



Theories of Classical Conditioning

Psychology 390

Psychology of Learning

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Stimulus Substitution Theory

- Pavlov
 - Presentation of a CS excites a particular brain area.
 - When UCS follows the CS the structure responsible for processing the CS and UCS are active at the same time.
 - Leads to a new neural pathway between the centers

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Stimulus Substitution Theory

Activate the one center, the other becomes activated too.
Ultimately, the CS becomes a substitute for the UCS.

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Opponent Process Theory

- Siegel
 - Contends the CR and UCR are different
 - Used Morphine as a UCS
 - Analgesia became the UCR
 - Used light or a tone as a CS
 - Found there was an increased sensitivity to pain.

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Other Studies

- Found UCR to insulin is Hypoglycemia
 - CR to a stimulus paired with insulin was hyperglycemia
- UCR to alcohol is hypothermia
 - CR to a stimulus paired with alcohol was hyperthermia

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Why?

- Siegel Contends
 - Tolerance represents the conditioning of a response that is the opposite of the unconditioned drug effects
 - Environmental cues present during drug administration antagonize the drug's action and results in lower pharmacological reaction to the drug

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Evidence

- Increased response to the drug can be induced by changing the stimulus context were the drug was administered.
- New environment does not elicit the CR opposite the drugs effect.

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Application

- Take a drug in environment 1. (Hotel)
- Develop tolerance
- Move to a new environment (House)
- Take the same amount of drug
- But, get a drug overdose

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Why?

- The CS cues are different. So, don't get the opposite effect.

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Rescorla – Wagner Model

- Accommodates many criticisms that were encountered with other models of CC.

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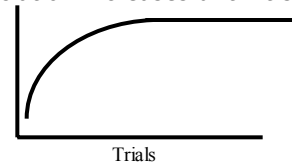
Rescorla – Wagner Model

- Kamin assumed that surprise determined whether conditioning occurs.
- Rescorla and Wagner extended this assumption and said that surprise would also determine HOW MUCH conditioning occurs.
- If surprised, should get lots of conditioning.
- Tone followed by shock would get more conditioning than if the shock was expected.

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Rescorla – Wagner Model

- When CS and US are paired, an association is formed between them.
- If repeated, the strength of the association increases until it stabilizes.



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 The Associative Strength is not
 Constant over Trials

- At T-1 Get a lot of associative strength.
- At T-2 Get less
- Ultimately V approaches a stable value.
- V represents the strength on each trial
- V_{max} is the asymptotic value of V
- V increases on each trial until V_{max}
- Amount of conditioning on any trial will depend on the difference between V and V_{max}

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 Rescorla – Wagner Model
 Expresses Four Basic Ideas

- 1. There is a maximum associative strength that can develop between the CS and UCS.
 - A. Maximum associative strength is determined by the UCS.
 - B. Different UCS's have different associative strength.
- 2. Associative strength increases with each learning trial.

However, the amount of associative strength that is gained on a particular trial is affected by the amount of previous training.

Thus, more associative strength will accrue during early learning trials than later trials.

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 Rescorla – Wagner Model
 Expresses Four Basic Ideas

- 3. The rate of conditioning is dependent on the particular CSs and UCSs that are presented.
 - a. Some stimuli develop rapid amounts of associative strength while other stimuli develop associative strength at slower rates.
 - b. Some UCSs produce more rapid learning than other UCSs.
- 4. The level of conditioning is dependent on
 - a. The amount of learning prior to conditioning of a stimulus, and
 - b. The level of conditioning to stimuli previously associated with the UCS.

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Thus

- A particular UCS can only support a certain amount of conditioning regardless of how many stimuli are associated with it.
- AND
- When several stimuli are presented, the stimuli must share the associative strength.

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 Rescorla – Wagner Model

The model has three different constructs that are similar to the ones described above.

- 1. The strength of association (V) between the CS and UCS controls the amount of conditioning displayed.
- 2. The maximum level (λ) determines the strength the association can reach.
- 3. The rate of learning (α) determines how rapidly the limit can be reached.

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$$\Delta V_n = C(V_{max} - V_n)$$

$$\Delta V_n = \alpha\beta (\lambda - V_n)$$

- $C = \alpha\beta$
 - α (alpha) which refers to the power of CSA and
 - β (beta) which refers to the intensity of the UCS
- $V_{max} (\lambda)$ is solely determined by the UCS
 - defines the maximum level of conditioning supported by a UCS.
- the ΔV_n is the change in associative strength that develops on a particular trial.

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$$\Delta V_n = C (V_{max} - V_n)$$
$$\Delta V_n = \alpha\beta (\lambda - V_n)$$

Trial	V_n	$\Delta V_n = C(V_{max} - V_n)$
• 1	0.00	$\Delta V_1 = .30 (1 - 0.00) = 0.30$
• 2	0.30	$\Delta V_2 = .30 (1 - 0.30) = 0.21$
• 3	0.51	$\Delta V_3 = .30 (1 - 0.51) = 0.15$
• 4	0.66	$\Delta V_4 = .30 (1 - 0.66) = 0.10$

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Points to Note and Problems

- V represents the strength of a theoretical association. You can see dogs salivate, but you cannot directly observe the association presumed to produce the behavior.
 - E.g. if association strength was 10 how many drops of saliva would you expect to see.
- You need to know the values of α and β (or C) before you can predict V .

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Points to Note and Problems

- Used arbitrary values to test the model.
- Their results showed that the model predicts a learning curve of the same general shape.
- You cannot predict the exact number of saliva drops, but you can predict whether salivation will increase or decrease.

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