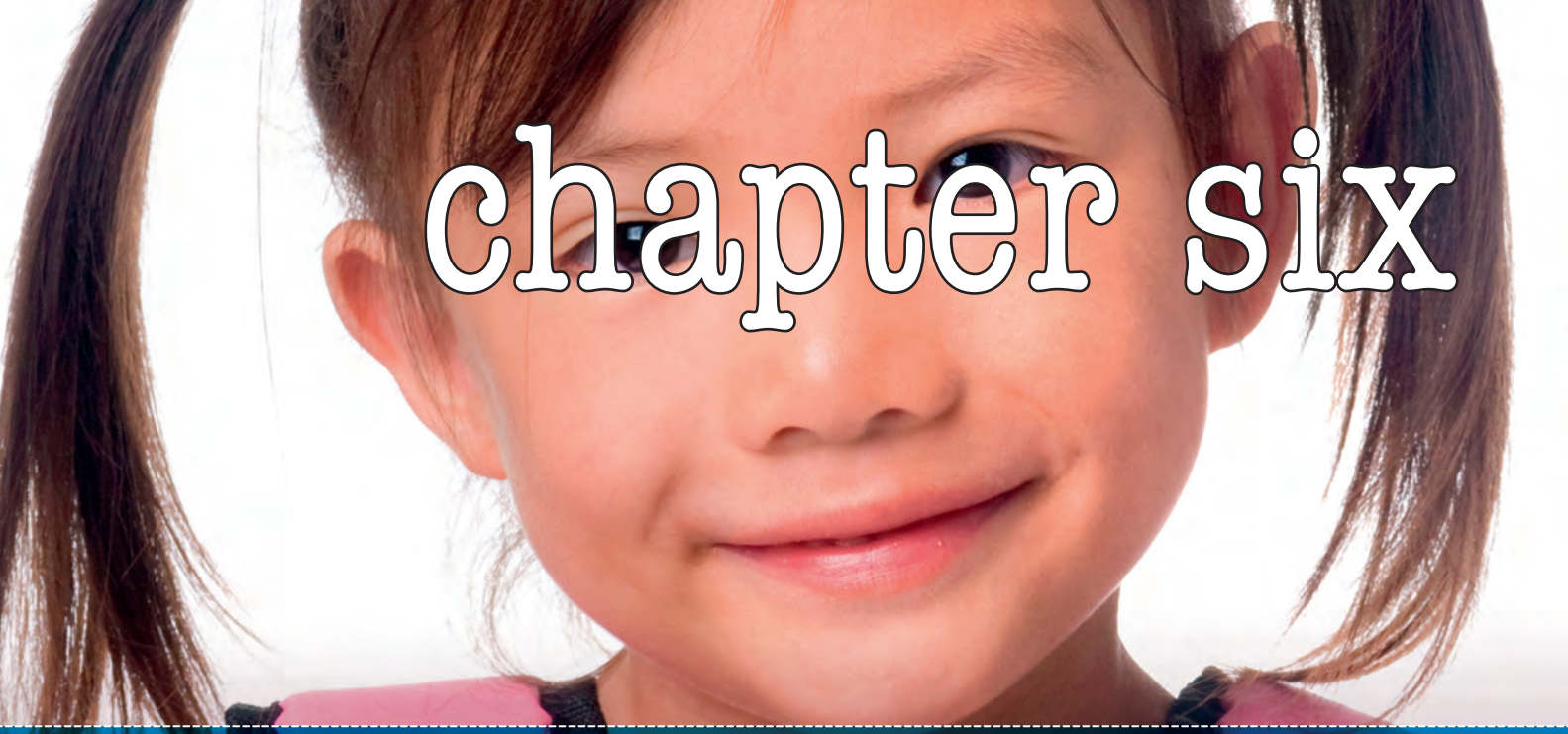


chapter six

Learning theories

Key knowledge and skills

This knowledge includes:

- applications of, and comparisons of, learning theories:
  - classical conditioning as informed by Ivan Pavlov: roles of neutral, unconditioned, conditioned stimuli; unconditioned and conditioned responses
  - applications of classical conditioning: graduated exposure, aversion therapy, flooding
  - three-phase model of operant conditioning as informed by B. F. Skinner: positive and negative reinforcement, response cost, punishment and schedules of reinforcement
  - applications of operant conditioning: shaping, token economies
  - comparisons of classical and operant conditioning in terms of the processes of acquisition, extinction, stimulus generalisation, stimulus discrimination, spontaneous recovery, role of learner, timing of stimulus and response, and nature of response (reflexive/voluntary)
  - one-trial learning with reference to taste aversion as informed by John Garcia and Robert A. Koelling (1966)
  - trial-and-error learning as informed by Edward Lee Thorndike's puzzle-box experiment
  - observational learning (modelling) processes in terms of the role of attention, retention, reproduction, motivation, reinforcement as informed by Albert Bandura's (1961, 1963a, 1963b) experiments with children
  - insight learning as informed by Wolfgang Köhler
  - latent learning as informed by Edward Tolman
- the extent to which ethical principles were applied to classic research investigations into learning including John Watson's 'Little Albert' experiment
- research methods and ethical principles associated with the study of learning, as outlined in the introduction to the unit.

These skills include the ability to:

- formulate research questions and construct testable hypotheses
- use research literature to demonstrate how psychological concepts and theories have developed over time
- process and interpret information, and make connections between psychological concepts and theories
- apply understanding to both familiar and new contexts
- evaluate the validity and reliability of psychology-related information and opinions presented in the public domain
- analyse issues relating to and implications of scientific and technological developments relevant to psychology.


LEARNING THEORIES
Classical conditioning
Pavlov
Neutral stimulus
Unconditioned stimulus
Conditioned stimulus
Unconditioned response
Conditioned response
Applications of classical conditioning
Graduated exposure
Aversion therapy
Flooding
Operant conditioning
Skinner
Reinforcement
Schedules of reinforcement
Punishment
Response cost
Applications of operant conditioning
Shaping
Token economies
Trial-and-error learning
Thorndike
Law of effect
Puzzle box experiment
One-trial learning
Taste aversion
Garcia & Koelling
Insight learning
Köhler
Preparation
Incubation
Illumination
Verification
Observational learning
Bandura
Attention
Retention
Reproduction
Motivation
Reinforcement
Bo-Bo doll experiments
Ethics
Watson's 'Little Albert' experiment
Latent learning
Tolman

The basics of learning

What produces learning? You may think that simply repeating a response or a behaviour means that it has been learnt. But this is not necessarily the case. For example, you could close your eyes and swing a tennis racquet hundreds of times without learning anything about actually hitting a tennis ball. So how do we learn skills such as how to play tennis? In order to understand the process of learning, we must understand some of the basic principles behind it.

Reinforcement is the key to some learning. Reinforcement refers to any event that increases the likelihood that a response will occur again. A response is any identifiable behaviour that is elicited by (produced as a result of) a stimulus. Responses may be observable actions, such as blinking or turning a doorknob, or they can also be internal behaviours, such as having a fast heart beat. A stimulus is any object or event that elicits a response.

Reinforcement can assist the learning process in a number of ways. To teach a dog a trick, you could reinforce correct responses by offering a food reward each time the dog performs the trick. Similarly, you could teach a child to be tidy by praising them for picking up their toys. Reinforcement can also occur in other ways. For instance, if a girl gets stung by a bee, she may learn to fear bees. In this case, the girl's fear is reinforced by the pain she feels immediately after seeing the bee.

How do we know if learning has taken place? Unlocking the secrets of learning begins with noting what happens before and after a response. Events that precede (or come before) a response are called antecedents. The effects of a response are the consequences.

There are many different ways to learn, and these are not necessarily independent of each other. How an organism learns depends on the situation and can vary for each individual. We will now examine some different types of learning that use these principles.

Classical conditioning

If you own a dog and walk it regularly, you may find that your dog can tell when it is time for a walk – whenever you pick up its lead, the dog leaps about excitedly. The dog has learnt to associate you picking up the lead with going for a walk, and this learning is the result of classical conditioning, a basic type of learning.

Classical conditioning (also known as *Pavlovian* or *respondent* conditioning) is a form of learning based on the repeated association of two normally unrelated stimuli. At its core, classical conditioning depends on reflex responses. As mentioned in the previous chapter, a reflex is a dependable, innate stimulus-and-response connection. For example, your hand reflexively draws back from a hot substance, bright light causes the pupil in the eye to narrow, and various foods elicit salivation. These reflexes are *unconditioned*, or in-built.

To begin learning via classical conditioning, we need a stimulus that reliably triggers a reflex response. Imagine, for example, that a puff of air (the stimulus) is aimed at your eye. The air-puff makes you blink (a reflex-based response) every time. Now, assume that we sound a horn (another stimulus) just before each puff of air hits your eye. This process is repeated many times, and soon the sound of the horn alone makes you blink, and the puff of air is not necessary. So, what happened? Clearly, you've learnt something: previously, the horn did not make you blink, but now it does. This is an example of classical conditioning.

Learning by classical conditioning is evident when, after a stimulus that elicits a reflex response is repeatedly linked with a new stimulus that previously did not elicit a response, the new stimulus elicits the response on its own (see Figure 6.1).

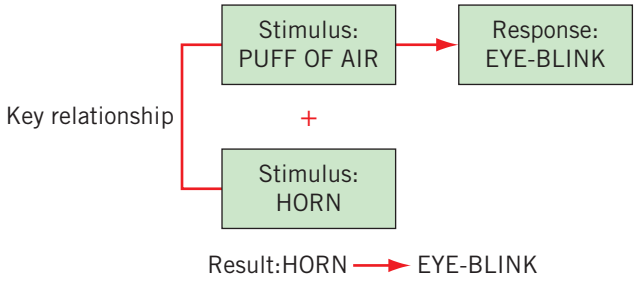


Figure 6.1 In classical conditioning, a stimulus that does not elicit a reflex response is paired with a stimulus that does. After many such pairings, the stimulus that previously had no effect begins to produce a response on its own.

reinforcement
Any event that increases the likelihood that a response or behaviour will occur again

response
Any identifiable behaviour, external or internal, that is elicited by a stimulus

stimulus
Any object or event that elicits a response

antecedent
An event that comes before a response

consequence
An event that comes after a response; the effect of the response

classical conditioning
A form of learning where two normally unrelated stimuli are repeatedly linked so that existing reflex responses are elicited by new stimuli; also known as Pavlovian or respondent conditioning

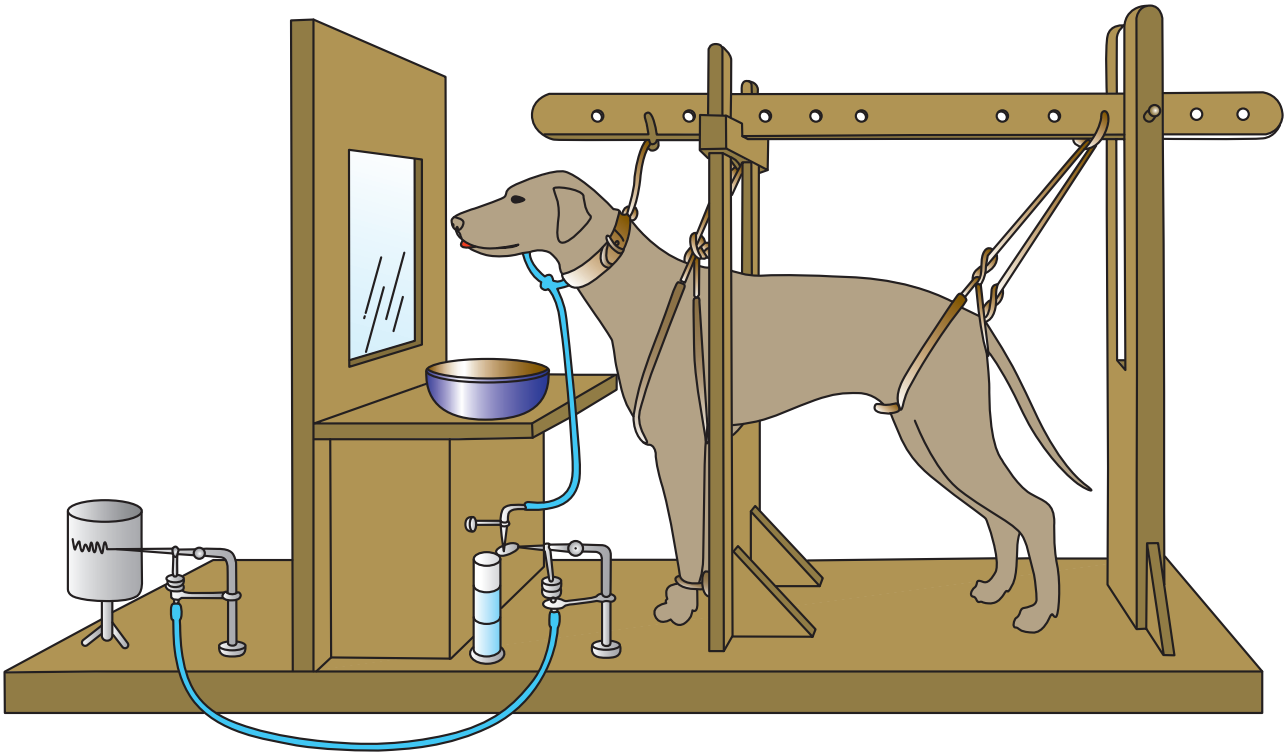


Figure 6.2 An apparatus more complex than, but similar to, that used in Pavlov's experiments: A tube carries saliva from the dog's mouth to a lever that activates a recording device (far left).

HISTORY OF CLASSICAL CONDITIONING

In the beginning of the 20th century, something happened in the laboratory of Russian physiologist Ivan Pavlov that would bring him lasting fame. It was this: Pavlov's subjects drooled at him.

Pavlov was studying the digestive system and salivary glands, and his participants were dogs. The dogs were placed in a soundproof room and a restraining apparatus kept them in position. A tube was surgically attached to the dogs' salivary glands, and this fed their saliva into a cup so that it could be measured (see Figure 6.2).

To produce salivation, Pavlov placed meat powder or some food tidbit on the dogs' tongues. After doing this many times, Pavlov noticed that his dogs were salivating *before* the food reached their mouths. Later, the dogs even began to salivate as soon as they saw Pavlov or his assistants enter the room. Was this misplaced affection? Pavlov knew better.

Salivation is normally a reflex response. You start to salivate so that your body can get ready to break down and digest food. For the animals to salivate at the mere sight of Pavlov, some type of learning must have occurred. Pavlov realised that the dogs had learnt to expect that they would be given food when a person entered the room, because they had learnt the association between people and food. They already had the in-built or reflexive response to salivate when food was presented; thus, they began to salivate at the mere sight of a person, in anticipation of the food that would closely follow. Pavlov called this type of learning classical conditioning.

Pavlov's conditioning experiments

After Pavlov's initial observations, he began his famous experiments into classical conditioning. To begin, he chose a neutral stimulus (NS). A neutral stimulus is a stimulus that does not elicit any response before learning has occurred. Pavlov chose a bell to use as his NS, because the sounds of the bell did not elicit any kind of response in the dogs. Because Pavlov knew that meat powder would cause the dogs to salivate, he called the meat powder the unconditioned stimulus (UCS). The UCS is the stimulus that is innately capable of eliciting a reflex response. Pavlov also gave the actual reflex response a name – he called it the unconditioned response (UCR) (or non-learnt response).

In his first experiments, Pavlov rang the bell (NS) so the dogs could hear it, then immediately placed meat powder on the dogs' tongues (UCS), which automatically caused the reflex of salivation (UCR). This process was repeated many times: bell > meat powder > salivation. Eventually, as conditioning took place, the dogs began to salivate when they heard the bell and they no longer needed the meat powder to elicit salivation. By association, the bell, which had previously had no effect, began to evoke the same response as the meat powder.

When this happened, the bell was no longer a neutral stimulus. It had become a conditioned stimulus (CS) – a stimulus that, because of learning, will elicit a specific reflex-based response. When the dogs began to salivate at the sound of the bell, this was a new response to the previously neutral stimulus (now the conditioned stimulus) that had occurred as a result of learning. Therefore, we refer to the new salivation response as a conditioned response (CR) – that is, a learnt response to a previous NS. Figure 6.3 gives an overview of this process.

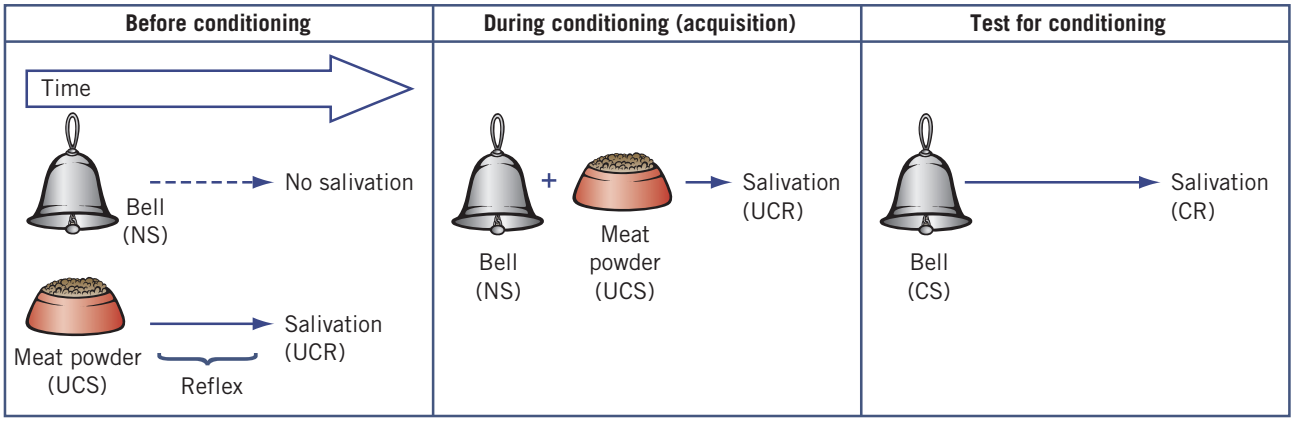


Figure 6.3 The classical conditioning process: After being paired with the unconditioned stimulus (UCS) that produced the unconditioned response (UCR), the neutral stimulus (NS) becomes the conditioned stimulus (CS), producing the conditioned response (CR).

PRINCIPLES OF CLASSICAL CONDITIONING

Pavlov soon discovered that the learning that takes place during classical conditioning procedures is subject to a number of principles. If we wanted to observe these principles in action, we might, for example, try to recreate a version of Pavlov's classical conditioning procedure, where we conditioned a dog's salivation response to a bell. The dog's reactions might then be used to explore the following principles of classical conditioning.

Acquisition: Gaining the knowledge

Acquisition refers to the learning (conditioning) itself; the acquiring or gaining of knowledge or skill. The acquisition process refers to the overall period of time taken to acquire the learnt response; that is, the period during which several trials are carried out and learning takes place. In classical conditioning, the NS must be presented with the UCS numerous times in order to become the CS – all these trials make up the acquisition process.

The acquisition phase is the period of time between the presentation of the CS and the UCS. As we know, in order to acquire a behaviour through classical conditioning, a conditioned response must be reinforced (strengthened) during training. In classical conditioning, reinforcement occurs when the CS is immediately followed by, or paired with, an UCS – so, in our recreated experiment with the dog, we must link the food (UCS) with the bell (CS). It has been found that conditioning will be most rapid if the UCS (food) follows *immediately* after the CS (the bell) and hence the acquisition phase is minimal. With most reflexes, the optimal delay between the presence of the CS and UCS is from half a second to about five seconds (Schwartz & Robbins, 1995). When the delay between the presentation of the CS and the UCS is any longer than five seconds, the conditioned behaviour is generally not acquired as the organism does not appear to associate or link the two together.

Extinction and spontaneous recovery: Gone but not forgotten

After conditioning has occurred, what would happen if the UCS no longer followed the CS? If the UCS *never* again follows the CS, the CR will eventually extinguish. Let's return to the dog and the bell. If you ring the bell (CS) many times and do not follow it with food (UCS), the dog's expectancy that 'bell precedes food' will weaken. As this occurs, the dog will lose its tendency to salivate (CR) when it hears the bell. Thus, we see that a classically conditioned response can be weakened by removing reinforcement – in this example, the food no longer reinforces the bell. This gradual decrease in the strength or frequency of a response that has been conditioned, when the UCS is no longer present, is called extinction.

neutral stimulus (NS)
A stimulus that does not naturally elicit any specific response

unconditioned stimulus (UCS)
A specific stimulus that is innately capable of eliciting a reflex response

unconditioned response (UCR)
The natural, automatic response to a specific unconditioned stimulus

conditioned stimulus (CS)
A stimulus that evokes a specific response due to learning

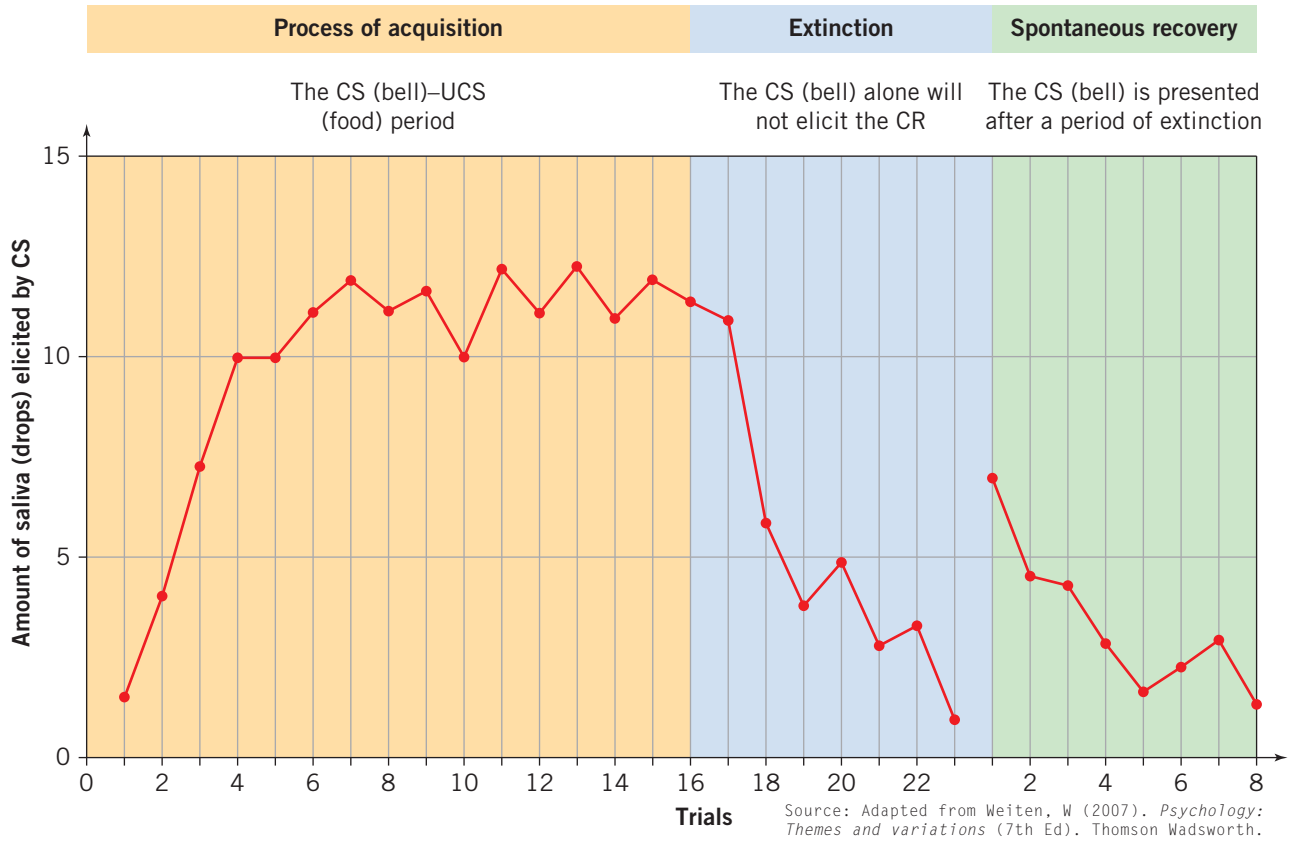
conditioned response (CR)
A reflex response to a previously neutral stimulus that occurs after learning has taken place

acquisition
The learning itself; the gaining (acquiring) of knowledge or a skill

acquisition process
The process of learning the conditioned response

acquisition phase
The period of time between presentation of a stimulus and receiving reinforcement

extinction
The gradual decrease in strength or frequency of a conditioned response when the unconditioned stimulus is no longer available



Source: Adapted from Weiten, W (2007). *Psychology: Themes and variations* (7th Ed). Thomson Wadsworth.

Figure 6.4 Graph of the results of one of Pavlov's experiments, showing acquisition (learning), extinction (when the CS is presented a number of times alone) and spontaneous recovery after a period of extinction

Several extinction sessions may be necessary to completely reverse conditioning. If the bell is rung until the dog stops salivating, it might seem that extinction of the CR is complete. However, if the bell is again rung after a period of apparent extinction, the dog may suddenly produce the CR and start to salivate. The reappearance of a CR following a period of apparent extinction is called spontaneous recovery. This response, however, is usually weaker and more short-lived than the original CR.

Figure 6.4 shows the acquisition process, extinction and spontaneous recovery.

Figure 6.5 This cat has learnt to salivate when it sees a cat food box. Because of stimulus generalisation, it also salivates when shown a similar-looking box of washing powder.

Stimulus generalisation: They all look the same to me

After conditioning, stimulus generalisation occurs when stimuli *similar* to the CS trigger the CR (see Figure 6.5). For example, we might find that our dog salivates to the sound of a ringing telephone or doorbell, because these sounds are similar to the sound of the bell used as the CS.

Stimulus generalisation explains why many shops carry imitations of nationally-known products. For many customers, positive attitudes conditioned to the real products tend to generalise to the cheaper knock-offs (Till & Priluck, 2000).

An example of stimulus generalisation is when you condition a person to blink each time you play a particular note on a piano. If you play slightly higher or lower notes that are similar in pitch to the conditioned note, blinking may occur almost as often as when the correct note is played – so, generalisation occurs. However, as these new stimuli become less similar to the original CS, generalised responding decreases. If the notes you play are significantly higher or lower and bear little resemblance to the conditioned note, the person is not likely to blink in response (see Figure 6.6). If the person does not blink when notes other than the correct note are played, they have learnt to *discriminate*.

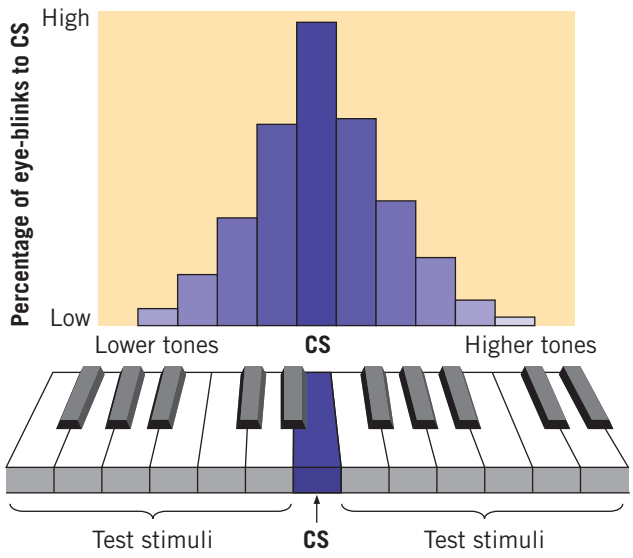


Figure 6.6 A person conditioned to blink when a particular note is played (CS) is less likely to respond as the notes become more dissimilar to the CS.

Stimulus discrimination: Knowing the difference

Let's consider one more idea with our dog. Suppose the dog is again conditioned with the bell as the CS. As an experiment, we occasionally sound a horn instead of the bell but never follow it with the UCS (food). The dog will not salivate to the sound of the horn because it perceives the horn to be a different stimulus to the CS (the bell). The dog has now learnt to *discriminate*, or respond differently, to the different stimuli even though they may sound similar – the bell produces salivation but the horn does not. Stimulus discrimination, therefore, is the ability to respond differently to various stimuli that may be similar.

Figure 6.7 gives an overview of the classical condition principles you have learnt. View 'Videolink: Classical conditioning' to see an overview of Pavlov and his experiments. In 'Try it yourself 6.1' you can investigate everyday examples of classical conditioning.

VIDEO
Classical conditioning

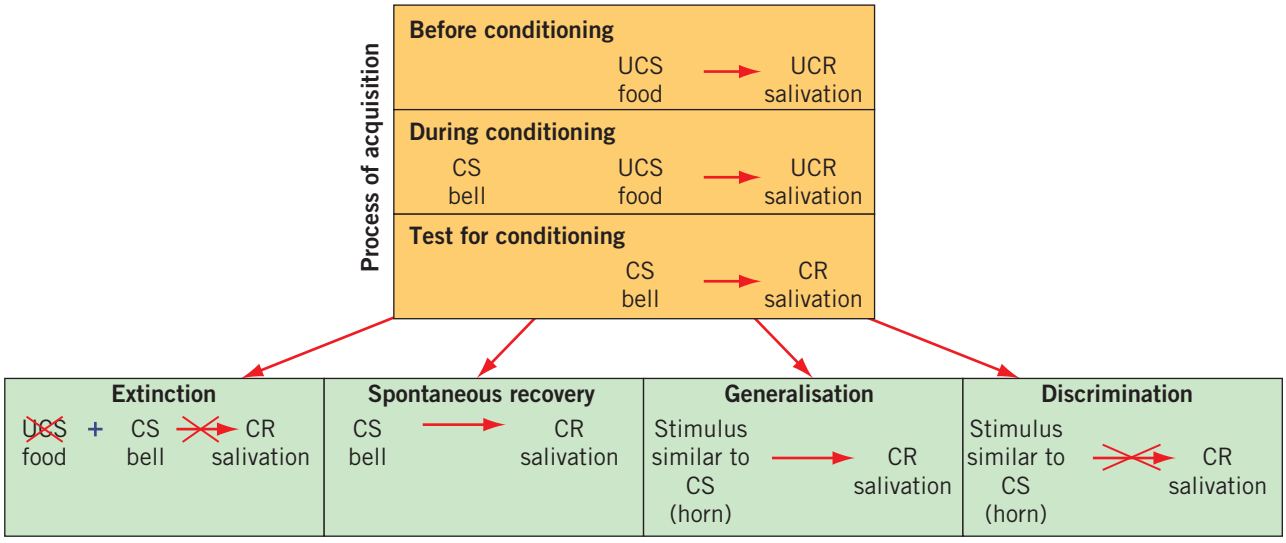


Figure 6.7 Classical conditioning: A summary of the processes of acquisition, extinction, spontaneous recovery, generalisation and discrimination

TRY IT YOURSELF 6.1
Everyday classical conditioning

Classical conditioning influences human behaviour in many ways. To highlight examples of classical conditioning in everyday life, students should note down behaviours they observe that illustrate classical conditioning principles.

For example:

- In class, as a teacher's voice lowers, students stop making noise and pay attention
- As the time on the clock approaches the end of the period, students start packing up their books
- At home, the doorbell rings and your brother or sister doesn't move, but when their mobile phone rings they bolt for the phone
- A particular song comes on the radio and you change the station

Collect at least five examples of different situations you observe and bring them to class. In small groups, develop the examples into scenarios and explain them using the principles of classical conditioning. For each scenario, construct a table that identifies the NS, UCS, UCR, CS and CR. These scenarios can be used for revision at a later date.

spontaneous recovery
The reappearance of a conditioned response to the conditioned stimulus after a period of apparent extinction

stimulus generalisation
When stimuli similar to the conditioned stimulus produce the conditioned response

stimulus discrimination
The ability to discriminate between stimuli so that only a specific stimulus produces the conditioned response

[ISBN 9780170182966]

CHECK YOUR UNDERSTANDING 6.1

1 In _____ conditioning, the repeated pairing of the NS and the UCS will result in an _____ that will produce the _____.

2 In classical conditioning, Pavlov found that after repeatedly pairing a bell with food, a dog will salivate when the bell is presented. Salivation to the bell is a(n):

A unconditioned stimulus.

B unconditioned response.

C conditioned stimulus.

D conditioned response.

3 If you touch a hot stove with your hand, you will reflexively pull away. According to Pavlov, pulling your hand away from the stove would be termed a(n):

A unconditioned stimulus.

B unconditioned response.

C conditioned stimulus.

D conditioned response.

4 Identify the NS, UCR, UCS, CR and CS in the following example.

As a child, you were playing in the backyard one day when a neighbour's pet cockatoo flew into the yard. It did not bother you, but your mother (who is terrified of birds) screamed, snatched you into her arms and ran inside with you. Her behaviour caused you to cry. You now have a fear of cockatoos, and when you see one you start to feel scared.

5 Match each term with its definition.

a	Spontaneous recovery	**i**	The ability to discriminate between stimuli so that the individual is only conditioned to respond in a particular way to one stimulus
b	Stimulus generalisation	**ii**	The gradual decrease in the strength or rate of a response when the unconditioned stimulus is not present
c	Stimulus discrimination	**iii**	The reappearance of a conditioned response after its apparent extinction
d	Extinction	**iv**	The tendency for similar stimuli to produce the same, but not necessarily identical, response
e	Acquisition phase	**v**	The first step in classical conditioning, when a behaviour is learnt

APPLICATIONS OF CLASSICAL CONDITIONING

Classical conditioning principles can be applied to a variety of situations, including those involving behavioural therapy (see also chapter 8). During behavioural therapy, classical conditioning principles are used to treat people with maladaptive behaviours. Maladaptive behaviours are behaviours that are considered unhealthy or socially unacceptable, such as biting your fingernails, smoking or consuming excessive amounts of alcohol. This type of therapy is based on the premise that the unwanted behaviour is a product of learning; therefore, this learnt behaviour can be *un*learnt.

Behavioural therapy applies the same principles used to explain how the maladaptive behaviour was acquired in the first instance to eliminate or reduce the unwanted behaviour. It attempts to change behaviour by applying the principles of many types of learning, including classical conditioning, operant conditioning and observational learning (which we will learn about later). Let's look at how behaviour therapy can be used to treat maladaptive behaviour using classical conditioning.

Graduated exposure/systematic desensitisation

The terms graduated exposure and systematic desensitisation mean the same thing, and they can be used interchangeably. In this chapter we will use the term *graduated exposure*.

Graduated exposure is a therapy used to reduce a phobia (also known as a *specific phobia*). A phobia is an intense and irrational fear or aversion to an object, situation or thing, which persists over time. A phobia can cause extreme distress and impact negatively on a person's ability to do everyday things. (Phobias will be covered in more detail in chapter 8.) Many phobias have their source in classical conditioning because they result from experience – they are learnt associations between objects/situations and unpleasant experiences.

Graduated exposure involves slowly exposing a person to the phobia-causing stimulus in a series of gradual steps, under relaxed conditions. It is based on the assumption that you cannot simultaneously be fearful and relaxed. It assumes that if you can relax when facing a fear-provoking stimulus, then you can gradually eliminate your fear over a number of repeated exposures to this stimulus in the relaxed state. You learn to associate a pleasant, relaxed situation with the previously fear-provoking stimulus.

By replacing fear with relaxation, a sufferer can learn a new response to the object or situation to eliminate or reduce phobic reactions. This behaviour-modification technique uses the principles of Pavlov's classical conditioning and was devised primarily by Joseph Wolpe in the 1950s. Wolpe reasoned that if a fear response can be learnt through conditioning, then it can also be unlearnt using conditioning. According to Wolpe (1958, 1990), graduated exposure is a form of counter-conditioning, which reverses the process of classical conditioning by associating the phobia-causing stimulus with a new conditioned response. The technique's effectiveness has been well documented (Spiegler & Guevremont, 2003). In his

studies, Wolpe found that approximately 90 per cent of participants reduced their fear greatly after using this method.

For example, if you had a phobia of heights, you might use graduated exposure to overcome this by gradually exposing yourself to more threatening situations involving heights, step by step. You might first stand halfway up a ladder, then when you are feeling relaxed you might stand at the top of the ladder. You might then climb a set of stairs on the outside of a building to the first level, then the second, then the third and so on.

We will revisit the concept of graduated exposure/systematic desensitisation in chapter 8.

Aversion therapy

Aversion therapy is probably the most controversial of the behaviour therapies and is generally used only when all other options for changing an unwanted behaviour have failed. Aversion therapy uses the principles of classical conditioning to teach some people to avoid certain maladaptive behaviours. It involves teaching a person to associate a strong unpleasant stimulus with an undesirable behaviour.

Aversion therapy is controversial due to the ethical concerns associated with causing pain or a negative emotional response in an individual (Myers, 2001). As with all types of therapy, a cost–benefit analysis on the benefits versus the side-effects should be considered before the therapy is initiated and it should only be used on voluntary participants who have been fully informed of the nature of the therapy.

Aversion therapy was developed to deal with harmful habits and addiction, and it has been used to help alcoholics control their drinking habits. A drug (UCS) that causes nausea (UCR) when mixed with alcohol is given to the individual, so that when they consume alcohol (originally a NS for nausea), the drug reacts with the alcohol and causes them to vomit and feel extreme nausea (CR). After feeling nauseous each time they drink alcohol, the individual learns to associate the nausea (CR) with drinking alcohol (a NS that has now become a CS), and quickly the person will avoid alcohol so that feeling ill is also avoided (Wilson, 1987).

While it can be effective, aversion therapy also has its limitations. For example, when the CS is no longer reinforced by the unpleasant UCS, the organism may stop responding to the CS and therefore extinction of the learned desirable behaviour will occur. Some alcoholics who use aversion therapy to help them 'beat the bottle' find that the conditioning extinguishes when they take a drink of alcohol without taking the drug. They may learn in this way that the nausea is only present when they consume the drug, and no longer associate alcohol itself with feeling nauseous. Therefore, the response does not necessarily generalise well, making treatment less effective.

Additionally, use of this therapy could cause overgeneralisation to occur, where, instead of only extinguishing the undesirable behaviour, other behaviours are also disrupted. For example, a person using aversion therapy to rid themselves of their alcohol addiction may give up alcohol but also develop an aversion to drinking any substance at all. Another criticism of using aversion therapy is that while it is aimed at reducing or extinguishing previously learnt undesirable behaviour, it does not teach appropriate alternative behaviour.

Flooding

Flooding is a form of behavioural therapy whereby an individual with a phobia or fear is exposed to the fear-producing object or situation not by degrees (as in graduated exposure), but instead in a 'flood-like' manner. That is, they are completely 'immersed' in the fear-producing situation and it is up to them to 'sink or swim'. Where graduated exposure attempts to focus on reducing anxiety levels in a series of gradual steps, flooding allows the anxiety to 'flood' in. The theory of flooding suggests that by exposing the phobic individual to the phobia-causing object or situation, the individual will survive the experience and realise that their original anxiety is not necessary. Therefore, they learn a different response to the feared stimuli. Although the flooding experience will cause extreme anxiety at the time, the fear should diminish and eventually extinguish if no real consequences appear.

For example, if you had a phobia of heights, you might be taken directly to the roof of a tall building, rather than doing it a little at a time. The experience of being 'up high' would then 'flood' your senses and you would have to work out how to calm yourself down while having that experience. As you could probably imagine, a major criticism of

graduated exposure/systematic desensitisation
: A type of behavioural therapy used to reduce a phobia, involving exposing a person to their phobia-causing stimulus or situation very slowly, by degrees, under relaxed conditions until the fear response is extinguished

phobia
: An intense and irrational fear of an object, situation or thing, which persists over time

counter-conditioning
: A behavioural therapy based on classical conditioning principles, which conditions new, pleasant responses to stimuli that trigger unwanted responses

aversion therapy
: A type of behavioural therapy that uses classical conditioning principles to change an undesirable behaviour by associating it with an unpleasant stimulus

flooding
: A form of behavioural therapy whereby an individual with a phobia is exposed to the fear-producing object or situation in a 'flood-like' manner, so they are completely immersed in the situation

[ISBN 9780170182966]

Figure 6.8 The behavioural therapy technique of flooding may be used to help a person suffering from a phobia of heights overcome their fear.

flooding is that it causes extreme anxiety for the phobic individual.

We will revisit the concept of flooding in chapter 8. 'Videolink: Dog training' presents a situation where flooding is used to decrease fear in a dog. Note that this is an example of flooding rather than graduated exposure/systematic desensitisation because even though the dog's owner is present to help calm it down, the dog has not been gradually exposed to the door – it has been placed directly in the situation.

VIDEO
Dog training

CHECK YOUR UNDERSTANDING 6.2

1 Graduated exposure refers to:
   - **A** extinction.
   - **B** the gradual use of anaesthetics to remove a fear response.
   - **C** building up tolerance to a threatening stimulus gradually.
   - **D** pairing a feared stimulus with a new, more negative response.

2 Identify the behavioural therapies described below.
   - **a** Used to reduce phobias by exposing the person to the phobia-causing stimulus or situation very slowly under relaxed conditions
   - **b** Used to reduce phobias by exposing the person to the phobia-causing stimulus or situation in an all-or-nothing manner
   - **c** Associating an undesirable behaviour with a painful or negative stimulus

3 A phobia is best defined as:
   - **A** a rational fear of a specific object or situation.
   - **B** an irrational fear of a specific object or situation.
   - **C** a response that automatically occurs when a neutral stimulus is presented.
   - **D** a response that is developed through the repeated pairing of happiness and fear.

4 Indicate whether the following statements are true (T) or false (F).
   - **a** Graduated exposure uses the theory of classical conditioning to help individuals overcome a phobia.
   - **b** Aversion therapy can be performed without informed consent.
   - **c** Flooding is a relaxing experience for an individual undergoing this therapy.
   - **d** Graduated exposure is sometimes referred to as systematic desensitisation.
   - **e** Phobias are rational and can come and go.
   - **f** Flooding would be an appropriate therapy to use on a child afraid of dogs.

5 Fill in the gaps below with the correct terms.
   - **a** _____ is a behavioural therapy in which something unpleasant is associated with a stimulus that elicits or causes an undesirable response.
   - **b** _____ is a therapy used to reduce a phobia by exposing the individual to the phobia-causing stimulus or situation very slowly under relaxed conditions, until the fear response is extinguished.
   - **c** _____ is a form of behavioural therapy whereby an individual with a phobia or fear of something is exposed to this object or situation without the benefit of relaxation.

Operant conditioning

Imagine that you are at a shopping centre and you are hungry. You are nowhere near the food court, but you spy a vending machine against the wall. You deposit your last two dollars to buy a chocolate bar. You press the button, but nothing happens. You press the other buttons, try the coin return, and look around for some help. Still nothing. Impulsively, you kick the machine. Then, as you turn away, out pops a chocolate bar plus 50 cents in change. Once this happens, chances are you will repeat the 'kicking response' in the future. If it pays off several times more, kicking vending machines may become a regular behaviour because you have learnt to associate a desired response with your action. In this case, your learning is based on operant conditioning.

Operant conditioning (also known as *instrumental* learning) is the learning process in which the likelihood of a behaviour being repeated is determined by the consequences of that behaviour. A response may be followed by the consequences of reinforcement (such as food) or punishment (such as being reprimanded), or nothing (where there is no consequence at all). These consequences determine whether the same response is likely to be repeated when an organism is presented with the same stimulus. For example,

if you wear a particular jacket and receive lots of compliments on it (reinforcement), you are likely to wear it often. If people snicker, insult you, or scream and run away when you wear the jacket (punishment), you will probably not wear it often, if at all! Reinforcers always strengthen behaviour (they 'reinforce' it), while punishment is used to suppress behaviour.

B. F. SKINNER

Burrhus Frederic Skinner was an American behavioural psychologist. Behaviourism is a theory of learning that focuses on the behaviour of animals and humans that can be objectively observed. It is not concerned about mental activity. Behaviour theorists think of learning as nothing more than the acquisition of new behaviour. Skinner's work into operant conditioning was pivotal in determining what we know about such techniques today. Some of his reinforcement techniques included teaching pigeons how to dance, play ping-pong and bowl a ball in a mini bowling alley. 'Videolink: Pigeon ping-pong' shows the results of one of these experiments.

VIDEO
Pigeon ping-pong

The Skinner box and rat studies

Most studies of operant conditioning take place in a conditioning chamber – an apparatus designed by Skinner for the study of operant conditioning in animals. For this reason, this device is often called a Skinner box. A typical Skinner box is a small, cage-like chamber. There is little in the box to stimulate the animal. The walls are bare, except for a metal lever, one or more stimulating lights, and a tray or hatch into which food pellets can be dispensed (see Figure 6.9). The operation of a Skinner box helps us to understand the process of operant conditioning.

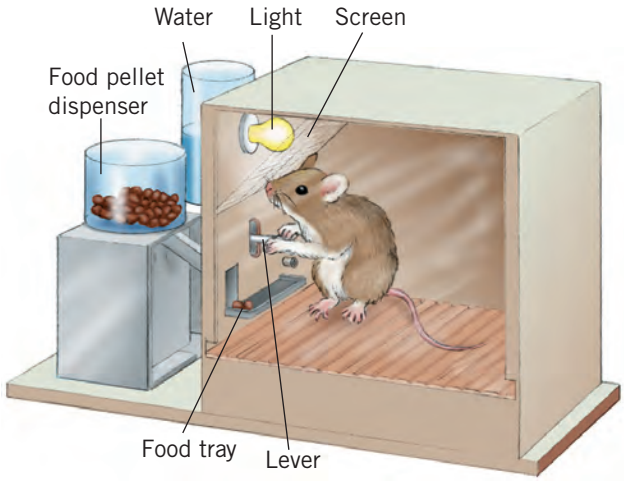


Figure 6.9 The Skinner box

In one of Skinner's experiments into operant conditioning, he placed a hungry rat inside a Skinner box. His aim was to train the rat to make a response based on receiving reinforcement. Hunger kept the rat motivated to seek out food as a reinforcer.

When Skinner placed the rat in the box, the lack of stimulation meant there was little for it to do after it had explored the corners of the cage. After investigating the cage, it ultimately (and probably accidentally) placed a paw on the lever. When the lever was pressed, a food pellet (or a drop of water) was dispensed into the tray so the rat could eat it. When the rat pressed the lever again, the same thing happened. Soon the rat settled into a pattern of pressing the lever and receiving food.

In follow-up experiments, Skinner used a light to teach the rats to know when to expect a reinforcer. When the lever was pressed and a light was illuminated, the food appeared in the tray. When the lever was pressed and the light did not illuminate, no food appeared in the tray. The rats learnt to press the lever several times until the light illuminated, then sought out their food.

We should note that in these situations the rat did not acquire new skills – the rat was already physically able to depress the lever. The food reward only altered how *frequently* the rat pressed the lever. In operant conditioning, reinforcement is used to alter the frequency of responses, or to mould them into new patterns.

Similar to classical conditioning, operant learning is based on information and expectancies. In operant conditioning, we learn that a particular stimulus is associated with a particular response, which is then associated with reinforcement (Dragoi & Staddon, 1999). From this point of view, a reinforcer tells a person or an animal that a response was 'correct' and worth repeating.

VIDEO
Skinner box

'Videolink: Skinner box' shows an experiment with a rat inside a Skinner box.

'A closer look: Further work by Skinner' outlines some further projects Skinner embarked upon after inventing his Skinner box.

operant conditioning
A learning process in which the likelihood of a behaviour being repeated is determined by the consequences of that behaviour

A CLOSER LOOK

Further work by Skinner

In 1943, with his wife pregnant, Skinner set about designing a new invention: an enclosed and heated crib with a plexiglass window. Skinner called his invention the 'Baby tender', and it was used only as a bed for the new baby. This was an early version of a modern-day humidicrib that hospitals use for premature or sick babies.

Once the Baby tender was completed, Skinner sent an article about it to the popular magazine *The Lady's Home Journal*. The journal promptly changed the name of the crib to the more attention-grabbing 'Baby in a Box' and published an article on it. Inevitably there was some confusion between the Baby tender and the well-known 'Skinner box'. After publication, Skinner was plagued by rumours about the conditions in which he kept his daughter, even though from all accounts Skinner was an affectionate father and never experimented on either of his children.

Although aeroplanes and bombs were being used in World War II, there were no missile guidance systems. In 1944, Skinner thought that he could contribute to the war efforts by training pigeons to essentially guide missiles. In training, he found that the birds could learn to peck a visual target on a screen in order to receive food. He then proposed that pigeons could be strapped inside the nose-cones of missiles and peck at a target shown on a screen in front of them. By pecking at the target, the pigeons would activate a guidance system that would keep the missile on its path.

The pigeons pecked reliably and quickly in training, but no pigeons ever had the chance to show their true colours in a real situation because the US military finally dismissed the project as impractical. The radar was also being invented at the same time, making the pigeon project redundant.

While Skinner's pigeon project was discontinued, his work was still useful. Skinner showed that pigeons behave more rapidly than rats, allowing more rapid discoveries. Skinner never again worked with rats in his experiments.

REINFORCEMENT

The idea that reward affects learning is certainly nothing new to parents (and trainers of animals). However, parents, as well as teachers, politicians, supervisors and even you, may use reward in ways that are inexact or misguided. The problem begins with the term 'reward' in itself – to be correct, it is better to say 'reinforcer'. Why? Because rewards do not always increase responding, whereas reinforcers do. What is reinforcing for one person may not be for another. For example, if you give liquorice lollies to a child as a 'reward' for good behaviour, it will work only if the child likes liquorice.

Therefore, in terms of operant conditioning, we always use the term 'reinforcer'. In operant conditioning, psychologists define an operant reinforcer as any event that follows a response and increases the probability of the response being repeated.

Reinforcement in operant conditioning must be appropriate (desirable) for the learner; otherwise they will not produce the desired response. Alternatively, if the consequence is not seen as desirable by the learner, it may act to reduce the probability of the response being repeated. For example, unless your teachers offer some type of reinforcement that you see as worthwhile to gain (such as a smile and praise or the achievement of a good grade) for completing homework, you may not do your homework. If your teacher offered you extra work as a reinforcer for doing your homework, you may find this undesirable and in the future you may not complete your homework.

Positive reinforcement

Positive reinforcement occurs when a *pleasant* or desirable event follows a response and generally *increases* or strengthens the likelihood of that response occurring again. You may have received positive reinforcement at some time during your school life; for example, when you received praise for completing a maths question or painting a beautiful portrait. Of course you are going to be pleased with this praise and will want to receive it again, so in future you will be more likely to repeat the behaviour to again receive this positive reinforcement.

Negative reinforcement

Negative reinforcement occurs when an *unpleasant* stimulus is *removed*, reduced or prevented to create a positive consequence, and this in turn *strengthens* or increases the frequency or likelihood of a desired response. So if an organism makes a desired response, then an unpleasant event or stimulus will be removed. Negative reinforcement increases the rate of responding, but it does so by ending discomfort. For example, imagine that you have a headache and in response to that headache you take an aspirin. Your aspirin-taking behaviour will be negatively reinforced if the headache stops; the likelihood of you taking an aspirin next time you have a headache is increased because you have received a positive consequence from an action that caused an unpleasant situation to end.

Positive and negative reinforcement can both be used to obtain a desired response. For example, a rat could be taught to press a lever to obtain food (positive reinforcement), or the rat could be taught to press a lever to turn off a continuous mild shock it receives through the bottom of its cage (negative reinforcement). Either way, the desired response (pressing of the lever) would increase because it leads to a desired situation (receiving food or ceasing the shock). Often, positive and negative reinforcement combine in the same situation. For example, if you are uncomfortably hungry, eating a meal is reinforced by the nice-tasting food (positive reinforcement) and also by the end to the feeling of hunger (negative reinforcement).

Schedules of reinforcement: When is it best to introduce a reinforcer?

Continuous reinforcement is a schedule of reinforcement that involves reinforcing every correct response. This is the type of reinforcement that should be used during the acquisition of learning in operant conditioning.

In continuous reinforcement, the timing between behaviour and reinforcer is also important. If you are using operant conditioning to teach a child a desirable behaviour, using reinforcers haphazardly will not change their behaviour. A child who demonstrates the helpful or courteous behaviour you desire should be praised (reinforced) immediately for their good behaviour. This is because, during the learning period, operant reinforcement is most effective when it *rapidly follows* a correct response.

Skinner demonstrated this when he taught rats to press a lever in order to obtain food. Skinner altered the time between when the rat would press the lever and when they would receive their reinforcer. He found that very little learning occurred when the delay between lever-pressing and receiving food reached 50 seconds. If the food was delayed for more than a minute and a half, no learning occurred (Perin, 1943).

Once the desired response is demonstrated consistently, continuous reinforcement should be replaced by partial reinforcement, which involves reinforcing only some correct responses. This method is more resistant to extinction than continuous reinforcement.

The story goes that Skinner discovered partial schedules of reinforcement one day when he had almost run out of food pellets. In order to make the pellets last longer, he arranged for a pellet to reinforce every second response rather than every response. So began the formal study of schedules of reinforcement.

How does partial reinforcement make a behaviour stronger? Imagine that you visited a casino to study the behaviour of people playing poker machines. You watch a player put $1 in the poker machine. They then press a button and $10 spills into the tray. The player repeats this behaviour many times, and each time they receive continuous reinforcement in the form of more payoffs. Then, suddenly, the payoffs stop. Each time the player presses the button, they receive no money. You observe that the player continues to respond several times more and then leaves.

Now, imagine that you switch your attention to another player. You see them put $1 in the machine five times in a row without payoff. Suddenly, on the sixth try, the machine returns $20. After this, payoffs continue on a partial reinforcement schedule: some occur after 10 button-presses, some after 14, and some after 17. Although many hits go unrewarded, the player continues to feed money into the machine based on the expectation that after an average of 13 or 14 button-presses, there will be a payoff. Partial reinforcement has therefore increased the likelihood that they will repeat their behaviour. However, when the payoff mechanism ceases the established pattern, the player continues a few more times and then leaves.

Partial reinforcement can be given in one of four patterns:

- Fixed ratio: A set number of correct responses must be made before obtaining reinforcement; for example, a newspaper delivery person is paid $5 for every 100 newspapers delivered. Fixed ratio schedules produce very high response rates. A hungry rat on a fixed ratio-10 schedule (where every 10th response is reinforced) will quickly make 10 responses (lever presses), pause to eat, then makes 10 more responses, as it learns that each reinforcer will appear after 10 responses. A similar situation occurs when factory workers are paid on a piecework basis – when a fixed number of items must be produced for a set amount of pay, work output is high.
- Variable ratio: A varied number of correct responses must be made before receiving reinforcement (see Figure 6.10); for example, when playing a poker machine, players keep playing even though they do not know how many dollars they will have to put in before receiving reinforcement. Variable ratio schedules also produce a high response rate.
  Variable ratio schedules seem less predictable than fixed ratio schedules, and this affects extinction.

operant reinforcer
: Any event that follows a response and increases the probability of the response being repeated (or strengthened)

positive reinforcement
: When a pleasant or desirable event follows a response and generally increases or strengthens the likelihood of that response occurring again

negative reinforcement
: When a response removes, reduces or prevents an unpleasant stimulus and creates a positive consequence; it increases or strengthens the likelihood of that response occurring again

continuous reinforcement
: A schedule of reinforcement where a reinforcer follows every correct response

partial reinforcement
: A schedule of reinforcement where a reinforcer follows only some (not all) correct responses

fixed ratio
: A type of partial reinforcement where a set number of correct responses must be made before obtaining reinforcement

variable ratio
: A type of partial reinforcement where a varied number of correct responses must be made before receiving reinforcement

[ISBN 9780170182966]

Because this type of reinforcement is less predictable, variable ratio schedules tend to produce greater resistance to extinction than fixed ratio schedules.

Figure 6.10 Golf, tennis and many other sports are reinforced on a variable ratio basis when a beginner is first learning to play. An average of one good shot in five or 10 may be all that is needed to create a sports fanatic!

- Fixed interval: After a correct response is made, a reinforcer is given after a fixed amount of time has passed. For example, you press the button that operates the pedestrian lights at an intersection, but the signal only changes after a certain amount of time has passed. These types of schedules produce moderate response rates. These are marked by spurts of activity mixed with periods of inactivity.
- Variable interval: A reinforcer is only given for the first correct response after a varied amount of time. For example, when people go fishing, they continue to throw their line in the water not knowing how long it will take for the fish to bite. The variable interval schedule of reinforcement produces slow, steady rates of response and tremendous resistance to extinction. For example, when you dial a phone number and you get a busy signal, reward (getting through) is on a variable interval schedule. You may have to wait 30 seconds or 30 minutes to get through. If you are like most people, you will doggedly dial over and over again until you achieve a connection.

In general, ratio schedules tend to produce more rapid responding than interval schedules (see Figure 6.11).

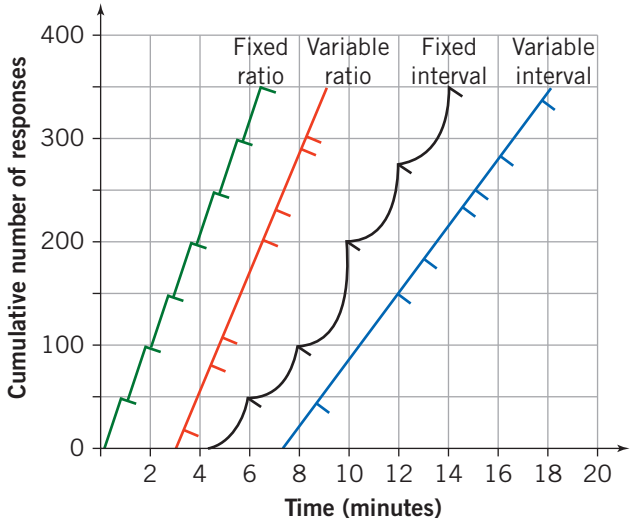


Figure 6.11 Typical response patterns for reinforcement schedules. The steeper slope indicates a faster rate of response and the marks reflect the delivery of a reinforcer. Dips in the slope indicate slower responses.

PUNISHMENT

Many people mistake negative reinforcement for punishment. However, while negative reinforcement *increases* the likelihood that a behaviour will occur again by removing an unpleasant stimulus, punishment involves a response being followed by the introduction of an unpleasant stimulus (a punisher) – and this *decreases* the likelihood of that response occurring again. Punishment, in the form of reprimands, fines, jail sentences, firings and failing grades, is commonly used to change undesirable behaviour.

The difference between negative reinforcement and punishment can be seen in a hypothetical example. Let's say your bedroom is next door to your brother's or sister's room and their stereo is blaring loudly. If you pound on the wall and the volume suddenly drops (negative reinforcement), you will be more likely to pound on the wall when they play loud music in the future. But if you pound on the wall and the volume increases (punishment), or if your sibling comes into your room and yells at you (punishment), there is less likelihood that you will pound on the wall again.

A punisher is any consequence or unpleasant stimulus that reduces the likelihood of a behaviour being repeated. It is not always possible to know ahead of time what will act as a punisher for a particular person. For example, if Jessica gets a poor grade on her psychology SAC because she spent too much time on the computer instead of studying, and her mother reprimands her for the poor grade, in the future Jessica is likely to study more and limit her use of the computer. In this instance, the reprimand was a punisher. However, if Kirsty is in the same situation as Jessica, but Kirsty is also starved for

attention of any kind from her parents, for Kirsty this reprimand might actually reinforce her poor behaviour because it results in her getting attention from her parents. In this case the reprimand is not a punisher.

Variables affecting punishment

Many people assume that punishment stops undesirable behaviour, but this is not always true. In fact, the effectiveness of punishers greatly depends on their *timing*, *consistency*, and *intensity*.

Punishment works best when it occurs as the response is being made, or immediately afterwards (timing), and when it is given each time a response occurs (consistency). Thus, you could effectively punish a dog that barks incessantly by spraying water on its nose each time it barks. Ten or 15 such treatments are usually enough to greatly reduce barking. This would not be the case if you did not apply punishment every time you heard the dog bark, or if you left it too long between the barking behaviour and the punishment. If you discovered that your dog dug up a tree in the backyard while you were not home, punishing the dog when you get home hours later will do nothing to prevent the behaviour being repeated next time you are absent.

For punishment to be effective it must be an appropriate deterrent; in other words, it must 'fit the crime'. If it is too harsh (intensity) it may lead to avoidance behaviour or fear; conversely, it must also be severe enough to act as a deterrent to repeating the undesirable behaviour.

The major limitation of using punishment is that it only tells a person or animal that a response was 'wrong'. It does not indicate what the 'right' response is, so it does not teach new, desirable behaviours. Generally speaking, punishment is painful, frustrating or both; therefore, it sets up a powerful environment for learning aggression. For example, if a child is punished, the child may feel angry, frustrated and hostile and may express their emotions by being aggressive towards someone else. If the child enjoys this aggressive act because it helps them release anger and frustration, their aggression has been rewarded and will probably be repeated again in other frustrating situations. In a study of classroom discipline problems, it was found that physical punishment, yelling and humiliation are generally ineffective in changing behaviour. However, positive reinforcement, in the form of praise, approval and reward, is much more likely to quell classroom disruptions, defiance and inattention (Tulley & Chiu, 1995). Additionally, sometimes the people associated with giving the punishment become feared, resented or disliked by those being punished.

Response cost

Isn't it also punishing to have privileges, money or other positive things taken away from you? Yes – punishment also occurs when a reinforcer or positive state of affairs is removed. This type of punishment is called response cost. If a desirable state or a reinforcer is taken away as a consequence of a particular behaviour, this will reduce the likelihood of that behaviour occurring in the future. Examples of response cost include parents who 'ground' their teenage children for misbehaviour (so, taking away their freedom) and drivers who are fined or lose their licence for breaking the road laws (so, taking away their money or their privilege to drive a car).

Table 6.1 outlines the types of consequences we have examined. Figure 6.12 shows how the consequences relate to each other.

Table 6.1 Types of consequences

CONSEQUENCE	WHAT IT INVOLVES	EFFECT ON FUTURE BEHAVIOUR
Positive reinforcement	Introducing something the organism likes	Strengthened – response likely to be repeated
Negative reinforcement	Removing something the organism doesn't like	Strengthened – response likely to be repeated
Punishment	Introducing something the organism doesn't like	Weakened – response not likely to be repeated
Response cost	Removing something the organism likes	Weakened – response not likely to be repeated

fixed interval
: A type of partial reinforcement where, after a correct response is made, a reinforcer is given after a fixed amount of time has passed

variable interval
: A type of partial reinforcement where a reinforcer is only given for the first correct response after a varied amount of time

punishment
: Any event following a response that decreases the likelihood of the response occurring again because it introduces an unpleasant stimulus

punisher
: Any unpleasant stimulus that reduces the likelihood of an unwanted behaviour occurring again

response cost
: When a reinforcer or positive state of affairs is removed following a response, and this decreases the likelihood that this response will occur again

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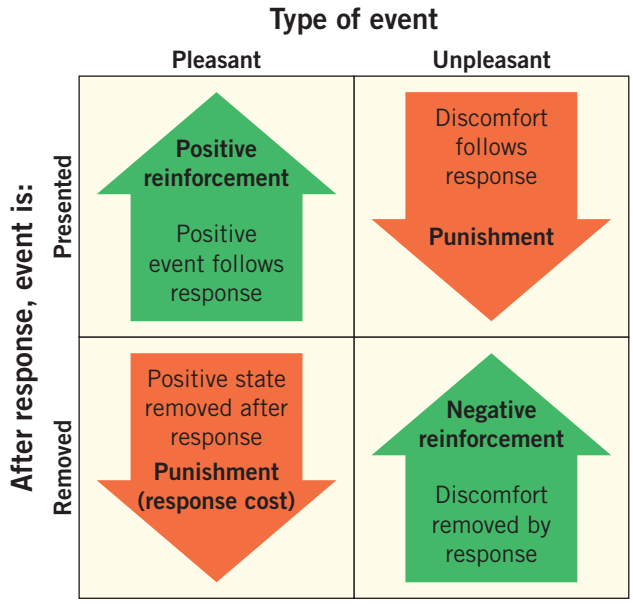


Figure 6.12 Types of reinforcement and punishment: The impact of an event depends on whether it is presented or removed after a response is made. The arrows depict the likelihood of a response occurring again in the future.

CHECK YOUR UNDERSTANDING 6.3

1 Fill in the gaps with the correct terms.

a _____ reinforcement _____ the likelihood of a behaviour being repeated in the future by applying a pleasant consequence when an organism exhibits the correct response.

b _____ decreases the likelihood of a behaviour occurring in the future by applying an unpleasant consequence to an organism when it exhibits undesirable behaviour.

c The _____ schedule of reinforcement means than an organism is rewarded after a set number of correct responses.

2 Indicate whether the following statements are true (T) or false (F).

a Reinforcement decreases the likelihood the behaviour would be repeated.

b Continuous reinforcement introduces a pleasant stimulus after a desired response has been demonstrated a set number of times.

c Negative reinforcement introduces an unpleasant stimulus and decreases the probability of a response being repeated.

3 Ashara rubbed some 'stop itch' cream on the spot where a mosquito had stung her and the itching stopped. The next week she was stung by a mosquito and immediately reached for the 'stop itch' cream. According to operant conditioning theory, this is an example of:

A positive reinforcement.

B negative reinforcement.

C punishment.

D response cost.

4 Match each term with its definition.

a	Negative reinforcement	**i**	A pleasant event follows a response that increases the likelihood of that response being repeated
b	Punishment	**ii**	Removing, reducing or preventing an unpleasant stimulus and increasing the likelihood of the response being repeated
c	Positive reinforcement	**iii**	The removal of a reinforcer to reduce an unwanted behaviour
d	Response cost	**iv**	The introduction of a negative consequence following a response

5 State whether the following scenarios are examples of positive reinforcement, negative reinforcement, punishment or response cost.

a Students are given a free bottle of orange juice when they wear the correct uniform.

b A psychologist is training rats to jump over a small hurdle. She does this by administering an electric shock to the base of their cage, which the rats can avoid if they jump.

c Sebastian studies hard to avoid his parents nagging him over his poor grades.

d Moi Leng is grounded for a month by her parents because she came home after her curfew.

e Jack is sitting at his desk daydreaming instead of working. The teacher comes and stands behind him and Jack starts working. The teacher moves away.

OPERANT EXTINCTION AND SPONTANEOUS RECOVERY

Would a rat in a Skinner box stop pressing the lever if no more food arrived? Yes, but not immediately. Learnt responses that are not reinforced gradually fade away. This process is called operant extinction, which refers to the learnt response gradually decreasing in strength or rate of response when reinforcement stops. Just as acquiring an operant response takes time, so does extinction. For example, if a TV program repeatedly bores you, your watching of the program will probably extinguish over time rather than immediately. Likewise, if there is a student who constantly disrupts the class, their behaviour may extinguish over time if they were ignored and therefore didn't receive reinforcement in the form of attention from the teacher and other students.

Even after a period of apparent extinction, the previously reinforced response may return. This is

operant spontaneous recovery. For example, if a rat is removed from a Skinner box after extinction and given a short rest, when returned to the Skinner box that contains the pellet-releasing lever, the rat will probably press the lever.

STIMULUS DISCRIMINATION AND GENERALISATION

As stated earlier, *stimulus discrimination* refers to the ability to respond differently to varied stimuli.

If a rat placed in the Skinner box is reinforced for lever-pressing when a light is on but not when it is off, responses continue to be made when the light is on, but seldom, if at all, when the light is not on. This means the he rat has learnt to discriminate between light and dark. Likewise the rat may press the lever with different amounts of force, and if only strong responses are reinforced, the rat will in turn press more forcefully. If only the weak presses are reinforced, then eventually the rat will only respond with a weak lever press.

Through operant stimulus discrimination, an organism will learn to differentiate between stimuli that signal reinforcement and non-reinforcement. As a result, their response pattern will shift to match these discriminative stimuli (stimuli that precede reinforced and non-reinforced responses).

Stimulus discrimination is demonstrated by sniffer dogs who locate drugs and explosives at airports. Operant discrimination is used to teach these dogs to recognise contraband. During training, they are reinforced only for approaching containers or bags baited with drugs, explosives or food – not simply any bags or containers (see Figure 6.13).

Is stimulus generalisation the same in operant conditioning as it is in classical conditioning?

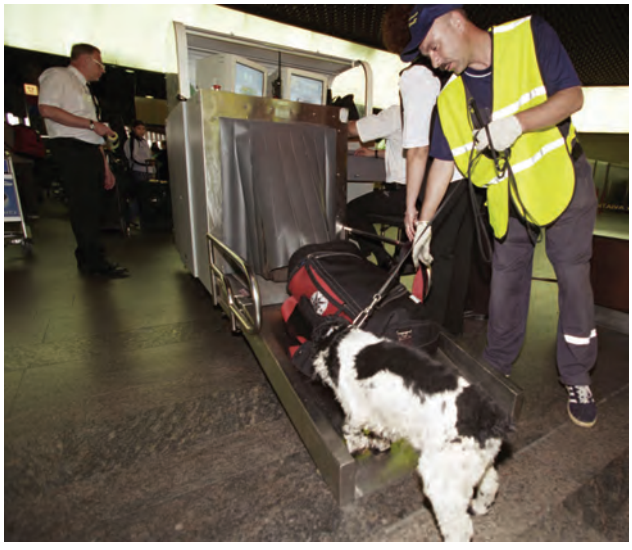


Figure 6.13 Sniffer dogs are taught to use stimulus discrimination to recognise contraband such as drugs, explosives and foods.

Basically, yes. Operant stimulus generalisation is the tendency to respond to stimuli similar to those that preceded operant reinforcement; that is, when similar stimuli produce the same (or similar) responses to a previously learned stimulus.

A rat placed in a Skinner box may learn to generalise stimuli if it is reinforced when it presses the lever after a coloured light goes on in the box. If the light is initially red and the rat receives a food pellet after it presses the lever, then the light changes to orange and the rat again receives a food pellet when it presses the lever, it may learn to press the lever no matter what colour the light is. If the stimulus is similar to the original, then a similar response may be transferred to those stimuli.

APPLICATIONS OF OPERANT CONDITIONING

Shaping

How is it possible to reinforce responses that rarely occur? Even in a barren Skinner box, it could take a long time for a rat to initially accidentally press the lever and receive a food pellet. We might wait forever for more complicated responses or series of response to occur. For example, imagine waiting for a duck to accidentally walk out of its cage, turn on a light, play a toy piano, turn off the light, and walk back to its cage. If this is the behaviour you wanted to reward, you would never get the chance.

You may have watched in awe as animals on television performed complicated tricks or tasks. These animals were taught to behave in such a way by using the technique of shaping (see Figure 6.14). Shaping involves reinforcing successive responses that closely resemble or progress towards the ultimate desired response. That is, by breaking down complex behaviours into smaller parts, the organism has to perform each step before moving on to learn the next step. Reinforcement is given only when the organism successfully accomplishes each step towards the target behaviour.

operant extinction
When the learnt response gradually decreases in strength or rate of response after reinforcement stops

operant spontaneous recovery
The reappearance of a previously reinforced response after a period of apparent extinction

operant stimulus discrimination
The ability to differentiate between stimuli similar to the stimuli that signal reinforcement and non-reinforcement

operant stimulus generalisation
The tendency to respond to stimuli similar to stimuli that precede operant reinforcement

shaping
An operant training technique that involves reinforcing successive responses that closely resemble or progress towards the desired response

[ISBN 9780170182966]

Figure 6.14 Shaping has been used to train this elephant to behave in a way that does not come naturally to it.

Shaping can be used to train an organism to complete a simple task or a complex series of tasks. If, for example, you wanted to train your dog to pull a toy cart attached to a rope, you might first start rewarding him for putting his mouth near the rope, then for grabbing onto the rope with his teeth, then for walking with the rope in his mouth, and so on. In this way, each successive response brings him closer and closer to performing the desired behaviour.

To train an organism in complex tasks, each part of that task must be taught in steps. As soon as one step is learnt, reinforcement for that step ceases, and only behaviours that move closer to accomplishing the next step are reinforced. An example of this is provided by Barnabus the rat, who was trained by psychologists at Brown University. The psychologists were able to train Barnabus to make an increasingly longer chain of responses to obtain a single food pellet, by working back from the last response to the first. Barnabus was ultimately able to climb a spiral staircase, cross a bridge, climb a ladder, pull a toy car with a chain, get into the car, pedal it to a second staircase that he would climb, wriggle through a tube, enter an elevator and descend to a platform, then press a lever to receive the food pellet (Pierrel & Sherman, 1963). In order to train Barnabus to exhibit this series of behaviours, the experimenters would have first reinforced him for climbing the spiral staircase, then for climbing the staircase and crossing the bridge, and so on until he had learnt the entire sequence of events.

VIDEO
Shaping explained

'Videolink: Shaping explained' shows a simple example of shaping in dog training.

Token economies

An individual's behaviour can also be influenced through the use of a token economy. In a token economy, desirable behaviours are rewarded with a symbolic reinforcer (a token), such as gold stars, plastic tokens or matches. These tokens can later be exchanged for tangible reinforcement such as food or privileges.

In the past, learning was very strongly tied to food, water and other primary reinforcers; it still is in some traditional societies. Primary reinforcers are natural, non-learnt and rooted in biology. They produce comfort, end discomfort, or fill an immediate physical need. Food, water and sex are obvious examples. Every time you open the refrigerator, turn up the heat or order a double latte, your actions reflect primary reinforcement.

Most of us, however, respond to a much broader range of reinforcers. Money, praise, attention, approval, success, affection, high marks at school and so on are all learnt or secondary reinforcers. Secondary reinforcers can be exchanged for primary reinforcers with a more direct value. Printed money (secondary reinforcer) obviously has little or no value on its own – you cannot eat it, drink it or sleep with it. However, it can be exchanged for food, water, lodging and other necessities (primary reinforcers). Some secondary reinforcers are intangible (do not have a physical presence), such as affection; some secondary reinforcers are tangible (have a physical presence), such as money or poker chips. A tangible secondary reinforcer is known as a token reinforcer.

In a series of classic experiments, psychologist J. B. Wolfe taught chimpanzees to work for tokens. The chimps were first trained to put poker chips into a 'Chimp-O-Mat' vending machine (see Figure 6.15). Each chip dispensed a few grapes or raisins as a reinforcer. Once the animals had learnt to exchange chips for food, they would learn new tasks in order to *earn the chips*, which could then be exchanged for food. As the learning of new skills may take some time, and the earning of chips may therefore take time, the chimps were occasionally allowed to use the Chimp-O-Mat to maintain the value of the tokens (Wolfe, 1936).

A major advantage of tokens is that they don't lose reinforcing value as quickly as primary reinforcers do. For instance, if you use a primary reinforcer such as lollies to reinforce a child for correctly naming things, the child might lose interest in demonstrating their learning once they are satisfied or no longer hungry. However, if you use tokens as immediate rewards for learning, the child may stay involved in the naming activity because they could exchange their tokens for any

Figure 6.15 A chimpanzee uses the Chimp-O-Mat in one of Wolfe's experiments in the 1930s.

number of things besides food, such as toys or a trip to the movies.

Tokens have been successfully used with troubled children and adults in special programs, as well as in ordinary primary school classrooms (Spiegler & Guevremont, 1998). In each case, the goal is to provide an immediate reward for learning. Many parents found that tokens greatly reduced discipline problems in younger children. For example, children can earn points or gold stars during the week for good behaviour. If they earn enough tokens, they are allowed on Sunday to choose one item out of a bag of small treats.

TRY IT YOURSELF 6.2
Token economies

An individual's behaviour can be influenced through the use of a token economy. As discussed in this chapter, in a token economy an individual is rewarded for appropriate behaviours by receiving a 'token' or a symbolic reinforcer, such as a gold star, plastic chip or matches. These tokens can later be exchanged for tangible reinforcement such as food or privileges.

Aim

The aim of this activity is for your class to develop a token economy in your classroom for one period. Use 10 minutes of class time to prepare the 'token economy' for the next class, when the activity will run.

Method

Participants: The participants in the research will be the members of your class, participating as a whole group or by assigning specific jobs to individuals.

Materials: Tokens (such as stones or squares of coloured paper) chosen by the class; data sheets

Procedure

Developing the token economy:

- Brainstorm, 'What is a token economy?'
- Create a hypothesis ('What effect will a token economy have on our classroom behaviour?')
- Decide on what your class will use as tokens.
- Decide what the tokens can be exchanged for at the end of the study (e.g. food, privileges).
- Decide which classroom behaviours will be rewarded (e.g. arriving to class on time, answering a question correctly).
- Decide which classroom behaviours will be punished, by taking tokens away (e.g. arriving late to class, talking in class).
- Construct a data sheet to be used to keep a count of the rewards and punishments given.
- Assign individuals to record the information on the data sheet.
- Assign members of the class to issue the tokens and take them away.
- Decide whether the whole class will take part in the economy, or whether the task will be undertaken in a small group. If the class decides on a small group, how will the sample be selected?

Putting the token economy into action:

- Observe your class members' behaviour for one period.
- Give or take rewards in accordance with the behaviour guidelines.
- Record all information on the data sheet.
- At the end of the study, exchange the tokens for the tangible rewards agreed on by the class.

Discussion

At the conclusion of the study, record the outcome for each class member. Discuss these findings in relation to past research and your hypothesis.

Continued

token economy
Where desirable behaviour is rewarded with a symbolic reinforcer (a token) that can be exchanged at a later date for a tangible reinforcer

primary reinforcer
A natural, non-learnt reinforcer that produces comfort, ends discomfort, or fills an immediate physical need

secondary reinforcer
A reinforcer that has no value of its own but can be exchanged for a primary reinforcer that does have value

token reinforcer
A tangible secondary reinforcer

- What factors may have influenced the findings?
- What are some of the limitations you encountered?
- Outline three ethical considerations involved in this study.
- Are token economies effective in the classroom, according to your study?
- How far could your findings be generalised?

Report

(The report is to be completed at home.)

Write up this activity as a formal report (see chapter 9 for information on the structure of a formal report).

According to Skinner, essentially every response to stimuli can be understood as an operant response that occurs because in the past it has been reinforced, or similar responses have been reinforced (and we have applied generalisation). In some cases we are aware of the relationship between the response and reinforcement, such as when we study we get a good score on a SAC or when we work in part-time employment and we get paid. In some cases, however, we may not be aware of a relationship, but it exists nonetheless (Gray, 1994). An experiment conducted many years ago by Hefferline and colleagues (1959) illustrated that humans can learn subtle conditioned responses to stimuli without their apparent awareness. This study is examined in 'Focus on research: Giving the thumbs up'.

FOCUS ON RESEARCH

Giving the thumbs up

Hefferline and colleagues placed adult participants into two groups. Participants were to sit in comfortable chairs and listen to music for an hour. Static was occasionally superimposed over the music.

One group was told that the experiment was about the effects of music on body tension. They were not told anything about the static or whether or how it could be removed. The second group was told that static would sometimes be heard over the music and that they would be able to turn the static off, but that they needed to discover the response to turn it off.

The response to turn off the music, for both groups, was in fact a small twitch of the left thumb. Participants in both groups were connected to an electrical recording system, so that the experimenter could sit in another room and monitor their muscle activity. When a participant's left thumb twitched, a signal was sent to the experimenter, and the experimenter would turn off the static for a set period of time.

Hefferline and colleagues found that all participants made the thumb-twitch response, and made it increasingly as the experiment progressed, thereby removing the static sounds for increasingly longer periods as the session progressed. Interestingly, however, while participants reported noticing a decrease in the instances of static, none of them could identify the response they had made to make the static stop. Even participants in the group that was given the task of discovering the response did not correctly identify the left thumb-twitch as the response to turn off the static. One participant humorously claimed that it involved 'subtle rowing movements with both hands, infinitesimal wriggles of both ankles, a slight displacement of the jaw to the left, breathing out, and then waiting' (Hefferline et al., 1959).

Although none of the participants could identify the correct response, they must have unconsciously learnt it, because all participants made the response consistently and increasingly during the experiment. It is interesting to think that it is possible that in everyday life we make unconscious connections between our responses and reinforcement, as we fine-tune our behaviour to learn and develop skills and accomplish tasks.

QUESTIONS

1. What was the aim of the experiment?
2. What was the difference between the two groups of participants?
3. The experimenters used deception in the procedure of this experiment. Was this ethical?
4. What were the results of the study?

CHECK YOUR UNDERSTANDING 6.4

1 Indicate whether the following statements are true (T) or false (F).

- **a** Skinner devised the concept of the law of effect.
- **b** In operant conditioning, we learn by associating responses with their consequences.
- **c** Operant extinction occurs immediately after reinforcement is ceased.
- **d** Operant stimulus discrimination is the tendency to respond to stimuli that are similar to those that came before reinforcement.

2 Match each term with its definition.

a	Operant extinction	**i**	The tendency to respond to stimuli similar to those that preceded operant reinforcement
b	Operant spontaneous recovery	**ii**	Reinforcing successive responses that closely resemble the desired response
c	Operant stimulus discrimination	**iii**	When a learnt response gradually decreases in strength or rate of response when reinforcement stops
d	Operant stimulus generalisation	**iv**	When only the reinforced stimulus produces the desired response
e	Shaping	**v**	The brief return of a response after a period of apparent extinction

3 In operant conditioning, when an organism responds differently to different stimuli, they are:

A generalising.

B habituating.

C adapting.

D discriminating.

4 In operant conditioning, a response will eventually disappear if reinforcement is withheld. This is called:

A spontaneous recovery.

B stimulus generalisation.

C stimulus discrimination.

D extinction.

5 Fill in the gaps with the correct terms.

When reinforcement is removed in operant conditioning, _____ is likely to occur as the organism will stop responding. If suddenly the response returns, this is called _____. When an organism will only respond to a particular stimulus, this is called _____. If it will respond to a variety of stimuli, not just the original stimulus, then this is called _____.

Comparison of classical and operant conditioning

As we have seen, classical conditioning and operant conditioning both involve learning that depends on the formation of associations between stimuli and responses. In both classical and operant conditioning there is a period of time where the response is conditioned – this is the acquisition process. Once either type of learning has taken place, extinction of the response can occur, and sometimes the response can spontaneously recover and reappear. You may have noticed that both types of learning use the same concepts of stimulus generalisation and stimulus discrimination, but they are applied in slightly different ways.

The main differences in classical and operant conditioning are evident in *how* the associations between stimulus and response occur.

Role of the learner

In classical conditioning, the role of the learner is a *passive* one because classical conditioning is a passive process. It simply 'happens to' the learner when a UCS follows or is linked with a CS. Learning occurs through the association of events, at least one of which is a naturally-occurring response (reflex) to a particular stimulus. For example, Pavlov's dogs did not have to actively learn to salivate during the research experiment; rather, salivation to a food stimulus is a reflex action.

In operant conditioning, however, the learner actively 'operates on' the environment. Thus, operant conditioning is described as an *active* learning process because the learner has some choice in the behaviour they will exhibit. The learner takes an active role in the behaviour they produce, and generally the response is based on the consequences of that behaviour. For example, raising your hand in class to get a teacher's attention is a learnt response. It is reinforced by gaining the teacher's attention. In operant conditioning the emphasis is on the consequences of a response: behaviour is more or less likely to be repeated depending on the reinforcement offered or the punishment given.

Timing of the stimulus and response

Operant conditioning works most effectively when reinforcement immediately follows a correct response. Punishment also works more effectively if given immediately after an undesirable behaviour has occurred. Therefore, an organism will learn using operant conditioning principles only if reinforcement or punishment follows immediately after the response. For example, if your psychology teacher asks the class to complete some work at home for the next day's class, it would be suitable to reinforce students with a gold star when they hand it in the next day. It would hardly work if all students were given a reward before they had made a response (or, alternatively, punished before they could complete the task). In operant conditioning, therefore, the reinforcement of the stimulus comes *after* the response.

In classical conditioning, the desired response is also more likely to occur if the time between presentation of the UCS and CS is minimal, but behaviour will not be learnt unless the CS is presented before the UCS, so that the organism can learn to associate the stimuli. For example, during conditioning of the dogs, Pavlov would ring a bell (CS) just before presenting the dogs with their food (UCS). The dogs would then learn to respond to the bell (CS) when it was rung without association with the food after a number of trials had been conducted to build up the association. In classical conditioning, therefore, the reinforcement of the stimulus comes *before* the response.

Nature of the response

As we have already seen, the role of the learner in classical conditioning is a passive one. This is because the nature of the response is involuntary, or reflexive. A behaviour is learnt using in-built reflexes; that is, behaviours not dependent on learning, such as producing saliva or showing fear.

The nature of the response in operant conditioning, however, is usually active and voluntary or spontaneous. A behaviour is learnt using voluntary responses to pleasant or unpleasant stimuli.

[ISBN 9780170182966]

Table 6.2 provides an overview of the differences between classical and operant conditioning.

Table 6.2 Comparison of differences between classical and operant conditioning

	CLASSICAL CONDITIONING	OPERANT CONDITIONING
Nature of the learning	Neutral stimulus becomes a CS through association with a UCS	Probability of making a response is altered by consequences that follow it
Role of the learner	Passive (response is elicited by the UCS)	Active (response is emitted)
Timing of stimulus and response	Occurs before response (conditioned stimulus paired with unconditioned stimulus)	Occurs after response (response is followed by reinforcing stimulus or event)
Nature of the response	Involuntary, reflex	Spontaneous, voluntary

CHECK YOUR UNDERSTANDING 6.5

1 Compared to classical conditioning, the behaviours that are learnt through operant conditioning are:
   - **A** reflexive.
   - **B** involuntary.
   - **C** elicited.
   - **D** voluntary.

2 Fill in the gaps with the correct terms.
   - **a** _____ conditioning is based on learning by associating two different stimuli, whereas _____ conditioning is based on learning by consequences.
   - **b** In classical conditioning the learner's role is _____, while for operant conditioning the learner takes an _____ role.
   - **c** In classical conditioning, the stimulus must be presented _____ the response is made, and in operant conditioning the stimulus (reinforcement) must be presented _____ the response is made.

3 For each of the following words or phrases, identify whether they are associated with classical or operant conditioning.
   - **a** Voluntary
   - **b** Reflexive
   - **c** Passive
   - **d** Involuntary
   - **e** Active
   - **f** Learning by consequence
   - **g** Based on learning by learning to associate two normally unconnected stimuli
   - **h** Stimulus (reinforcement) occurs before the response
   - **i** Stimulus (reinforcement) occurs after the response

4 Which learning theory states that we learn through associations?
   - **A** Operant conditioning
   - **B** Instrumental conditioning
   - **C** Classical conditioning
   - **D** Reinforcement theory

5 Indicate whether the following statements are true (T) or false (F).
   - **a** In classical conditioning, the UCS follows the NS.
   - **b** Punishment works most effectively when delivered immediately after a desired response.
   - **c** The learner chooses to respond in classical conditioning.
   - **d** In operant conditioning, the nature of the response is described as voluntary and passive.

One-trial learning

One-trial learning is a form of classical conditioning where learning occurs after just one pairing of a NS prior to an unpleasant UCS. Where classical conditioning takes many 'trials' for learning to occur, in one-trial learning just one 'trial' or occasion is enough to create a lasting association. A lot of the time this occurs with food (you will find out about taste aversion next), but it can also occur with pain or with other sensations.

For example, imagine that as a child you once had a terrifying experience when you visited the dentist. The dental procedure was intensely painful and involved several needles and drills, and afterwards you had to be on medication that made you feel nauseated. After this occasion, you felt ill and frightened every time your parents drove you past the dentist's surgery. This behaviour is a result of that one bad experience (one trial) at the dentist's office – you have learnt to associate discomfort and nausea with the dentist.

Another difference between one-trial learning and classical conditioning is that in classical conditioning, the UCS must *immediately* follow the NS for learning to occur. However, in one-trial learning the time between the presentation of the NS and the UCS could be hours or even days. One-trial learning also seems to be very persistent even when reinforcement is not available, so that the learnt response is difficult to extinguish. It seems that we learn these responses to stimuli that may do us harm, thereby avoiding situations that may make us ill or compromise our safety.

Table 6.3 Experimental set-up for Garcia and Koelling's taste aversion experiments

PHASE 1		PHASE 2	
Group A	Saccharin water + light and noise ↓ Shock	**Group A1**	Saccharin water on its own
		Group A2	Unflavoured water + light and noise
Group B	Saccharin water + light and noise ↓ Poison	**Group B1**	Saccharin water on its own
		Group B2	Unflavoured water + light and noise

TASTE AVERSION

Taste aversion refers to a learnt avoidance of a *particular food*, which results from a single association between a particular stimulus (such as smell or taste) and an unpleasant response (such as vomiting or headache); therefore, it is a type of one-trial learning. For example, imagine that on your birthday your family takes you out for dinner and you eat an oyster for the first time. Two hours later you feel nauseous and you vomit several times. You vow never to eat oysters again. Six months later, you still don't like to think about oysters, and when you drive past the restaurant where you had your birthday dinner, you start to feel ill again. This is an example of taste aversion, which you learnt after only one 'trial' of the food. Taste aversion is very difficult to extinguish as the experience is generally so unpleasant that it creates a long-lasting association.

Psychologist John Garcia first demonstrated taste aversion in experiments with animals, so taste aversion is sometimes referred to as the *Garcia Effect*. In 1966, Garcia and his colleague Robert Koelling conducted an experiment involving rats and taste aversion.

In their experiment, Garcia and Koelling used thirsty rats that had been maintained in individual cages without water. The rats were allocated to one of two experimental groups – Group A or Group B. To prepare for the experiment, both groups were initially given water containing saccharin ('saccharin water') from an apparatus that measured the amount of fluid taken. As the rats drank the saccharin water, a light was flashed and a loud noise was produced in the cage.

Rats in Group A were then given the saccharin water accompanied by the light and noise, but when they drank it they received a painful electric shock to their feet through the floor. Rats in Group B were also given the saccharin water accompanied by the light and noise, but after consumption they were exposed to poison (either through X-ray radiation or being given Lithium chloride [LiCl]), which made them feel nauseated.

When the rats were offered saccharin water again without any of the other stimuli, they refused to drink it. It appeared that the rats had learnt (after just one trial) to associate the saccharin water with either pain from the electric shock or nausea from the poison; thus, they had been classically conditioned. To test whether this conditioning also applied to the bright light and noise experienced while drinking the water in the initial phase of the experiment, Garcia and Koelling offered half of the rats in both Groups A and B (Group A1, Group B1) saccharin water on its own, while the other half of each group (Group A2, Group B2) was offered plain water accompanied by light and noise. Table 6.3 shows the experimental set-up.

The results showed that when water consumption from Phase 2 was compared to consumption from Phase 1, the Group A rats (which in Phase 1 were all given the electric shock) designated to Group A1 (saccharin water only) consumed basically the same amount of water and the Group A2 rats (unflavoured water + light and noise) consumed less water. Group B rats (which in Phase 1 were all given the poison) designated to Group B1 (saccharin water only) refused to drink the water but Group B2 rats (unflavoured water + light and noise) continued to drink the water (Garcia and Koelling, 1966).

Because rats by nature are likely to get sick after eating poisonous food, they readily learn to avoid distinctively flavoured food or drink when it is paired with illness. Therefore, if taste and sickness go together, the rats exposed to the poison should have had a bigger aversion to the taste of saccharin than to the cue of light and noise. This is supported by the results of this experiment, because:

- rats that were poisoned refused to drink saccharin water in Phase 2, but light and noise made little difference because poison was more of a deterrent; that is, the presence of poison meant they formed an aversion to the taste rather than the other factors (light and sound)

one-trial learning
A form of classical conditioning where learning occurs after a single pairing of a neutral stimulus and an unpleasant stimulus; one instance of pairing creates a lasting association between the stimuli

taste aversion
A type of one-trial learning that is a learnt avoidance of a particular food after it has been associated with just one unpleasant experience

- rats that were shocked did reduce consumption of the water when it was paired with light and noise; that is, they formed an aversion to the external factors (light and sound) rather than the taste, because they did not experience the condition where taste was associated with poison.

This experiment therefore suggests that taste may be more readily associated with sickness than with shock and that the light and noise cues are more readily associated with pain (shock) than with sickness. Garcia and Koelling interpreted the formation of selective associations as evidence for adaptive specialisations in animal learning, meaning that animals that survive the experience of consuming poisonous food must learn not to repeat their mistakes. They will adapt to their environment, and learn the associations between stimuli that may cause them ill health.

In a similar experiment, Carl Gustavson and Garcia (1974) tempted coyotes (North-American prairie wolves) into eating sheep carcasses laced with sickening poison, to which they responded by developing an aversion to sheep meat (see Figure 6.16). These experiments showed that coyotes and other animals could be conditioned to avoid certain foods, thereby enhancing the survival of the species over time by learning the association (Myers, 1986). In the case of the coyotes, producing a taste aversion for sheep meat may be a more humane method of controlling them, rather than them being killed by sheep farmers.

Figure 6.16 The coyotes in Gustavson and Garcia's experiment developed a taste aversion to sheep meat as a result of one-trial learning.

VIDEO Aversive conditioning

'Videolink: Aversive conditioning' examines aversive conditioning techniques used on bears.

CHECK YOUR UNDERSTANDING 6.6

1 Donatella bakes some fish for her boyfriend Mario. Mario eats it and becomes ill. The next time Donatella cooks fish, Mario refuses to eat it. This is an example of:

A aversive conditioning.

B taste aversion.

C an allergy.

D operant conditioning.

2 Indicate whether the following statements are true (T) or false (F).

a Taste aversion is an active process, whereas classical conditioning is reflexive.

b Taste aversion will extinguish after only one trial without the unconditioned stimulus.

c Taste aversion can involve a lengthy time lapse between the presentation of the unconditioned stimulus and the unconditioned response.

3 Fill in the gaps with the correct terms.

a _____ conditioning is based on responses with reflex connection with particular stimuli.

b _____ conditioning is based on the consequences that follow a response.

c Stimulus _____ involves the conditioned response being elicited by stimuli similar to the conditioned stimulus.

d Stimulus _____ involves only the conditioned stimulus eliciting the conditioned response.

4 Which of the following statements is correct?

A Both operant and classical conditioning require that reinforcement is given before the desired response.

B Both operant and classical conditioning can produce stimulus generalisation and stimulus discrimination.

C Both operant and classical conditioning require that reinforcement is given each time after the desired response.

D Both operant and classical conditioning only involve involuntary responses.

5 Identify whether each statement is associated with classical conditioning or one-trial learning.

a Requires linking of two stimuli to produce learning

b Involves automatic learnt responses to stimuli

c Difficult to extinguish

d Requires only one presentation of the NS and the UCS for conditioning to take place

e Conditioned stimulus can usually be generalised

f Time between presentation of stimuli can be several hours or even days apart

Trial-and-error learning

In operant conditioning we associate responses with their consequences. The basic principle is simple: behaviours or responses that are satisfying tend to be repeated, while behaviours that are not satisfying tend not to be repeated. Pioneer learning theorist Edward L. Thorndike (1874–1949) called this the law of effect; that is, the probability of a response being repeated is determined by its effect. Thorndike suggested that the probability that a response will be repeated is strengthened each time the response is followed by a satisfying state of affairs, while the probability of a response not being repeated is strengthened each time the response is followed by an unsatisfying state of affairs.

For example, if you have a part-time job, you receive your pay after a period of work – so, working is reinforced by the payment you receive. You are likely to present for work in the future because you expect that you will get paid – usually on a weekly or fortnightly basis. If your employer one day decided not to pay you, then it would be most likely that you would stop presenting for work and instead look elsewhere for employment.

One of Thorndike's early experiments was a study into animal intelligence (in particular their capacity for reasoning) using cats as subjects. He placed a hungry cat inside a wooden box, which came to be known as the 'Puzzle box'. The box was enclosed on all sides, but the cat could see out and even stick its paws out between the wooden slats. The only way for the cat to escape was through a door, which could be opened by pressing a lever inside the box. Thorndike placed a piece of fish outside the box, just out of reach. If the cat wanted to eat the fish, it had to work out how to get out of the box through the door. Thorndike observed the cat's behaviour, and recorded the length of time it took for the cat to press the lever and exit the box.

At first the cat tried some unsuccessful random behaviours, such as trying to squeeze between the slats, reaching out through the slats, or clawing at the sides of the box. Eventually, the cat accidentally pressed the lever and the door opened. The cat was, therefore, able to eat the piece of fish (satisfying consequence).

The cat was then placed back in the box under the same conditions, and the same behaviours were observed. The cat made a number of useless attempts to reach the fish before pressing the lever. With each trial, however, the cat became quicker in pressing the lever. After several trials the cat would immediately press the lever when placed in the box. Random behaviour had now been replaced by deliberate behaviour the cat had learnt in order to gain reinforcement.

Thorndike adapted versions of his Puzzle box to include different methods of escaping the box, such as pressing a lever as well as nudging a string attached to a bolt. View 'Videolink: Thorndike's puzzle box' to see an example of the puzzle box in action.

VIDEO
Thorndike's puzzle box

What did Thorndike conclude from these experiments? Thorndike proposed that the cats had learnt to obtain the fish through acting on their environment in a trial-and-error fashion. Trial-and-error learning occurs when an organism continues to explore their environment until they discover a response that will allow them to reach their desired goal; learning occurs when the organism eliminates responses that do not achieve the desired goal.

Observational learning (modelling)

There is little doubt that many skills are learnt by what psychologist Albert Bandura (1971) called observational learning, or modelling. Observational learning is when we watch (observe) the actions of another person and note the consequences of that person's actions, then we decide whether to imitate them or not. In other words, modelling is any process in which information is imparted by example, before direct practice is allowed (Rosenthal & Steffek, 1991).

The value of learning by observation is obvious. Imagine trying to tell someone – not show them – how to tie a shoe, do a dance step, swim or play a guitar. Bandura believes that anything that can be learnt from direct experience can be learnt by observation. Often, this allows a person to skip the tedious trial-and-error stage of learning.

It seems obvious that we learn by observation, but how does it occur? By observing a model (someone who serves as an example), a person may learn:

- new responses
- to carry out or avoid previously learnt responses
- a general rule that can be applied to various situations.

For observational learning to occur, several factors must be involved.

- *Attention*: The learner must pay attention to the model; the learner must perceive the model to be interesting in one way or another.

law of effect
The probability of a response being repeated is altered by the effect of that response

trial-and-error learning
When an organism continues to explore their environment until they discover a response that will allow them to reach their desired goal

observational learning
When learning occurs by watching (observing) others and noting the consequences of their actions, then imitating or not imitating their behaviour

model
Someone who serves as an example in observational learning

Table 6.4 Attention, retention, reproduction, motivation and reinforcement in observational learning

	ATTENTION	RETENTION	REPRODUCTION	MOTIVATION/REINFORCEMENT
***Observer* factors in observational learning**	Observers cannot learn unless they pay attention to what's happening around them.	Observers must be able to remember what was happening around them at the time of observation.	Observers must be capable (physically and psychologically) of reproducing the act.	Observers will only perform what they have observed if they have some motivation or reason to do so. The presence of reinforcement can be an important aspect to motivation.
***Other* factors**	If the observer likes or can identify with the model, then learning is more effective.	Information is more readily retained if the observer can encode and structure the information in an easily-remembered form.	Some tasks require the use of skills the observer will not have; e.g. carefully watching a clown juggle will not necessarily mean you can learn to juggle. It is a skill that requires coordination and practice.	If the person observing the model is appropriately reinforced, they are more likely to repeat the task. Also, if the model being watched is reinforced, the observer is more likely to perform the task.

- *Retention*: The learner must remember (retain) what was done by the model so that the information can be encoded and stored for later use.
- *Reproduction*: The learner must be able to reproduce (form a reproduction, or copy, of) the modelled behaviour.
- *Motivation/Reinforcement*: The learner must have the desire, or motivation, to repeat the observed behaviour in order to receive a reward. Normal reinforcement determines if it will be repeated thereafter.

Table 6.4 summarises these factors. In general, models who are attractive, trustworthy, capable, admired, powerful or high in status also tend to be imitated (Bandura & Walters, 1963; Brewer & Wann, 1998).

IMITATING MODELS: BANDURA'S BO-BO DOLL EXPERIMENTS

In a series of classic experiments by Albert Bandura in the 1960s, preschool-aged children watched an adult attack a large blow-up clown: the Bo-Bo doll. The first study used adult models (live, in person), that either did or did not play aggressively with a Bo-Bo doll (Bandura, Ross & Ross, 1961). A follow-up study investigated whether filmed models were as influential as live models (Bandura, Ross & Ross, 1963a). The researchers found that aggression in the children increased in both cases when the model behaved aggressively towards the Bo-Bo doll; that is, whether they observed the live adult model in the room or whether they observed the filmed version (see Figure 6.17). Bandura and his colleagues conducted many more studies into the effect of modelling on aggressive behaviour in children. We will now look at some specific experiments undertaken by Bandura.

In one study, Bandura and colleagues used adult models who interacted with each other, rather than with Bo-Bo dolls. Bandura's subjects were preschool-aged children who were invited, one at a time, to play in a room filled with toys. On the way to the toy-room, the researcher took each child on a detour via the researcher's office, on the pretext that the researcher had to collect something. While each child waited outside the office, they were exposed to one of four conditions. In the first condition, children were instructed to watch a video on a television that showed two adult models playing, and then one model physically attacked the other. The attacker was then rewarded with toys and treats to eat. In the second condition, children were shown a video that depicted the same aggressive attack, but this time the attacker

Figure 6.17 A preschool-aged child imitates the aggressive behaviour of an adult model he has just seen in a film, in one of Bandura's experiments.

was punished. In the third condition, children were shown a video where two models played together without any aggression. In the fourth condition, children were not shown a video at all as they waited outside the office.

Each child was then taken to the toy room and left alone to play with various toys. Among the toys there were two Bo-Bo dolls. The children were observed through a one-way mirror, and the number of aggressive acts towards the Bo-Bo dolls was recorded.

The results showed that the children who observed the film where the aggressive attacker was rewarded displayed significantly more aggressive acts when playing alone than children from any of the other conditions. A summary of the results is shown in Figure 6.18. Logic would tell us that the children attacked the Bo-Bo doll instead of being aggressive with the other toys because the Bo-Bo doll was the most similar of the toys to human form, and hence the best imitation of the behaviour they had witnessed.

Another study by Bandura and colleagues in 1965 used preschool-aged children again – this time the children were divided into three groups. The first group saw a live adult sit on a Bo-Bo doll, punch it, hit it with a hammer and kick it around the room. The second group saw a movie of these actions. A third group saw a cartoon version of the aggressive acts.

In each of the conditions, the aggressive model was either rewarded with lollies and praise from another adult, punished verbally and physically with a smack, or neither rewarded nor punished. Later, after all of the children had watched the model, the children were frustrated by having some attractive toys taken away from them. Then they were allowed to play with the Bo-Bo doll in a room where experimenters could watch each child's behaviour through a two-way mirror. Some children were offered incentives such as sweets and praise for imitating the model's behaviour, and some were not. During their play with the Bo-Bo doll, most children imitated the adult's attack. Some even added new aggressive acts of their own! Interestingly, the cartoon was only slightly less effective in encouraging aggression than the live adult model and the filmed model (Bandura, Ross & Ross, 1963b).

The results of the experiment indicate that the consequences for the model that the children viewed had an effect on the behaviour displayed by those children when placed in the room with the Bo-Bo doll. Children who saw the model being rewarded or suffering no consequences for their behaviour were more likely to display aggressive behaviour themselves. Children who watched the model receiving punishment were less likely to display aggressive behaviour. Most children tended to behave aggressively if given a reinforcement to do so, even if they had seen the model receiving punishment. In general, boys were more aggressive than girls, although girls behaved nearly as aggressively as the boys if offered a reward (see Figure 6.19). These results indicate that the children had learnt the model's behaviour, even if they didn't imitate the model until they were offered a reward to do so. Bandura suggested that although an individual may display no evidence of having learnt a behaviour from observing a model, a cognitive (mental) form of the model's response has still been made, and may not be used (elicited) unless an incentive to do so is present.

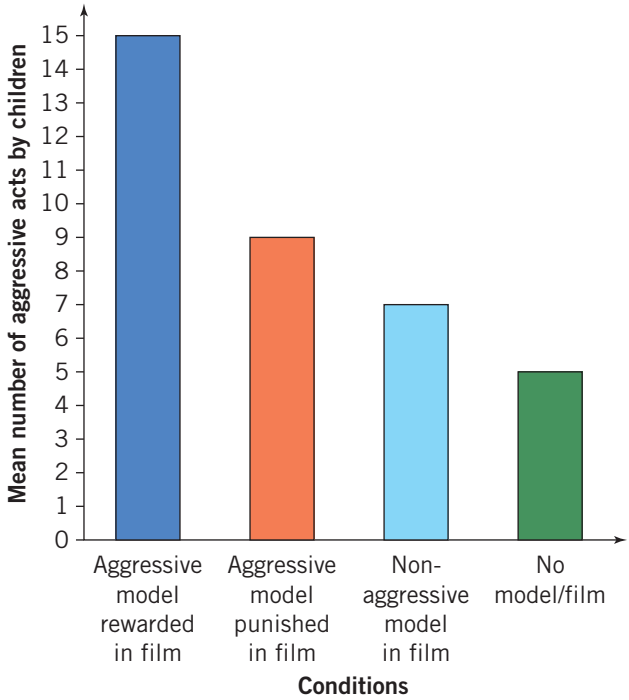
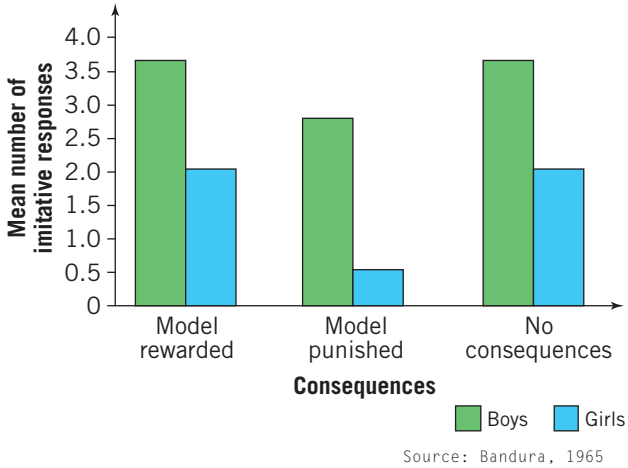


Figure 6.18 Results from one of Bandura's modelling experiments



Source: Bandura, 1965

Figure 6.19 The effect of observed consequences on imitative behaviour from Bandura's 1965 experiment on observational learning and aggression.

VIDEO
Bo-Bo doll experiment

'Videolink: Bo-Bo doll experiment' outlines Bandura's experiments.

So, do children blindly imitate adults? No. Remember that observational learning only *prepares* a person to duplicate a response. Whether it is actually imitated depends on whether the model was rewarded or punished for what was done. Nevertheless, when parents tell a child to do something but model a completely different response, children tend to imitate what the parents do, not what they say (Bryan & Walbek, 1970). Thus, through modelling, children learn not only attitudes, gestures, emotions and personality traits, but also fears, anxieties and undesirable habits.

CHECK YOUR UNDERSTANDING 6.7

1 Indicate whether the following statements are true (T) or false (F).
   - **a** B. F. Skinner coined the phrase 'law of effect'.
   - **b** Trial-and-error learning is an early form of operant conditioning.
   - **c** Observational learning involves eliminating unsuccessful responses.

2 Which of the following is not involved in observational learning?
   - **A** Reproduction
   - **B** Attention
   - **C** Motivation
   - **D** Verification

3 Bandura's Bo-Bo doll experiment showed that:
   - **A** girls are more aggressive than boys.
   - **B** if the children observe the model's behaviour and do not imitate the behaviour they observed, it means that the behaviour was not learnt.
   - **C** if the children observe the model's behaviour being punished, they will be more likely to imitate the behaviour they observed.
   - **D** if the children observe the model's behaviour being reinforced, they will be more likely to imitate the behaviour they observed.

4 Match each term to its definition with regard to observational learning.

a	Attention	**i**	Observers must remember the model's behaviour
b	Retention	**ii**	Observers must be physically and psychologically capable of demonstrating the observed behaviour
c	Motivation	**iii**	Observers must observe what the model does
d	Reproduction	**iv**	Observers need the desire to perform the modelled behaviour
e	Reinforcement	**v**	Observers will perform the modelled behaviour if there is some incentive for doing so

5 Fill in the gaps with the correct terms.
   - **a** The probability of a response being repeated is altered by the consequences of the response. This is known as the _____.
   - **b** In trial-and-error learning the first response the learner makes is described as _____, while the last response is described as _____.
   - **c** The desire to reproduce a learnt behaviour is known as _____.
   - **d** The first step in observational learning is _____.

Insight learning

Animals demonstrate an amazing ability to solve problems. First, they appear to be able to mentally represent situations in delayed-response problems. These are tasks in which an animal must remember the solution to a problem before responding. For example, a hungry animal could be allowed to watch as food is hidden under one of three boxes. After a time delay, the animal is released. Can it select the correct box? If the delay is brief, the answer is usually yes. Sometimes they can still select the correct box after a long delay; in fact, some animals can remember the locations of objects for several days or more (Lea & Kiley-Worthington, 1996).

At times, animal behaviour implies even higher levels of thought, such as being able to plan ahead (Zentall, 1999). In one study, a chimpanzee watched as various objects were hidden outside her cage. Later, when a human approached the chimp, she gained the chimp's attention and then touched a lexigram (a symbol on a board that represents a word) corresponding to one type of object that was hidden. When allowed to leave her enclosure, the chimp found the object and vocalised until the person came to retrieve it.

German psychologist Wolfgang Köhler believed that animals such as chimpanzees are actually capable of insight. Insight is a sudden understanding of knowledge or information, known as the 'aha effect' (as in, 'Aha! Now I understand!') (Wilson, Peper & Gibney). To test for insight, Köhler challenged Sultan, his brightest chimp, with a multiple-stick problem. In this problem, several sticks of increasing length were arranged between Sultan's cage and a desired object (a banana, in this case). To reach the banana, Sultan had to use the first stick to retrieve the second stick (which was longer than the first). The second stick could then be used to retrieve the third, even longer stick, which could then be used to reach the banana (Köhler, 1925).

When confronted with this problem, Sultan looked at the banana, then at the sticks, then back at the banana. Picking up the first stick, Sultan appeared to have his 'aha' moment, then smoothly and without

further hesitation solved the problem by obtaining each stick and raking in the banana (see Figure 6.20).

Figure 6.20 Sultan the chimpanzee gained insight into the relationship between the two sticks and the banana. This is an image from Köhler's 1920s experiment.

Köhler argued that the chimp had gained insight into (or learnt) the relationship between the two sticks and the banana. Insight develops when perceptions are suddenly organised. The sequence of events that the chimp was involved in appears to be too complex to be an accident. Since it had not been trained to solve the problem and had not seen another person or chimp perform the task before, it seems likely that insight was in fact arrived at as a result of some sort of cognitive process. Though it seems to be a relatively simple moment, it would seem that the 'aha' moment is actually the result of a complex process.

STAGES IN INSIGHT LEARNING

There have been many theories proposed to explain how learning occurs through insight. One of the early theories by Wallas (1926) proposed that there are a series of stages involved in the 'aha' experience and insight learning. In his work on creative thought and problem-solving, Wallas theorised that the following stages would occur as a problem was solved:

- *Preparation stage:* Information is gathered and the organism begins to work on solving the problem.
- *Incubation stage:* The organism works on the problem unconsciously, and for the onlooker there appears to be nothing happening, a time of mental 'time out'.
- *Illumination or insight stage:* The organism experiences the 'aha' effect and the knowledge of how to solve the problem 'comes to them'.
- *Verification:* The organism puts the insight they have gained into action and the solution to the problem is tested. Generally, the first time the action is performed, it is done without mistake.

When a person learns through insight, the information is better remembered (Auble, Franks & Soraci, 1979), the learning is immediate and relatively permanent, and it appears the learning can be transferred readily to other learning situations.

A CLOSER LOOK

Learning set: Useful for solving problems

Learning set refers to the positive or negative transfer of information from a previous learning situation to a new learning situation, which makes a new task quicker and easier to complete. For example, imagine that you have learnt how to play tennis but you have never played badminton. If you are asked to play badminton and are able to do so, you have transferred your learning set (expertise gained) from playing tennis to playing badminton.

Harry Harlow (1949) demonstrated how learning set can be used in new situations using rhesus monkeys. The monkeys were presented with a number of discrimination problems where they were required to choose one of two objects to receive a reinforcement of food. The monkeys were presented with a small green triangle and a large red square (Figure 6.21). One of the shapes covered some food. The shapes were presented outside the monkeys' cage, but within reach of the monkeys. The task for the monkey was to pick the shape that covered the food, and it was only allowed one attempt each time. The shapes were presented on a number of trials and the food was always under the same shape, although the position of the shape was altered. Therefore to receive the food the monkey had to discriminate between the shapes and choose on the basis of the shape of the object, not on the position of the object.

At first, the monkeys chose randomly. They selected the correct object approximately 50 per cent of the time. Over time, the monkeys' performance improved so that they were selecting the correct shape 100 per cent of the time.

Figure 6.21 Harlow's rhesus monkeys located food hidden under distinctly-shaped objects. Later, the monkeys used their experiences of previous tasks to complete a new task.

Continued

insight
A sudden understanding of knowledge or information

After completing the shape experiments, Harlow tested further problem-solving tasks on his monkeys. These tasks were seen to be learnt with greater efficiency than prior tasks. The monkeys needed fewer trials to solve subsequent problems; hence they learnt the tasks quicker.

In Harlow's view, the monkeys had learnt a rule, or strategy, for responding correctly in the discrimination problems. He proposed that the learning the monkeys had obtained in his earlier experiments was a cognitive process that had taught them how to solve future problems. He coined the phrase 'learning how to learn', meaning that the monkeys' past experiences had taught them strategies and techniques for solving new tasks.

Latent learning

Latent learning occurs without obvious reinforcement and remains hidden until reinforcement is provided. A series of latent learning experiments were conducted by Edward Tolman and his colleagues in the 1930s, using rats and maze-running problems.

In a pivotal study by Tolman and C. H. Honzik in 1930, three groups of food-deprived rats were placed in a complicated maze each day to learn how to solve it (see Figure 6.22). There were two control groups (Group A and Group B) and an experimental group (Group C). Each day the rats in Group A were given a food reinforcement when they reached the end of the maze. It was found that each day these rats were able to run the maze more quickly and that they made fewer mistakes (the amount of wrong turns they made decreased) than previously. This behaviour was thought to occur due to the reinforcement they were given.

The rats in Group B experienced the same conditions, except when they reached the end of the maze they were not offered any reinforcement. Over time, it was found that they only made a small improvement on performance and they continued to make many errors or wrong turns.

Finally, Group C completed the first 10 trials without any reinforcement. On their 11th trial, and for all subsequent trials, they were given food reinforcement when they completed the maze. This group was the experimental group, and the critical group when looking at latent learning. The rats in this group showed little improvement on performance in the first 10 trials; however, after they began to receive reinforcement at the end of the maze after the 11th trial, their performance improved remarkably. In fact, their performance was a little better than that of rats in Group A.

Tolman concluded that the rats in Group C had been learning the solution to the maze all along – just as much as the rats in Group A – but they had no motivation to demonstrate what they had learnt until they were offered reinforcement. They had been building up a 'map' of the maze that they could utilise as soon as they were motivated to do so. Many learning theorists of the time had the view that learning was a stimulus–response connection, whereas Tolman argued that some learning was built up of sets of information that function like cognitive maps or mental representations of spatial layouts (Tolman, 1948).

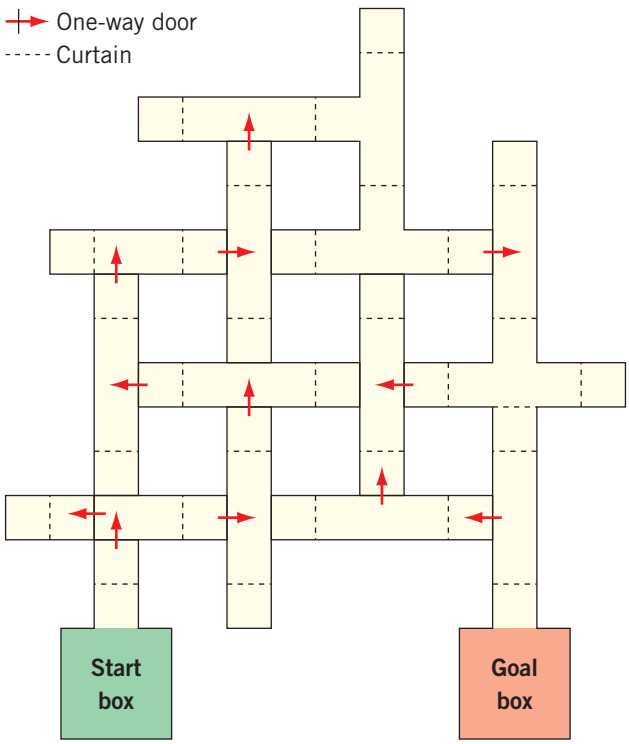


Figure 6.22 In Tolman and Honzik's study, rats learnt to run a complicated maze such as that shown here.

CHECK YOUR UNDERSTANDING 6.8

1 Indicate whether the following statements are true (T) or false (F).
   - **a** Wolfgang Köhler is associated with insight learning.
   - **b** Insight learning involves a sudden understanding of information.
   - **c** Illumination is the second stage in insight learning.
   - **d** Motivation in the form of reinforcement is required for a person to demonstrate latent learning.

2 The stage of insightful learning that bridges the gap between having an unsolved problem and having a solution to the problem is known as:
   - **A** preparation.
   - **B** incubation.
   - **C** illumination.
   - **D** verification.

3 Shanti is having difficulty understanding the maths problem she has been assigned as homework. She tries all of the practice questions, she checks her workbook and she consults her class notes. Frustrated, she decides to walk around the block. She walks for 30 minutes, thinking about her boyfriend. Suddenly, she gets an idea and hurries home and looks up an example in her textbook that enables her to solve the problem. She then looks up the answer and finds that she is correct.

Looking up the relevant information and trying out a possible strategy in this scenario is the _____ stage in problem solving, whereas looking up the answer to check that she is correct involves _____.

A preliminary; formalisation

B 'aha' experience; verification

C preparation; incubation

D preparation; verification

4 Fill in the gaps with the correct terms.

a During the _____ stage of insight learning, the learner does not consciously think about the problem.

b _____ learning shows that we need to be motivated to demonstrate our learning.

c _____ learning demonstrates that learning can occur without reinforcement.

5 Sort the following stages of insight learning into the correct sequence.

- illumination
- verification
- preparation
- incubation

Ethical issues in learning experiments

John B. Watson (1878–1958) was a psychology professor at the Johns Hopkins University from 1908 until 1920. Watson and his assistant, Rosalie Rayner, are probably best known for their rather 'unethical' experiment into classical conditioning using a baby named Little Albert B. In their demonstration of classical conditioning, Watson and Rayner (1920) set out to condition 11-month-old Little Albert to have an emotional response of fear to laboratory rats and other white objects.

THE LITTLE ALBERT EXPERIMENT

At the time of the experiment, Watson was investigating how specific fears might be conditioned. He hypothesised that a child would react with fear when they heard a loud noise, and that this fear was an innate (inborn) or unconditioned response. Therefore, according to classical conditioning theory, he could pair a loud noise with other stimuli in order to condition a child to have a fear response to stimuli that normally would not be feared by a child.

Watson and Rayner chose as their participant the child of a worker at the clinic in which the experiment would take place. It is believed that Little Albert's mother was unaware that her son would be used in an experiment on conditioning fear responses. As there was no rule of informed consent in 1920, this is one of the reasons why this experiment is now considered unethical and would not be conducted today (see chapter 9). Little Albert was considered suitable for the experiment, as he was a placid child who rarely cried or seemed sad; his emotional stability was one of the main reasons for using him as a participant. Watson also felt that relatively little harm could be done to Albert during the experiment.

To determine that Albert was capable of a fear response (UCR), Watson and Rayner pre-tested him by presenting him with scary masks and loud noises – they found that he was capable of the fear response.

For the experiment, Albert was placed on the floor in the middle of the room, and a white laboratory rat (NS) was placed nearby. Albert was allowed to play with the rat and showed no fear of the rat at this stage.

This procedure was repeated, and then the next stage of the experiment was conducted. Whenever Little Albert reached out to touch the rat (NS), Watson struck a steel bar behind Albert's head with a hammer, resulting in a loud noise (UCS). Albert reacted to the noise by starting violently; his breathing became irregular and he raised his arms. The second time the bar was struck, Albert had the same reaction, but this time his lips began to pucker and tremble. The third time, Albert started to cry. After several repetitions of this step, Albert would burst into tears and tremble (CR) at the mere sight of the rat (CS), and would become distraught. Clearly, Albert was conditioned: he had built up an association between the rat and an unpleasant stimulus (loud noise).

Five days later, Little Albert showed stimulus generalisation of his conditioning, as he reacted with fear when presented with a white rabbit, a fluffy dog and a sealskin coat, not to mention some of his toys that were similar to the rat (Myers, 2001). At this stage, Albert's mother discovered what they were doing to her child – in response, she quit her job and left the area. Watson and Rayner therefore had no chance to reverse (extinguish) the conditioning.

Breached ethics

Psychologists have had little success in replicating Watson and Rayner's findings with other children, because of the ethics surrounding such experiments. Watson and Rayner breached almost every modern-day ethical consideration; yet interestingly, they probably would not have obtained the results they did obtain if they did not breach these guidelines. Put simply, today's ethical guidelines (rightly) make it prohibitive for psychologists to replicate the Little Albert experiment.

latent learning
Learning that occurs without obvious reinforcement, and which remains hidden until reinforcement is provided

There are a number of reasons why Watson and Rayner's experiment is now considered unethical:

- The experiment was designed to condition an emotional response of fear in the participant. It could therefore reasonably be assumed that the participant would be emotionally traumatised by the experiment, and that he may have suffered lasting psychological harm as a result.
- Watson failed to seek permission from Albert's mother; therefore, no informed consent was obtained and withdrawal rights were not explained.
- Watson did not debrief either Albert or his mother, to extinguish the conditioned fear response, and though no one is sure what became of Little Albert, he was probably left with an irrational fear of anything white and fluffy.
- Watson failed to follow the ethical principles of confidentiality. He published results of his experiment without ensuring that Little Albert would remain anonymous.

View 'Videolink: J. B. Watson' to find out more about the life and work of Watson and the Little Albert experiment.

VIDEO
J. B. Watson

Figure 6.23 A film still from Watson and Rayner's 1920 experiment with 11-month-old 'Little Albert'

CHECK YOUR UNDERSTANDING 6.9

1 By today's standards, Watson and Rayner would not meet ethical requirements in their experiment on Little Albert because:
   - **A** they did not stop the experiment when Albert became distressed.
   - **B** they did not inform Little Albert's mother about the nature of the experiment.
   - **C** they did not extinguish Little Albert's fear response.
   - **D** All of the above

2 Fill in the gaps with the correct terms.
   - **a** Watson and Rayner did not gain _____ from Little Albert's mother to conduct the experiment on her son.
   - **b** After he was conditioned to fear a white rat, Albert also feared many white fluffy objects. This fear of white fluffy objects demonstrated that Albert had _____ his fear.
   - **c** Because Watson and Rayner did not extinguish Little Albert's fear response, they breached the ethical principle of _____.

3 In Watson and Rayner's famous experiment, they conditioned Little Albert to fear a white rat. At the end of this experiment, the white rat represents:
   - **A** the conditioned response.
   - **B** the unconditioned response.
   - **C** the conditioned stimulus.
   - **D** the unconditioned stimulus.

4 Indicate whether the following statements are true (T) or false (F) in reference to Watson and Rayner's famous experiment with Little Albert.
   - **a** Fear was the unconditioned response.
   - **b** Fear was the conditioned response.
   - **c** The white rat was both the unconditioned stimulus and the conditioned stimulus.
   - **d** A modern ethics committee would approve this study.

5 Name the ethical principles that Watson and Rayner breached when they did each of the following.
   - **a** Failed to tell the mother of the nature and purpose of their experiment and gain her written permission to use her son
   - **b** Failed to stop the experiment when Little Albert showed distress
   - **c** Failed to extinguish Little Albert's fear of white fluffy objects
   - **d** Published information that could have identified Little Albert in the future

Chapter summary

WORDCHECK TEST YOURSELF

Classical conditioning:

- Classical conditioning, studied by Pavlov, occurs when a neutral stimulus (NS) is associated with an unconditioned stimulus (UCS) to elicit a response.
- The UCS causes a reflex response called the unconditioned response (UCR). If the NS is consistently paired with the UCS, it becomes a conditioned stimulus (CS) capable of producing a response by itself. This response is a conditioned (learnt) response (CR).
- When the CS is followed by the UCS, conditioning is reinforced (strengthened).
- When the CS is repeatedly presented alone, conditioning is extinguished (weakened or inhibited). After extinction seems to be complete, a rest period may be followed by the temporary reappearance of a CR. This is called *spontaneous recovery*.
- Through *stimulus generalisation*, stimuli similar to the CS will also produce the CR. Generalisation gives way to *stimulus discrimination* when an organism demonstrates the CR only when the specific CS is present.

Operant conditioning:

- Operant conditioning occurs when a voluntary action is followed by a reinforcer. Reinforcement in operant conditioning increases the frequency or probability of a response being repeated. This result is based on the *law of effect*.
- If an operant response is not reinforced, it may extinguish (disappear). But after extinction seems complete, it may temporarily reappear (spontaneous recovery).

Different kinds of operant reinforcement:

- In *positive reinforcement*, a reward or a pleasant event follows a response. In *negative reinforcement*, an unpleasant stimulus or event is removed when a correct response is made so that a response that ends discomfort becomes more likely.

Patterns of reward:

- Delay of reinforcement greatly reduces its effectiveness.
- Reinforcement may be given *continuously* (after every response) or on a schedule of *partial reinforcement*. Partial reinforcement produces greater resistance to extinction.
- The four most basic schedules of partial reinforcement are *fixed ratio*, *variable ratio*, *fixed interval* and *variable interval*. Each produces a distinct pattern of responding.
- Stimuli that precede a reinforced response tend to control the response on future occasions (stimulus control). Two aspects of stimulus control are generalisation and discrimination.
- In generalisation, an operant response tends to occur when stimuli similar to those preceding reinforcement are present.
- In discrimination, responses are given in the presence of discriminative stimuli associated with reinforcement and withheld in the presence of stimuli associated with non-reinforcement.

Punishment:

- *Punishment* decreases responding. Punishment occurs when a response is followed by the onset of an unpleasant event or by the removal of a positive event (response cost).
- Punishment is most effective when it is immediate, consistent and of an appropriate intensity.

One-trial learning and taste aversion:

- One-trial learning occurs as a result of classical conditioning; however, in one-trial learning it only takes one pairing of a NS prior to an unpleasant UCS to create a lasting association between the two. Most of the time this occurs with food, and is known as taste aversion.

Observational learning:

- Much human learning is achieved through observation or modelling.
- *Observational learning* is influenced by the personal characteristics of the model and the success or failure of the model's behaviour. Studies have shown that aggression is readily learnt by modelling.
- There are four aspects of observational learning: attention, retention, reproduction, motivation/reinforcement.

Insight learning:

- *Preparation stage*: Information is gathered to begin solving the problem.
- *Incubation stage*: The organism works on the problem unconsciously.
- *Illumination or insight stage*: The organism experiences the 'aha' effect.
- *Verification*: The organism puts the insight they have gained into action and the solution to the problem is tested.

Latent learning:

- Latent learning occurs without obvious reinforcement and remains hidden until reinforcement is provided.

Watson and Rayner's Little Albert experiment:

- Watson and Rayner failed to adhere to the following ethical considerations: do no psychological or physical harm, informed consent, debriefing, confidentiality, withdrawal rights.

Apply your knowledge and skills

SECTION A: MULTIPLE-CHOICE QUESTIONS

1 In classical conditioning, an organism develops an association between the:

- **A** neutral stimulus and the conditioned stimulus.
- **B** conditioned stimulus and the unconditioned stimulus.
- **C** conditioned stimulus and the conditioned response.
- **D** neutral stimulus and the unconditioned response.

2 Unlike operant conditioning, what does classical conditioning involve?

- **A** Reflexive responses
- **B** Stimulus discrimination
- **C** Stimulus generalisation
- **D** Voluntary responses

3 Taste aversion for a particular food is often created when the food is associated with:

- **A** an illness or discomfort.
- **B** a positive reinforcer.
- **C** a neutral stimulus.
- **D** hunger.

4 Toto the airport sniffer dog has been trained to detect bags containing illegal substances such as drugs, but to ignore other bags. Toto has been trained in:

- **A** good manners.
- **B** negative reinforcement.
- **C** stimulus discrimination.
- **D** stimulus generalisation.

5 Which schedule of reinforcement tends to produce the scallop effect pattern where responding is low following a reinforcer, but rapidly increases as the time for the next reward approaches?

- **A** Fixed ratio
- **B** Fixed interval
- **C** Variable ratio
- **D** Variable interval

6 Watson's experiments with 'Little Albert' are an example of the _____ conditioning of _____.

- **A** classical; a fixed action pattern
- **B** classical; an emotional response
- **C** operant; a phobic reaction
- **D** operant; maturation

7 Barnabus the rat was trained in a Skinner box to press a lever to receive food. The rat underwent:

- **A** stimulus training.
- **B** classical conditioning.
- **C** respondent conditioning.
- **D** operant conditioning.

8 A punisher could be unintentionally functioning as a reinforcer if:

- **A** conditioning is used.
- **B** it comes too late after the behaviour.
- **C** the frequency of the behaviour goes up.
- **D** the frequency of the behaviour goes down.

9 Which of the following is an example of one-trial learning?

- **A** The dog salivating at the sight of meat powder
- **B** The rat pressing the lever in a Skinner box for a food pellet
- **C** Foxes not preying on sheep after eating a bait containing lithium chloride
- **D** Little Albert being scared of white laboratory rats

10 Amanda's horse, Apples, had a habit of biting people. After a long period of conditioning, the horse had not bitten anyone for quite a few weeks. Then one day, Apples suddenly bit Amanda's friend on the arm. The appropriate term for the reappearance of this behaviour is:

- **A** counter-conditioning.
- **B** generalisation.
- **C** negative conditioning.
- **D** spontaneous recovery.

11 Which of the following statements about learning is incorrect?

- **A** Learning can be defined as a relatively permanent change in behaviour that occurs as a result of experience.
- **B** Learning is an ongoing process that continues throughout the lifespan.
- **C** Learning can only occur when an organism is motivated to learn.
- **D** The change in behaviour associated with learning may be delayed and actually occur some time after learning has taken place.

12 Bandura was best known for his studies with:

- **A** dogs and reflex conditioning.
- **B** cats and trial and error learning.
- **C** children and aggressive behaviour.
- **D** pigeons and ping-pong games.

13 Steven had never cooked a meal in his life, although he always watched his mother preparing the evening meal. Steven moved out of home to go to university, and tried to cook a meal for himself. To his surprise he was capable of cooking reasonably well. What method of learning did Steven use to gain the knowledge to cook for himself?

A Classical conditioning

B Learning set

C Operant conditioning

D Observational learning

14 Peter has watched his father mow the lawn for several months. Today, however, his father is ill and Peter has to do the mowing. Peter has never mown the lawn before, but he does an excellent job without any assistance. This demonstrates:

A insight.

B latent learning.

C vicarious learning.

D classical conditioning.

15 Which of the following does not belong with the others?

A Pavlov

B Skinner

C Thorndike

D Operant conditioning

SECTION B: SHORT-ANSWER QUESTIONS

1 A person has a phobia of elevators. They will not enter an elevator, even to reach a high floor of a building – they would rather take the stairs. Apply your knowledge of classical conditioning and operant conditioning to briefly describe how a psychologist might assist a person who suffers from a fear of elevators.

2 Do you have a taste aversion to a particular food? (If not, ask a friend or family member.) Using the one-trial learning theory, explain how the dislike occurred and persists.

3 Imagine that you are a psychologist. Little Albert (not so little any more) comes to you seeking help to overcome his fear of white rats. What learning process could you use to help Albert overcome it? Detail the steps you would use.

4 Compare classical and operant conditioning. Briefly explain three ways in which they are different, and three ways in which they are similar.

5 Briefly describe the elements that are necessary for observational learning to occur. Use an example that does not appear in the text to explain each step.

6 What is trial-and-error learning?

7 David has decided that it is time to train his daughter Chloe to tie her own shoelaces. He decides to apply the concept of shaping to this task. Describe how he might use shaping to train Chloe to tie her shoes.

8 Name and define the aspects involved in insight learning.

9 Watson's experiment with Little Albert is considered unethical by today's standards. Describe three aspects of the experiment that are considered unethical.

10 Using the language of classical conditioning, describe an example of how aversion therapy may be used to help someone quit smoking.

SECTION C: EXTENDED-RESPONSE QUESTION

Bernard is suffering from an addiction to alcohol. Using your knowledge of learning theories, detail how Bernard may be treated for this maladaptive behaviour and discuss the advantages and limitations of using this technique, including ethical considerations. In your response, ensure that you use the appropriate psychological terminology.
This question is worth 10 marks.

SECTION D: ASSESSMENT TASK

Evaluation of research

You may work independently or in groups for this task.

Choose one of the following sets of theories to compare.

1 Classical conditioning and operant conditioning

2 Observational learning and insight learning

3 One-trial learning and classical conditioning

4 Latent learning and insight learning

5 Any other combination of learning theories

[ISBN 9780170182966]

You must evaluate your chosen two theories of learning. In your evaluation you should:

- summarise the key concepts in each theory
- clearly explain the differences between the theories
- clearly explain any similarities between the theories
- refer to specific research that supports each theory
- provide an everyday application of each theory
- write a report on the findings.

Use your textbook as a starting point, then research more widely using other means such as the Internet, the library and journal articles.