

BEHAVIORAL SCIENCES

Theories of Learning and
Behavioral Modification

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Learning Objectives

- Demonstrate understanding of theories of learning and how different reinforcers are applied
- Answer questions about behavioural modification, including classical and operant conditioning
- Answer questions about behavioural models of depression

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LEARNING

Learning results from a permanent change in behaviour not due to fatigue, drugs, or maturation. There are two main types of learning: classical and operant.

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Classical Conditioning

- In classical conditioning, a neutral stimulus is associated with an event that usually elicits an unconditioned response. The conditioned response is elicited by the conditioned stimulus after repeated pairings of the unconditioned stimulus (UCS) and conditioned stimulus (CS).
- The classic example is the Pavlovian experiment, which pairs the ringing of a bell with the bringing of food. Eventually the sound of the bell elicits the salivary response that previously occurred only with the sight of the food.
- Another example is when a patient receives chemotherapy (UCS), which induces nausea (UCR). Eventually, the sights and sounds of the hospital alone (CS) elicit nausea, now a conditioned response (CR).

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Operant Conditioning

In operant conditioning (experiment by B. F. Skinner), learning occurs when a behaviour is followed by an event. In the experiment:

- A rat presses a lever to get a pellet of food. (The behaviour is called operant because it operates on the environment.)
- After receiving the food, the rat becomes more likely to press the lever because the food is a reinforcing event.
- The role of the reinforcer is to increase the likelihood of a response.

A **primary reinforcer** is the key motivator for behaviour. It is often a physiological or psychological necessity, e.g., food, water, and sex.

A **secondary reinforcer** is a stimulus or situation that has acquired its function as a reinforcer after pairing with a stimulus that functions as a reinforcer.

- Examples often include tokens and money.

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- **Types of Reinforcers**

- There are two types of reinforcers that both increase the probability of a response. Typically, positive reinforcers add a desirable stimulus and negative reinforcers remove an aversive stimulus. No stimulus is universal.

- A **positive reinforcer** is a stimulus that, when applied following an operant response, strengthens the probability of that response occurring.

- A woman gets a bonus at work after completing a big project; that will make her happy and more likely to perform well again.

- A **negative reinforcer** is a stimulus that, when removed following an operant response, strengthens the probability of that response occurring.

- A child cleans up his room (response/desired behaviour) in order to stop his mother's nagging (negative reinforcer).

- Behavioural response to the same stimulus can be different (increased or decreased)from person to person. Do not rely on subjective evaluations of whether the Stimulus is unpleasant. An introvert might find a party aversive, while an Extrovert would not.

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Punishment is a stimulus that will decrease the probability of the response. It usually uses an aversive stimulus to the individual. In punishment, you want to decrease the response.

- A man drives over the speed limit and gets a speeding ticket. The goal of the ticket is for the man to reduce his driving speed.
- **Extinction** refers to the disappearance of a response when it is no longer being reinforced.

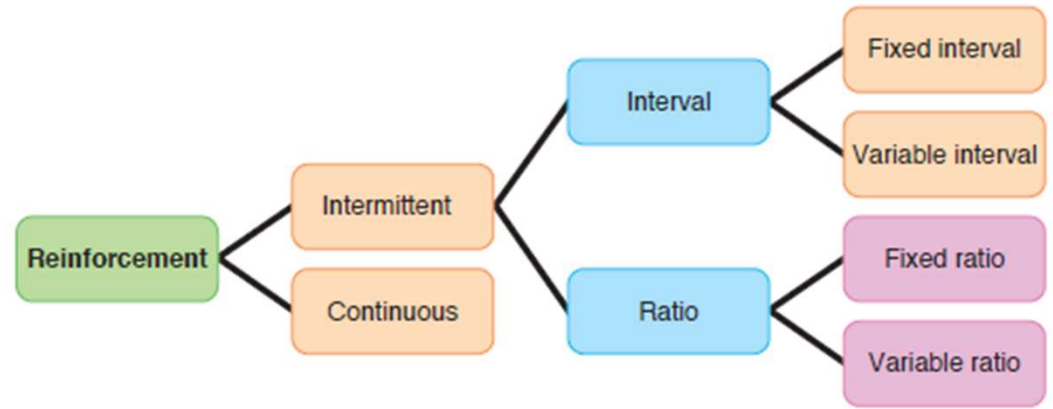
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Types of Reinforcement

- In **continuous reinforcement**, every response is followed by a reinforcement. This results in fast learning (acquisition) and fast extinction when reinforcement is stopped.
- In **intermittent (or partial) reinforcement**, not every response is reinforced.
- Learning is slower and response is harder to extinguish.
- Suppose a child often throws tantrums, and in the hope that he will stop, the parents ignore him for long periods of time. They don't want to reinforce such behaviour with attention. However, if their patience eventually wears thin and they attend to him, they are putting the child on an intermittent reinforcement schedule, which will make it harder to extinguish the tantrums.

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Reinforcement



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Reinforcement Schedules

- **Interval schedules** are based on the passage of time before reinforcement is given.
- A **fixed interval schedule** reinforces the response that occurs after a fixed period elapses. Responses are slow in the beginning of the interval and faster immediately prior to reinforcement (end-of-year bonus).
- A **variable interval schedule** delivers reinforcement after unpredictable time periods elapse (surprise bonus you can get anytime).

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Ratio schedules are based on the number of behaviours elicited before reinforcement is given.

- A **fixed ratio schedule** delivers reinforcement after a fixed number of responses. It produces a high response rate (getting a bonus after every three projects completed).
- A **variable ratio schedule** delivers reinforcement after a changing number of responses. It produces the greatest resistance to extinction (getting a bonus after completing undisclosed number of projects).

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Reinforcement Schedule

Interval Schedule	Examples
Fixed interval	<ul style="list-style-type: none">• Weekly paycheck• Bonus during holiday season• Gift with each purchase• Weekly quiz
Variable interval	<ul style="list-style-type: none">• Surprise bonus• Pop quiz• Listening to radio for favorite song

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Reinforcement schedule

Ratio Schedule	Examples
Fixed ratio	<ul style="list-style-type: none">• Piecemeal work• Free sandwich after 10 sandwiches bought• \$5,000 to a salesman after each sale of 5 automobiles
Variable ratio	<ul style="list-style-type: none">• Slot machines• Door-to-door salesman• Unknown sales bonus

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Modeling

- In modelling, learning occurs through observation. Watching someone else get reinforcement is enough to change behaviour.

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Classical Conditioning

Systematic desensitization usually begins with imagining oneself in a progression of fearful situations and using relaxation strategies that compete with anxiety. It is often used to treat anxiety and phobias, is based on the concept of counterconditioning.

- Patients start by creating a list of fear-eliciting stimuli from least stressful to most stressful.
- They then pair their fear-eliciting stimulus with behaviours that elicit unconditioned responses (relaxation).
- When they are relaxed in the presence of the feared stimulus, the fear response disappears

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- **Exposure** is treatment by forced exposure to the feared object; maintained until fear response is extinguished. If you are afraid of heights, you will ride up the elevator until the fear ceases.
- **Flooding**, or massive exposure, is where patients are exposed to a maximum intensity anxiety-producing situation. If imagined, it is called implosion. If you are afraid of bugs, you will be locked in a room with millions of bugs.
- **Aversive conditioning** occurs when a stimulus that produces undesired behavior is paired with an aversive stimulus. In treatment of alcoholism, Patients are given disulfiram, which makes them sick when they drink alcohol.

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Operant Conditioning

- **Shaping** (or successive approximations) achieves final target behaviour by reinforcing successive approximations of the desired response. Reinforcement is gradually modified to move behaviours from the more general to the specific responses desired. A boy with autism is rewarded when he utters one word and subsequently must utter more words to obtain the same reward.
- **Stimulus control** is where a stimulus inadvertently acquires control over behaviour. When this is true, removal of that stimulus can extinguish the response. Watching TV while eating will increase weight, so in order to lose weight you must stop watching TV.
- **Biofeedback** (neurofeedback) uses external feedback via instruments to provide usually unperceived biological information subsequently used to modify internal physiologic states. Certain functions of the autonomic nervous system (pulse, blood pressure, muscle tone, pain perception) can be manipulated through the technique of biofeedback.
- **Fading** is gradually removing the reinforcement without the individual becoming aware of the difference.
 - Patients receive pain medication after surgery, but each dose is smaller until discontinuation.
 - Nicotine patch begins with 21 mg and is later reduced to 14 mg and then 7 mg.
 - Patients are unaware during this process that they are receiving less nicotine.

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Behavioral Models of Depression

- **Learned helplessness** (or the animal model of depression) is where all normal avoidance responses are extinguished. If a rat is shocked and not allowed to escape, eventually the rat will not take an obvious avoidance route even when it is offered. Symptoms of helplessness in animals include passivity, norepinephrine depletion, and difficulty learning responses that produce relief and weight/appetite loss.

Characterized in people by an attitude of “when nothing works, why bother.” A woman in an abusive relationship who perceives she cannot escape the abuse will give up and become depressed.

Increased levels of GABA in hippocampus decrease the likelihood of learned helplessness response.

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Low rate of response-contingent reinforcement is another explanation for depression. The person receives too little predictable positive reinforcement and may lack the social skills necessary to elicit this positive reinforcement. Depression be a prolonged extinction schedule; it results in passivity.

- A man who feels he receives no positive reinforcement from his spouse can become depressed, even if he seems otherwise successful. A caring and giving father who feels unappreciated by his family might become depressed.

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