


Introduction to Psychology
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Lecture – 12
Learning
Classical Conditioning

Now, that we have seen how animals are trained by human beings and how we derive pleasure out of the way we see animals behaving around us; let us come to the theories.

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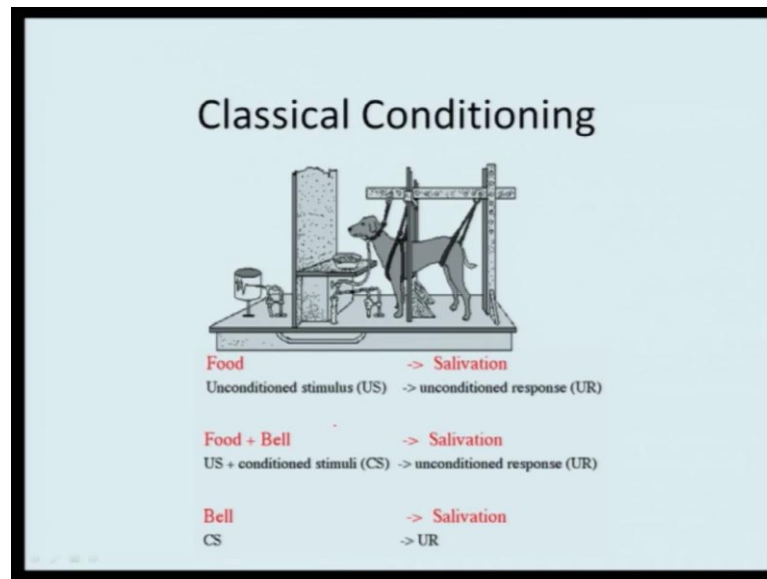
Classical Conditioning



- Russian physiologist Ivan P. Pavlov
- Early 1900s: Mechanism of digestion
- Nobel Prize in 1904

We first come to the interesting theory, the first theory in learning given by Russian physiologist Ivan Pavlov what is called as classical conditioning. Interestingly Pavlov's task was not to know find how animals learn he was not looking at classical conditioning at all, but he was basically designated by the Russian army of conducting a research on the mechanism of digestion this was in early 1900s and for his novel work and the great theory that he come forward with Ivan Pavlov received Nobel prize in 1904.

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Now, what actually Ivan Pavlov had done? Was exactly what you see in this image he took a dog the dog was now (Refer Time: 01:27) to belts, so that he could not make voluntary movements his body remains stable and then small surgery was performed such that the throat of the dog was connected to a tube and from that tube that the saliva that was segregated from the dog would come and get collected in a beaker. Now you see this is the point where the surgery has performed and the actual intention was that in this very plate whenever the meat powder will be presented the dog would salivate once the dog salivate the saliva that gets collected here, will now travel from here and then collected in the beaker there. So, that was now the basic experimentation that Pavlov's has designed and what he did was that every time he would present the meat powder in the bowl there the dog would salivate and every time saliva would get collected in the beaker this is what he adopted in order to understand the mechanism of digestion.

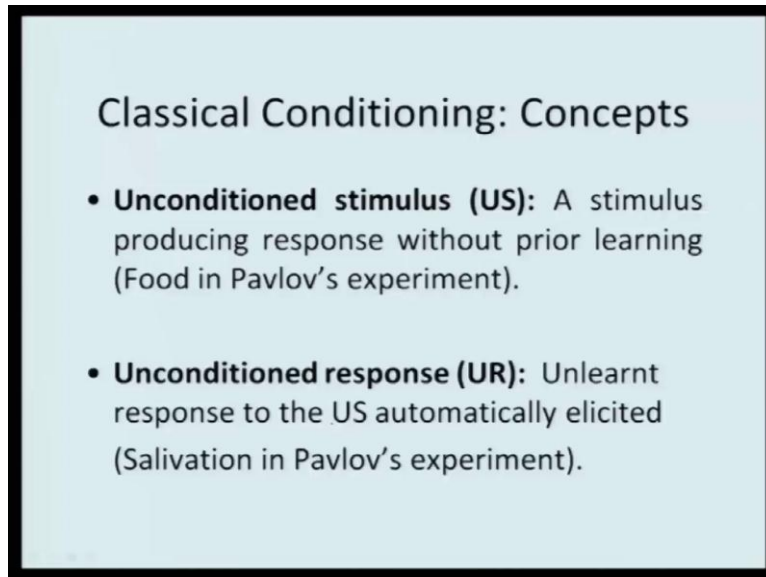
But then something very interesting happen in that very lab the bell was also being ring for some other purpose and what Pavlov's observed that initially the dog which was salivation on the presentation of the meat powder started salivating on the sound of the bell. So, somehow although it was not part of the experimental protocol although this was not the intention of the work that Pavlov's was doing what he realized was that the

dog somehow had formed an association - the association was between the meat powder and the sound of the bell and these two things got associated.

So, exactly what he found was that the food is presented food is the unconditioned stimulus now you are just presenting food and there is a biological mechanism, hunger is triggered by a biological mechanism there is a process of satisfaction that one derives sort of a having food and salivation is again a biological process. So, the urge for having food and salivation which was basically a biological mechanism got associated with the sound of the bell, what actually happen? The food was presented salivation took place, food is the unconditioned stimulus salivation is the unconditional response because these are biological mechanisms. But then the dog what it started doing was that it associated the sound of the bell with food, he thought at every time before the food is presented the bell is definitely rang. So, sound of the bell got associated with the meat hence next time onwards whenever the bell will be rang the dog use to anticipate that now definitely the food pallet will come and this again lead to salivation.

Now, salivation which was basically a biological reflects an unconditional response again got condition to the association that was formed between the sound of the bell and presentation of meat powder, and then next step when the meat powder was not provided only bell was rang still the dog use to salivate anticipating that certainly the meat powder will get presented.

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Classical Conditioning: Concepts

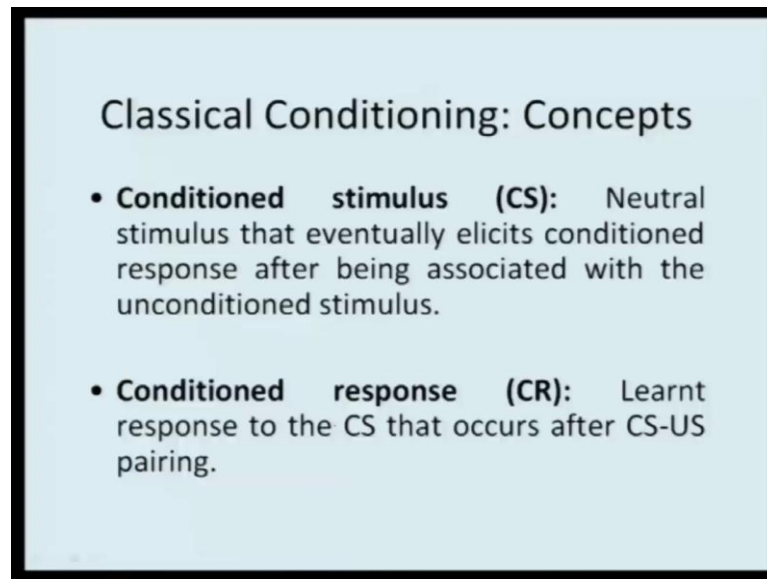
- **Unconditioned stimulus (US):** A stimulus producing response without prior learning (Food in Pavlov's experiment).
- **Unconditioned response (UR):** Unlearned response to the US automatically elicited (Salivation in Pavlov's experiment).

And this is Ivan Pavlov found that the dog was classically conditioned the natural response of the dog got associated with the sound of the bell which lead to an anticipatory type of a behavior. Now although we have used this word you understand the concept let me repeat it again so that you remember it better. The major concepts in classical conditioning are unconditioned stimulus, unconditioned response - conditioned stimulus, conditioned response, rest all you understand.

So, stimulus which produces the response without prior learning, you have not learnt how to respond to that very stimulus that stimulus is unconditioned stimulus. Food in the in this very experiment was the unconditioned stimulus, the conditioned response was salivation the dog had not learnt the how to respond to the unconditioned stimulus, it was automatic process it is a biological mechanism. So, salivation was the unconditional response.

Then the other two important concepts where you remove the 'un' and therefore, it becomes conditioned stimulus conditioned response.

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Classical Conditioning: Concepts

- **Conditioned stimulus (CS):** Neutral stimulus that eventually elicits conditioned response after being associated with the unconditioned stimulus.
- **Conditioned response (CR):** Learnt response to the CS that occurs after CS-US pairing.

What is the conditioned stimulus? The neutral stimulus that eventually elicits conditioned response after being associated with the unconditioned stimulus.

So, the sound of the bell and the meat powder both got associated and conditioned response again remains the same, but the learnt response here what is called as conditioned response is basically that occurs after this CS-US pairing has taken place now, the conditioned stimulus the unconditioned stimulus that pairing has taken place. The unconditioned stimulus we discussed in the previous slide that the unconditional stimulus was the food, so the conditioned stimulus would be the sound of the bell and because sound of bell and the food both got associated and therefore, the salivation which was actually initially in the first step considered as unconditioned response now becomes a conditioned response.

So, what actually happens in classical conditioning basically a neutral stimulus gets associated with a meaningful stimulus and then it acquires the capacity to elicit a similar response.

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Classical Conditioning

- A neutral stimulus gets associated with a meaningful stimulus & acquires the capacity to elicit a similar response.
- It is a form of associative learning.
- It is the substitution & association of one stimulus for another.

Again it is nothing but formation of association. So, classical conditioning is also associative learning and it is the substitution and association of one stimulus for the other one. So, the sound of the bell replaces the meat powder, substitutes because it is associated.

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Classical Conditioning

Under normal circumstances

Conditioned stimulus (CS)	→	No response
Unconditioned stimulus (UCS)	→	UR

During conditioning

Conditioned stimulus (CS)	+	→	UR
Unconditioned stimulus (UCS)			

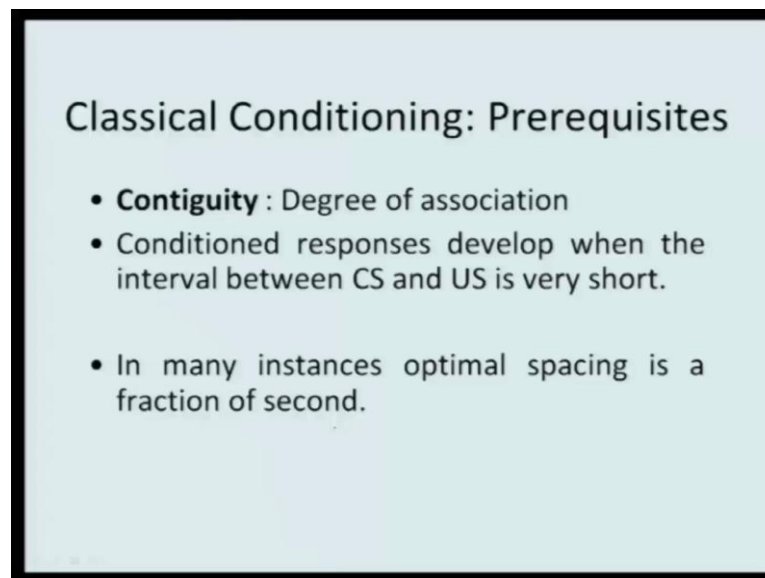
After conditioning

Conditioned stimulus (CS)	→	Conditioned response
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Now this is actually what happens, now under normal condition conditioned stimulus leading to no response unconditioned stimulus leads to response. So, when the dog was not classically conditioned even if the bell would rang the dog will not salivate, know dog will not respond to sound of the bell it has there is no association between two.

So, initially sound of the bell is nothing but a conditioned stimulus, but it leads to no response therefore, it is no meaning for the dog, what has the meaning for dog? Food has the meaning for the dog, what is food in the in the normal condition? It is the unconditional stimulus and therefore, salivation was also an unconditional response there because it is biologically program to salivate. During conditioning what happened? The sound of the bell and the meat powder the food both got associated and it was this combination that lead to the unconditioned response and after conditioning took place; now what was initially leading to no response, the sound of the bell now stand alone sound of the bell can be create salivation and then salivation becomes a conditional response here. So, this was what Pavlov now found.

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Classical Conditioning: Prerequisites

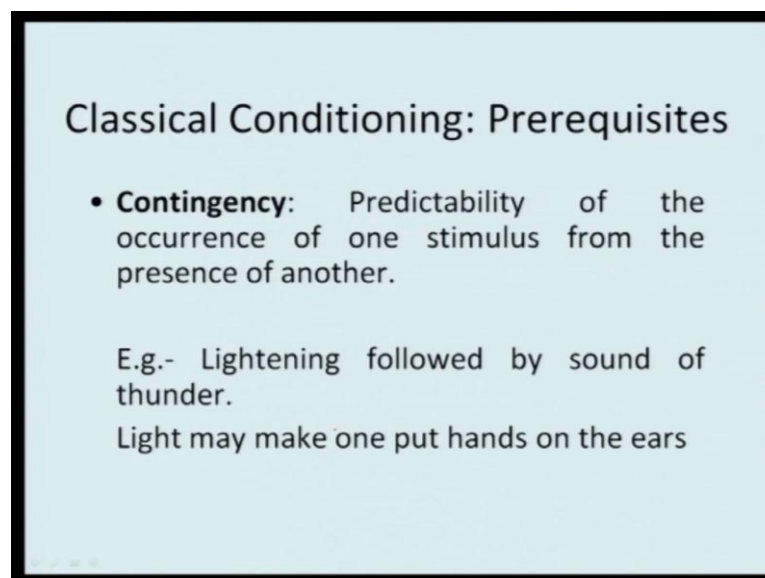
- **Contiguity** : Degree of association
- Conditioned responses develop when the interval between CS and US is very short.
- In many instances optimal spacing is a fraction of second.

Now, the prerequisite for classical conditioning you remember which this first initially that contiguity contrasts and similarity these are the three primary facilitators of learning. These are the factors which now helps us form association. So, the prerequisite from

classical conditioning point of view would be again contiguity and contiguity will decide the degree of association. So, the conditioned stimulus will lead to conditioned response which basically would develop when the interval between the conditioned stimulus and the unconditioned stimulus is very short.

Means the meat powder is being presented simultaneously the bell is also rang. So, temporally the difference between the two processes which are independent the dog is not able establish its so, so, so small, but had it been little far of, you rang the bell and after certain now laps of time if the food was presented the degree of association would not have been stronger because the contiguity factor was not there. So, what happens the more and more know is what we call lack of absence, so higher is the contiguity, shorter is the period between the conditioned and the unconditioned stimulus stronger is the bond the degree of association increases and they are have been many studies we suggest that in certain types of learning the optimum duration, the gap that you can afford is just fraction of seconds. So, you can understand how important contiguity is. The other prerequisite for classical conditioning is the contingency, contingency basically nothing but the predictability of the occurrence.

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Classical Conditioning: Prerequisites

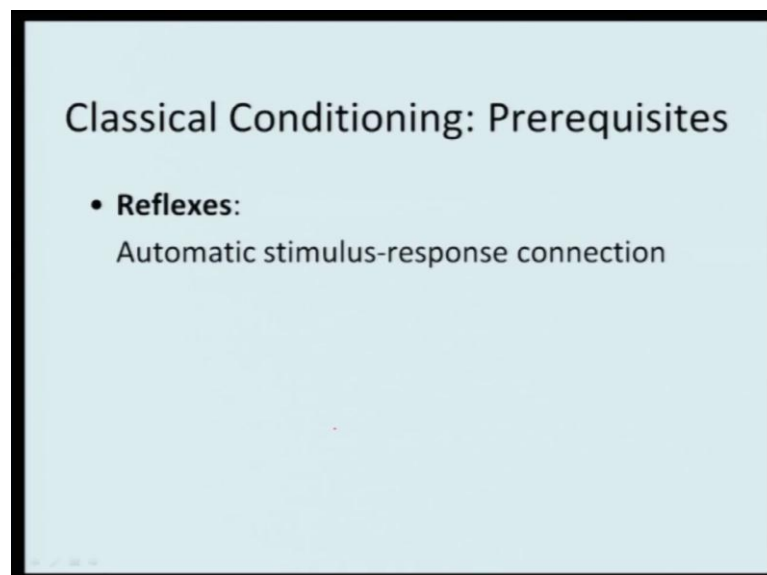
- **Contingency:** Predictability of the occurrence of one stimulus from the presence of another.

E.g.- Lightening followed by sound of thunder.
Light may make one put hands on the ears

So, the once the bell is rang the dog would anticipate now definitely the meat powder will come, thing of our own human experience the fact we know that whenever there is a tender storm we see the light first because it travels faster compare to the sound, but the movement you say you know lighting you anticipate that you will now here sound of the tender, what is this? Again this is contingency this is predictability you know that this is how nature is designed you know that all lighting will be followed by the sound of the tender. Reason being this is how it is programmed because these two things the light and the sound they travel at different speeds. So, right from now the space to our area take little more time, sound takes little more time compare to light, but because we know that is by default going to happen therefore, the movement we see the light we anticipate the sound.

And anticipating the sound what we do? We close our ears because we anticipate that the sound will be (Refer Time: 12:07), it will be extremely loud you have seen the light and you close your ears this is how we respond and this is nothing, but the importance of contingency.

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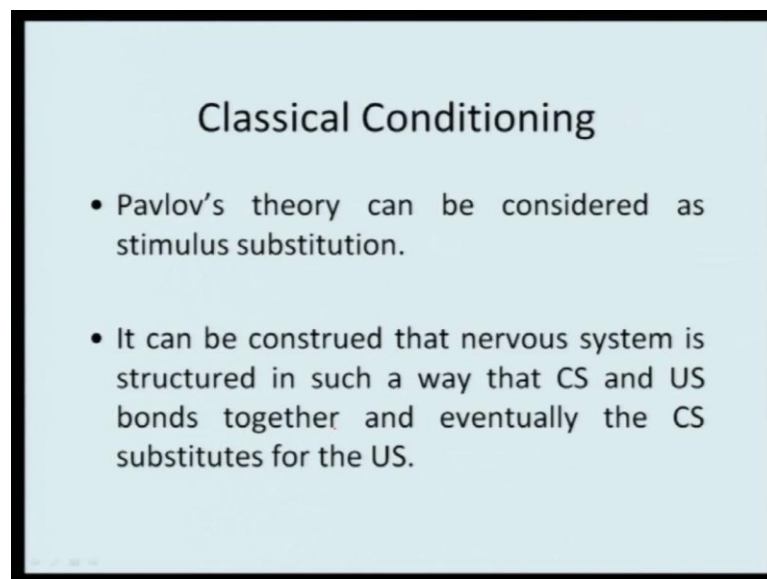


And the third important factor that is reflex. So, reflex basically the automatic response and stimulus connection it is formed. A stimulus leading to response and how automated

it becomes the more and more automated becomes the faster it becomes it becomes a part of you reflex, because of contiguity. You know that if x has happened y is by default arriving, you form a very strong bond and this is strong bond leads you to design a response which also is extremely fast. Imagine situations where you do things in a much more reflexive order for example, now if you are riding and you see now as smallest object coming from one side of your visual field, suddenly you would try to have control over the break mechanism because you anticipated in something that is moving towards you is by default going to come very near to you and it might lead to accident.

So, the three prerequisites contiguity the first important thing that we discussed, contingency the second important thing and then reflex the third important thing; these three prerequisites are there for classical conditioning to take place.

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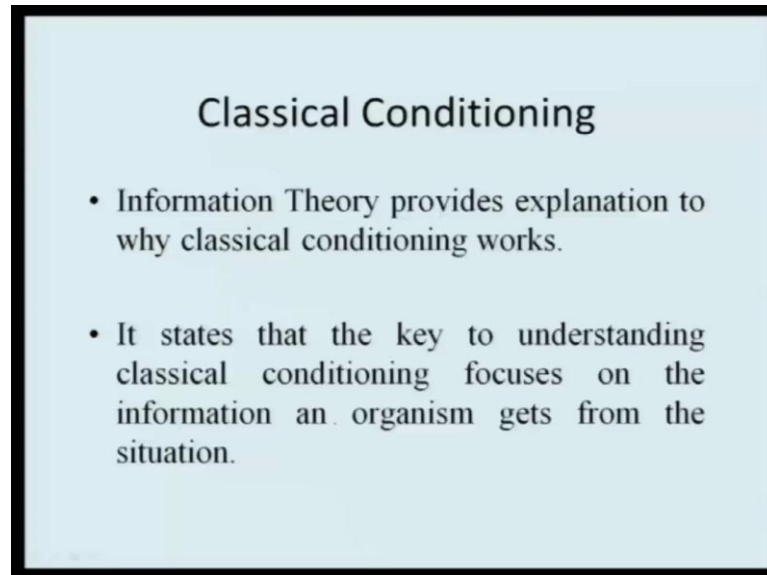
Classical Conditioning

- Pavlov's theory can be considered as stimulus substitution.
- It can be construed that nervous system is structured in such a way that CS and US bonds together and eventually the CS substitutes for the US.

Now, you can consider Pavlov's theory as a stimulus substitution theory it can be construed that nervous system is basically structured in such a way that the conditioned stimulus and the unconditioned stimulus, the bond between them they get formed and eventually the conditioned stimulus substitutes unconditional stimulus. So, of course, learning takes place in the brain there would be some chemical neuro chemical signature of learning. This has taken place in the nervous system and then what happens? CS-US

bond is formed and eventually the CS will substitute the US. So, why that is the reason why Pavlov theory can also be considered as stimulus substitution theory.

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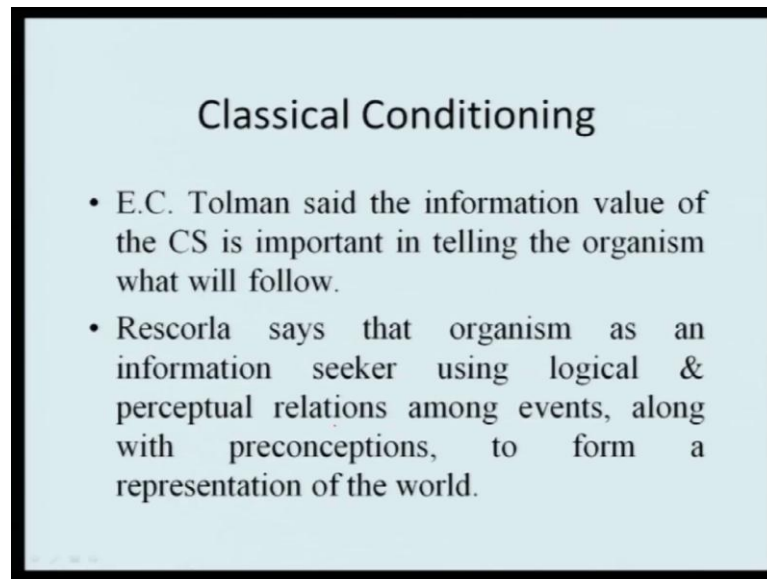


Classical Conditioning

- Information Theory provides explanation to why classical conditioning works.
- It states that the key to understanding classical conditioning focuses on the information an organism gets from the situation.

Now, the information theory provides explanation to the fact as to why is it that we get classical conditioning - it says that the key to understanding classical conditioning is that the information and organism gets from the situation.

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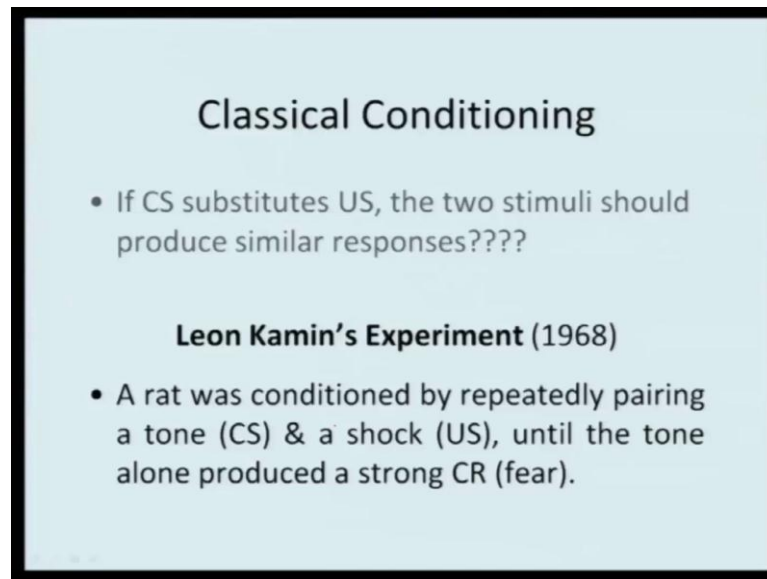


Classical Conditioning

- E.C. Tolman said the information value of the CS is important in telling the organism what will follow.
- Rescorla says that organism as an information seeker using logical & perceptual relations among events, along with preconceptions, to form a representation of the world.

Two important people, their contribution is worth mentioning here - Tolman said that the information value of the conditioned stimulus is important in telling organism what has to be followed and Rescorla said that the organism as an information seeker usually uses the logic and perceptual relation among the events, along with the preconceptions to form the representation of the world. It is this information processing strategy leads to that result into classical conditioning.

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Classical Conditioning

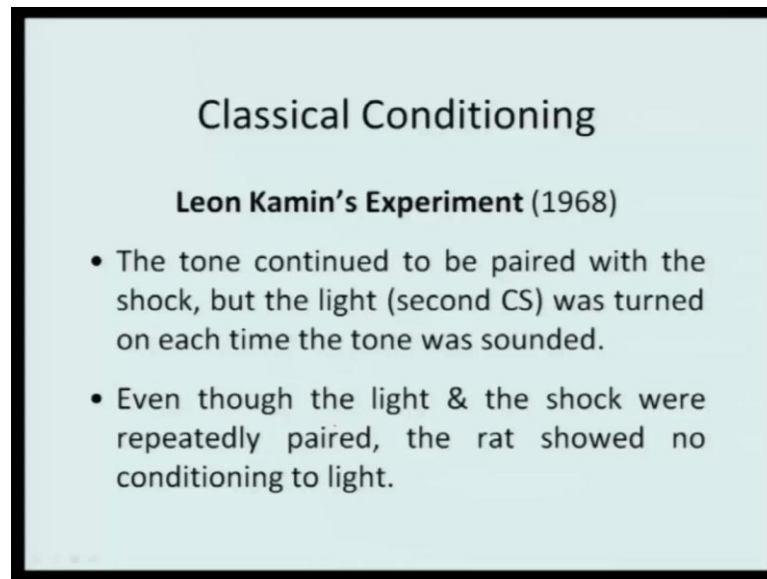
- If CS substitutes US, the two stimuli should produce similar responses????

Leon Kamin's Experiment (1968)

- A rat was conditioned by repeatedly pairing a tone (CS) & a shock (US), until the tone alone produced a strong CR (fear).

Now, let us look at one question if the conditioned stimulus substitutes the unconditioned stimulus the two stimuli should produce similar response or are they suppose to now produce dissimilar responses. In this context let us take the experiment done by a Kamin, what Leon Kamin did was that rat was conditioned by repeatedly pairing a tone of sound and electric shock, now tone of the sound is the conditioned stimulus and the electric shock is the unconditioned stimulus and this pairing was done until the tone alone produced a stronger condition response and here of course, condition response would be fear. So, just like Pavlov's experiment where the sound of the bell will come and the food will be presented, here the sound will be given and along with sound electric shock will also be given and the rat now develop fear for it; went to the extent that now even though electric shock was not given only the sound was generated the rat would produce fear.

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Classical Conditioning

Leon Kamin's Experiment (1968)

- The tone continued to be paired with the shock, but the light (second CS) was turned on each time the tone was sounded.
- Even though the light & the shock were repeatedly paired, the rat showed no conditioning to light.

Now when now Kamin's started analyzing the result he founded the tone contributed to be paired with the shock, but when he tried to pair this with the second conditioned stimulus that light he realized that the light when it was turned each time the tone was sounded. Basically this was again stimulus substitution, electric shock associated with the tone, now tone as well as light both are given to understand that is it that if tone is replaced by light will light also induce a similar fear and even though the light and the shock where repeatedly paired it was realized that the rat did not show that conditioning to light. So, the question that we were asking was that is if that conditioned stimulus substitute the unconditioned stimulus, is it that two different types of stimuli illustrate similar response and Kamin's experiment now shows that no that is not true.