3.2. Operant Conditioning (Skinnerian Conditioning)

Basic process of operant. conditioning and experiment on rat

Perhaps the most important of the behaviourists was Burrhus Frederic Skinner. He is more commonly known as B.F. Skinner. His views were slightly less extreme than those of Watson (1913). Skinner believed that **we have such a thing as a mind**, but that **it is simply more productive to study observable behavior rather than internal mental even**

Skinner believed that classical conditioning was too simplistic to be used to describe something as complex as human behavior. Operant conditioning, in his opinion, better described human behavior since it examined that causes and effects of intentional behavior. To implement his empirical approach, Skinner invented the operant conditioning chamber, or "*Skinner Box*", in which subjects such as pigeons and rats were isolated and could be exposed to carefully controlled stimuli.

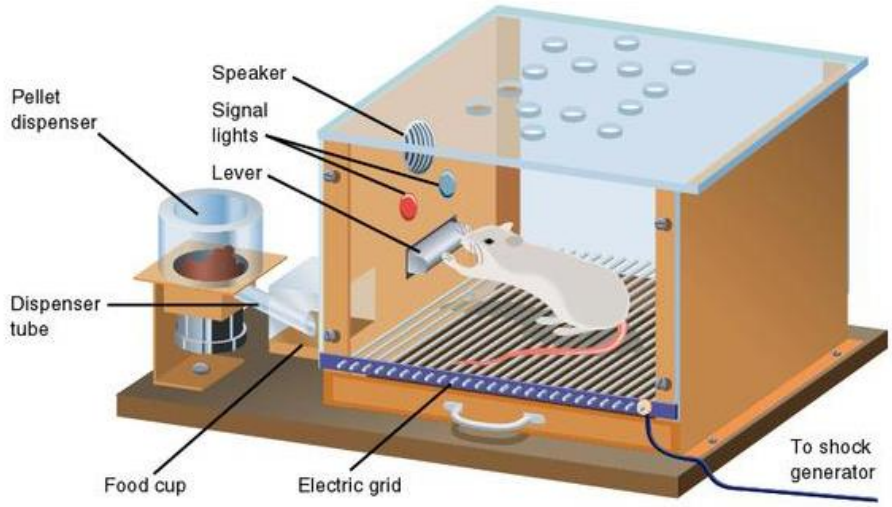
Operant Conditioning deals with operant - intentional actions that have an effect on the surrounding environment. Skinner set out to identify the processes which made certain operant behaviors more or less likely to occur.

Skinner, first time, got the idea that most of the responses could not be attributed to the known stimuli. He defined two types of responses—the one "elicited" by known stimuli which he called as "respondent behaviour" and the other "emitted" by the unknown stimuli which he called as **"operant behaviour".**

Operant conditioning is a type of learning where **behavior is controlled by consequences**. Key concepts in operant conditioning are positive reinforcement, negative reinforcement, positive punishment and negative punishment. It (sometimes referred to as **instrumental conditioning**) is a method of learning that occurs through rewards and punishments for behavior. Through operant conditioning, **an association is made between a behavior and a consequence for that behavior.** For example, when a lab rat presses a blue button, he receives a food pellet as a reward, but when he presses the red button he receives a mild electric shock. As a result, he learns to press the blue button but avoid the red button.

His work was based on Thorndike's (1905) law of effect. Skinner introduced a new term into the Law of Effect - Reinforcement. Behavior which is reinforced tends to be repeated (i.e., strengthened); behavior which is not reinforced tends to die out-or be extinguished (i.e., weakened).

Skinner (1948) studied operant conditioning by conducting experiments using animals. But, his first experiment was done upon rat. He placed the rat in a *box (called 'Skinner Box')* which was similar to Thorndike's 'puzzle box'.



Experiments

B. F. Skinner used a Skinner box to study operant learning. The box contains a bar or key that the organism can press to receive food and water, and a device that records the organism's responses.

The most basic of Skinner's experiments was quite similar to Thorndike's research with cats. A rat placed in the chamber reacted as one might expect, scurrying about the box and sniffing and clawing at the floor and walls. Eventually the rat chanced upon a lever, which it pressed to release pellets of food. The next time around, the rat took a little less time to press the lever, and on successive trials, the time it took to press the lever became shorter and shorter. Soon the rat was pressing the lever as fast as it could eat the food that appeared. As predicted by the law of effect, the rat had learned to repeat the action that brought about the food and cease the actions that did not.

B.F. Skinner (1938) coined the term operant conditioning; it means roughly **changing of behavior by the use of reinforcement which is given after the desired response.** We can all think of examples of how our own behavior has been affected by reinforcers and punishers. As a child you probably tried out a number of behaviors and learned from their consequences.

For example, if when you were younger you tried smoking at school, and the chief consequence was that you got in with the crowd you always wanted to hang out with, you would have been positively reinforced (i.e., rewarded) and would be likely to repeat the behavior.

If, however, the main consequence was that you were caught, caned, suspended from school and your parents became involved you would most certainly have been punished, and you would consequently be much less likely to smoke now.

Types of Reinforcement

In operant conditioning, there are two different types of reinforcement. Both of these forms of reinforcement influence behavior, but they do so in different ways.

Positive Reinforcement

In operant conditioning, positive reinforcement involves the addition of a reinforcing stimulus following a behavior that makes it more likely that the behavior will occur again in the future. When a favorable outcome, event, or reward occurs after an action, that particular response or behavior will be strengthened. One of the easiest ways to remember positive reinforcement is to think of it as something being *added*.

By thinking of it in these terms, you may find it easier to identify real-world examples of positive reinforcement.

Sometimes positive reinforcement occurs quite naturally. For example, when you hold the door open for someone you might receive praise and a thank you. That affirmation serves as positive reinforcement and may make it more likely that you will hold the door open for people again in the future.

In other cases, someone might choose to use positive reinforcement very deliberately in order to train and maintain a specific behavior. An animal trainer, for example, might reward a dog with a treat every time the animal shakes the trainer's hand.

Skinner showed how positive reinforcement worked by placing a hungry rat in his Skinner box. The box contained a lever on the side, and as the rat moved about the box, it would accidentally knock the lever. Immediately it did so, and a food pellet would drop into a container next to the lever.

The rats quickly learned to go straight to the lever after a few times of being put in the box. The consequence of receiving food if they pressed the lever ensured that they would repeat the action again and again.

Positive reinforcement strengthens a behavior by providing a consequence an individual finds rewarding. For example, if your teacher gives you £5 each time you complete your homework (i.e., a reward) you will be more likely to repeat this behavior in the future, thus strengthening the behavior of completing your homework.

Negative Reinforcement

Negative reinforcement is a term described by B. F. Skinner in his theory of operant conditioning. In negative reinforcement, a response or behavior is strengthened by stopping, removing, or avoiding a negative outcome or aversive stimulus.

Negative reinforcement occurs when something already present is removed (taken away) as a result of a behaviour and the behaviour that led to this removal will increase in the future because it created a favourable outcome.

Aversive stimuli tend to involve some type of discomfort, either physical or psychological. Behaviors are negatively reinforced when they allow you to escape from aversive stimuli that are already present or allow you to completely avoid the aversive stimuli before they happen.

Deciding to take an antacid before you indulge in a spicy meal is an example of negative reinforcement. You engage in an action in order to avoid a negative result.

One of the best ways to remember negative reinforcement is to think of it as something being *subtracted* from the situation. When you look at it in this way, it may be easier to identify examples of negative reinforcement in the real-world.

Examples of Negative Reinforcement

Example: Thomas has wet hands after washing them. He rubs them in the towel and the water is now removed from them. He knows that every time he doesn't want his hands to remain wet he can use a towel to get rid of the water. He now uses a towel every time he wants to remove the water from his hands.

For example, if you do not complete your homework, you give your teacher £5. You will complete your homework to avoid paying £5, thus strengthening the behavior of completing your homework.

Skinner showed how negative reinforcement worked by placing a rat in his Skinner box and then subjecting it to an unpleasant electric current which caused it some discomfort. As the rat moved about the box it would accidentally knock the lever. Immediately it did so the electric current would be switched off. The rats quickly learned to go straight to the lever after a few times of being put in the box. The consequence of escaping the electric current ensured that they would repeat the action again and again.

In fact Skinner even taught the rats to avoid the electric current by turning on a light just before the electric current came on. The rats soon learned to press the lever when the light came on because they knew that this would stop the electric current being switched on.

These two learned responses are known as *Escape Learning* and *Avoidance Learning*.

The removal of an unpleasant reinforce can also strengthen behavior. This is known as negative reinforcement because it is the removal of an adverse stimulus which is 'rewarding' to the animal or person. Negative reinforcement strengthens behavior because it stops or removes an unpleasant experience.

Punishment (weakens behavior)

Punishment is defined as the opposite of reinforcement since it is designed to weaken or eliminate a response rather than increase it. It is an aversive event that decreases the behavior that it follows.

Like reinforcement, punishment can work either by directly applying an unpleasant stimulus like a shock after a response or by removing a potentially rewarding stimulus, for instance, deducting someone's pocket money to punish undesirable behavior.

Note: It is not always easy to distinguish between punishment and negative reinforcement.

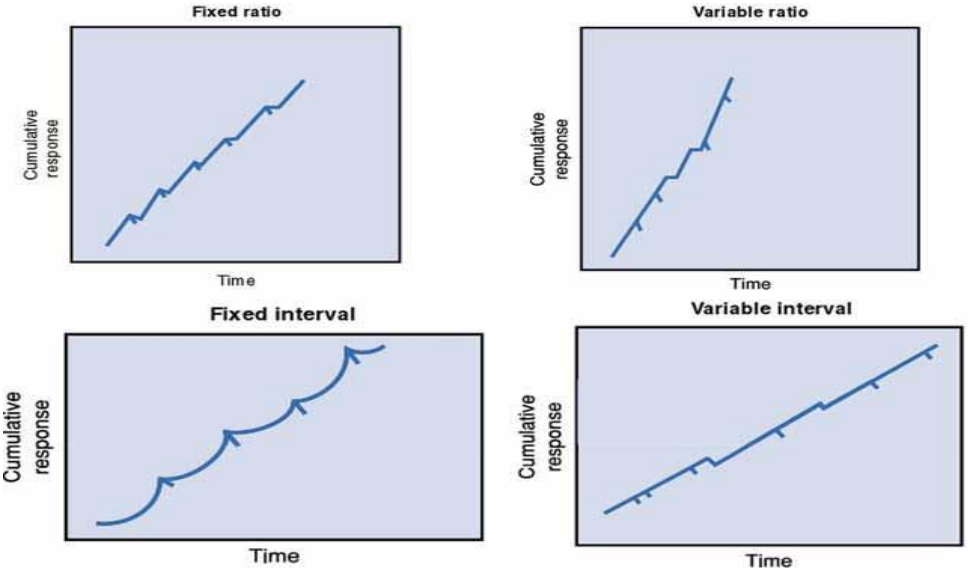
There are many problems with using punishment, such as:

- Punished behavior is not forgotten, it's suppressed - behavior returns when punishment is no longer present.
- Causes increased aggression - shows that aggression is a way to cope with problems.
- Creates fear that can generalize to undesirable behaviors, e.g., fear of school.
- Does not necessarily guide toward desired behavior - reinforcement tells you what to do, punishment only tells you what not to do.

Schedules of Reinforcement

Skinner also found that when and how often behaviors were reinforced played a role in the speed and strength of acquisition. He identified several different schedules of reinforcement:

1. **Continuous reinforcement** involves delivery a reinforcement every time a response occurs. Learning tends to occur relatively quickly, yet the response rate is quite low. Extinction also occurs very quickly once reinforcement is halted.
2. **Fixed-ratio schedules** are a type of partial reinforcement. Responses are reinforced only after a specific number of responses have occurred. This typically leads to a fairly steady response rate.
3. **Fixed-interval schedules** are another form of partial reinforcement. Reinforcement occurs only after a certain interval of time has elapsed. Response rates remain fairly steady and start to increase as the reinforcement time draws near, but slow immediately after the reinforcement has been delivered.
4. **Variable-ratio schedules** are also a type of partial reinforcement that involve reinforcing behavior after a varied number of responses. This leads to both a high response rate and slow extinction rates.
5. **Variable-interval schedules** are the final form of partial reinforcement Skinner described. This schedule involves delivering reinforcement after a variable amount of time has elapsed. This also tends to lead to a fast response rate and slow extinction rate.



Variable Ratio

- 1:1/ 7:1 / 4:1 / 12:1 / 8:1 / 19:1 / 3:1 / 2:1 / 2:1 / 5:1 / 16:1 / 11:1 / 3:1 / 8:1 / 4:1

Fixed Ratio

- 7:1 / 7:1 / 7:1 / 7:1 / 7:1,…. 15 times

Fixed Interval

- 10 sec:1 / 10 sec:1 / 10 sec:1 / ,… 15 times

Variable Interval

- 6 sec:1 / 8 sec:1 / 10 sec:1 / 3 sec:1 / 7 sec:1 / 14 sec:1 / 15 sec:1 / 8 sec:1 / 5 sec:1 / 12 sec:1 / 6 sec:1 / 9 sec:1 / 13 sec:1/15 sec:1 / 8 sec:1

Behavior Shaping

The concept of behavior shaping was first developed and used by B.F Skinner as an application of learning behaviors through reinforcement. Behaviour shaping is the **process of reinforcing behaviors that are closer to the target behavior (expected behavior)**, also known as successive approximations.

The theory involves reinforcing behavior that are successively closer and closer to the approximations of the desired, or targeted, behavior. The process of shaping is vital because **it's**

not always likely that an organism should display the exact target behavior spontaneously. However, by reinforcing the behavior that is closer and closer to the desired behavior, the required behavior can be taught/learned. The step by step procedure of reinforcing different behaviors until the target behavior is achieved is called **Successive Approximations.**

One of the first **experiments** conducted by B.F Skinner on shaping involved teaching pigeons how to bowl, where the pigeons were gradually taught to sideswipe the ball with its beak down the alley towards the pins.

In his experiment where he taught a rat how to press the lever for food, it wasn't a sudden spontaneous behavior rat performed out of guess. The target behavior for the rat was to press the lever, in which case, it would be rewarded with food. But, of course, the rat wasn't going to spontaneously press the lever. So, the trainer, initially, even gave rewards to crude (simple/rough/ basic) approximations of the target behavior. **For example**, even a single step taken in the right direction was reinforced. Then, another step was reinforced, and likewise Skinner would reward the rat for standing on its hind legs, then even the slightest touch on the lever was rewarded, until the rat finally pressed the lever.

The crucial aspect of this procedure is to only **reward new behaviors that are closer to the targeted behavior**. **For instance**, in the experiment with the rat, once the rat touched the lever, it wasn't rewarded for standing on its hind legs. And, when the targeted behavior is achieved, successive approximations leading towards the targeted behavior werren't rewarded anymore. In this way, shaping uses principles of **operant conditioning** to train a subject to learn a behavior by reinforcing proper behaviors and **discouraging unwanted behaviors**.

Steps involved in the process of Shaping

The following steps are involved in behavior shaping:

- For starters, reinforce any behavior that is even remotely close to the desired, target behavior.
- Next step, reinforce the behavior that is closer to the target behavior. Also, you shouldn't reinforce the previous behavior.

- Keep reinforcing the responses/behaviors that resembles the target behavior even more closely. Continue reinforcing the successive approximations until the target behavior is achieved.
- Once the target behavior is achieved, only reinforce the final response.

Educational Implications or Significance of Operant Conditioning:

1. **Successive approximation**: The theory suggests the great potentiality of the shaping procedure for behaviour modification. Operant conditioning can be used for shaping behaviour of children by appropriate use of reinforcement or rewards. Behaviour can be shaped through successive approximation in terms of small steps. Successive approximation is a process which means that complicated behaviour patterns are learned gradually through successive steps which are rewarding for the learner. Every successful step of the child must be rewarded by the teacher.

2. **Eliminating negative behaviour through extinction**: When a learned response is repeated without reinforcement, the strength of the tendency to perform that response undergoes a progressive decrease. Extinction procedures can be successfully used by the class-room teacher in eliminating negative behaviour of students.

3. **Reinforcement**: Operant conditioning has valuable implications for reinforcement techniques in the class-room. The schools can use the principles of operant conditioning to eliminate the element of fear from school atmosphere by using positive reinforcement. Positive reinforcement is perhaps the most widely used behavioural technique in the school setting. This technique simply involves providing a reward for positive behaviour. The reward can be a high grade, a pen, a smile, a verbal compliment. The principle underlying positive reinforcement is that the tendency to repeat a response to a given stimulus will be strengthened as the response is positively rewarded.

4. **Behaviour modification/shaping**: Shaping may be used as a successful technique for making individual learn difficult and complex behaviour. Operant conditioning technique also implies the use of behaviour modification programmes to shape desirable behaviour and to eliminate undesirable behaviour. a teacher needs to identify the student's strengths and weaknesses around a specific skill, and then break the skill into a series of steps that lead a child toward that target. If the targeted skill is being able to write with a pencil, a child might have difficulty holding a pencil. An appropriate assistive step-wise strategy might start with the teacher placing her hand over the child's hand, demonstrating to the child the correct pencil grasp. Once the child achieves this step, she is rewarded and the next step is undertaken.

5. **Basis for programmed instruction**: The theory provides the basis for programmed instruction. Programmed instruction is a kind of learning experience in which a programme takes the place of tutor for the students and leads him through a set of specified behaviours. The principles originating from operant conditioning have revolutionised the training and learning programmes. Consequently, mechanical learning in the form of teaching machines and computer-assisted instructions have replaced usual classroom instructions. The use of programmed material in the form of a book or machine makes provision for immediate reinforcement.
6. *Behaviour therapy:* **Managing Problem Behaviour:** Two types of behaviour is seen in the classroom viz undesired behaviour and problematic behaviour. Operant conditioning is a behaviour therapy technique that shape students behaviour. For this teacher should admit positive contingencies like praise, encouragement etc. for learning. One should not admit negative contingencies. Example punishment (student will run away from the dull and dreary classes – escape stimulation.

Operant Conditioning Summary

Looking at Skinner's classic studies on pigeons' / rat's behavior we can identify some of the major assumptions of the behaviorist approach.

• Psychology should be seen as a science, to be studied in a scientific manner. Skinner's study of behavior in rats was conducted under carefully controlled laboratory conditions.

• Behaviorism is primarily concerned with observable behavior, as opposed to internal events like thinking and emotion. Note that Skinner did not say that the rats learned to press a lever because they wanted food. He instead concentrated on describing the easily observed behavior that the rats acquired.

• The major influence on human behavior is learning from our environment. In the Skinner study, because food followed a particular behavior the rats learned to repeat that behavior, e.g., operant conditioning.

• There is little difference between the learning that takes place in humans and that in other animals. Therefore research (e.g., operant conditioning) can be carried out on animals (Rats / Pigeons) as well as on humans. Skinner proposed that the way humans learn behavior is much the same as the way the rats learned to press a lever.

So, if your layperson's idea of psychology has always been of people in laboratories wearing white coats and watching hapless rats try to negotiate mazes in order to get to their dinner, then you are probably thinking of behavioral psychology.

Behaviorism and its offshoots tend to be among the most scientific of the psychological perspectives. The emphasis of behavioral psychology is on how we learn to behave in certain ways. We are all constantly learning new behaviors and how to modify our existing behavior. Behavioral psychology is the psychological approach that focuses on how this learning takes place.