Classical Conditioning: Basic Principles

EXP 4404

Conditioned Stimuli Act as Signals

- ***Role of Contingency in Classical Conditioning***
- ***CS and US must be positively correlated***
  - ***US occurs when the CS occurs***
  - ***US does not occur when the CS does not occur***
- ***CS is a reliable predictor of the US***
- ***CS enables an organism to prepare for the arrival of the US***

Pavlov's Experiments on Salivation

- Unconditioned Stimulus (US)
  - food powder
- Unconditioned Response (UR)
  - salivation
- Conditioned Stimulus (CS)
  - beat of a metronome (neutral stimulus)
- Conditioned Response (CR)
  - salivation to the sound

Common Conditioning Paradigms

- Eye blink conditioning
- Autoshaping
  - relation of CR to voluntary behavior
  - CR is the response elicited by the US
- Conditioned Emotional Responses
  - CR is fear, which causes a brief freezing response & interruption of ongoing behavior
  - Suppression Ratio as measure of fear

Classical Conditioning in Daily Life

- Development of fear responses
  - phobias
- Conditioning of Opponent Processes that lead to the development of drug tolerances
  - evidence from animal models of addition
  - addicts frequently overdose in novel environments
- Allergic reactions and asthma can be classically conditioned

Variables that Affect Excitatory Conditioning

Timing of the CS & US

- Delayed Conditioning
  - Brief overlap of CS & US
- Trace Conditioning
  - CS terminates before onset of the US
- Simultaneous Conditioning
  - CS and US begin & end at same time
  - CS has little predictive value for preparation for US
- Backward Conditioning
  - CS follows US - no predictive value

Characteristics of the CS & the US

- Intensity of the CS and the US
- Salience of the CS

Optimal CS - US Interval

- Optimal conditioning occurs with CS - US intervals between 200 msec and 2 sec
- Taste aversions are an exception to this rule
  - Taste aversions can be acquired with CS - US intervals as long as 24 hours
  - Application: Aversion Therapy

Effects of Prior Experience with the CS or the US

- Pre-exposure to a CS can slow down conditioning (latent inhibition)
- Pre-exposure to a US alone can also slow down conditioning
- CS - US relevance based on relation in the natural environment

  problems with the concept of genetic preparedness

Contingency versus Contiguity

- Contiguity
  - argues that the ***number of pairings*** of CS & US is important for conditioning to occur
- Contingency
  - argues that a ***positive correlation*** between the CS & US is important for conditioning to occur
- Rescorla (1968) found that the ***predictive value*** of the CS was most important for strength of conditioning (support for contingency)

Compound Conditioning: Effects of Other Stimuli on Conditioning

- Overshadowing
  - **more intense or more salient CS acquires the CR**
- Blocking
  - **Prior conditioning experience with one CS can prevent a new CS from acquiring the CR**

Correlation Between Elements of a Compound and the US

Tone1+Light Tone2+Light

- Correlated Condition
  - **Tone1+Light → US**
  - **Tone2+Light → no US**
- **CR develops to Tone1 but not to Light**
- Uncorrelated Condition
  - **Tone1+Light → US on half the trials**
  - **Tone2+Light → US on half the trials**
- **CR develops to Light but not to either tone**

Inhibitory Conditioning

- CS signals the ***absence*** of the US
- Tone - Shock → conditioned fear
  Light - no shock → conditioned inhibition of fear
- **Problem: how to measure conditioned inhibition of fear?**

Conditioning Without an Explicit US

Higher Order Conditioning

1. CS1 (tone) - US (shock) → Fear
2. CS2 (light) - CS1 (tone) → Fear (CR)
3. Test: CS2 (light) → ???

Retardation Test

- Assumes that excitatory and inhibitory responses are incompatible
- Once one CR has been trained, it is difficult to train a different response
- Evidence for conditioned inhibition: Stimuli that were trained for inhibition develop excitatory conditioning more slowly than stimuli that have not been used in prior training

Conditioning Without an Explicit US

Sensory Preconditioning

1. CS1 (tone) - CS2 (light)
2. CS2 (light) - US (shock) → Fear
3. Test: CS1 (tone) → ???

Summation Test

- Also assumes that excitatory and inhibitory conditioned responses are incompatible
- Inhibitory CS is presented in a compound stimulus in which the other stimulus is excitatory
- Adding the Inhibitory CS reduces the size of the CR elicited by the excitatory CS

Training Inhibitory Responses

- Discrimination learning
  - CS+ is always followed by the US
    - excitatory conditioning
  - CS- is never followed by the US
    - inhibitory conditioning
- Long CS-US Intervals
  - **With very long intervals, the CS comes to signal the absence of the US**

Extinction

- Reduction in the CR when the CS occurs and the US no longer occurs
  - ***not equivalent to forgetting***
  - ***return to CS-US pairing is followed by rapid reacquisition of the CR***
- Spontaneous Recovery
  - ***return of an extinguished CR following a period of rest***

- Clinical Applications to Treating Phobias
  - ***flooding***
  - ***systematic desensitization***