

Operant conditioning

Principles

In operant conditioning the behaviour is determined by its punishing and/or rewarding consequences, in contrast to the natural reflexes associated with classical conditioning. In other words, the behaviour is not part of the natural repertoire of the individual but is acquired (learned) through reward and punishment.

Elements of Operant Conditioning

There are 4 elements that describe operant conditioning:

- 1. positive reinforcement;
- 2. negative reinforcement;
- 3. punishment;
- 4. extinction.

Element	Effect on Behaviour	Example
Positive Reinforcement	Behaviour is increased by reward	A student increases a certain pattern of behaviour in studying leading to passing the exams with higher grades to get more pocket money (reward/positive reinforcement).
Negative Reinforcement	Behaviour is increased by avoidance/escape	A student increases a certain pattern of behaviour in studying leading to passing the exams with higher grades in order to avoid being grounded at home (the negative event actively being avoided)
Punishment	Behaviour is decreased by suppression	A student decreases procrastination during studying after the parents ground him/her home
Extinction	Behaviour is eliminated by non-reinforcement	A child stops fooling around (trying to attract attention) when the parents ignore this behaviour. There can be an initial increase in the behaviour before it decreases and eventually disappears. Extinction is more powerful than punishment for long-term reduction in unwanted behaviours.

Reinforcement Schedules and their Results

The pattern and frequency of reinforcement (be it positive or negative) is directly proportional to how quickly the behaviour is learned. However, the more dependent the behaviour is on reinforcement the more vulnerable is also to extinction. The various schedules are listed below, in descending order of vulnerability to extinction.

Schedule	Description	Example	Resistance to Extinction
Continuous	Reinforcement is presented after every response	Always receiving a candy from a vending machine	Least resistant - response disappears rapidly without reinforcement stops (when the machine doesn't give candy anymore)
Fixed ratio	Reinforcement is presented after a fixed number of responses	Getting paid for every 10 tickets sold.	There is a fast response rate - in order to sell more tickets and get more reward
Fixed interval	Reinforcement is presented after a designated amount of time	Studying for regularly scheduled tests	The response rate increases towards the end of the interval
Variable ratio	Reinforcement is presented after a random and unpredictable number of responses	Winning at the slot machine	Highly resistant to extinction. It persists with little/no reinforcement
Variable interval	Reinforcement is presented after a random and unpredictable amount of time	Going fishing and catching a fish every so often	Highly resistant to extinction. It persists with little/no reinforcement

Role of the Limbic System

Reward and Punishing Centers

The major reward centers are located throughout the medial forebrain bundle. The lateral and ventromedial nuclei of the hypothalamus are especially involved.

The major punishment centers are located in the central gray area around the aqueduct of Sylvius, starting from the level of the mesencephalon and extending rostrally into the periventricular zones of the hypothalamus & thalamus. Some less potent punishment areas are in the amygdala and hippocampus.

Habituation Versus Reinforcement

Sensory experience will be remembered only if it causes reward or punishment. This plays a very important role in learning and memory. It is very difficult for the brain to learn and remember new pieces of information which cannot be linked to a reward or punishment, even in abstract or vague, indirect way. A new sensory stimulus usually excites multiple areas of the brain but it will be retained only if the stimulus elicits a sense as in reward or punishment. If the stimulus does not elicit any rewarding/punishing sense and is keep repeating, this will cause habituation (desensitization) and eventually be ignored (a way of filtering important and valuable information).

Links

Related articles

- Classical Conditioning

Sources

- POKORNY, Jaroslav. *Operant Conditioning* [lecture for subject Physiology, specialization Physiology, 1LF Charles University in Prague]. Prague. 2009-03-20.

Bibliography

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