Chapter 5
Finishing up Classical Conditioning
Underlying Processes & Practical Applications

Chapter 5 Lectures Outline

- Underlying processes in Pavlovian conditioning
  - S-R vs. S-S learning
  - Stimulus-substitution vs. Preparatory-response theory
  - Compensatory response model
  - Rescorla-Wagner model
- Practical applications of Pavlovian conditioning
  - Understanding the nature of phobias
  - Treating phobias
  - Aversion therapy
S-R vs S-S Learning

• S-R (stimulus-response learning)

Example
When a tone and food are presented together, the tone becomes associated with the salivation that occurs to the food. A direct connection is created between the CS and UR such that the CS elicits the same response as the UR.

\[
\text{Tone: Food} \quad \text{CS} \quad \text{UCS} \quad \text{Salivation} \quad \text{UR}
\]

S-R vs S-S Learning cont.

• S-S (stimulus-stimulus learning)

Example
When a tone and food are presented together, the tone generates a mental representation of the food and, as result of this representation, salivation occurs. A direct connection is created between the CS and US such that the CS elicits (same) similar response to the UR.

\[
\text{Tone: Food} \quad \text{CS} \quad \text{US} \quad \text{Salivation} \quad \text{UR}
\]
The evidence for S-S vs. S-R learning

- Holloway & Domjan (1993)
  - Evaluate the vigour of responding by reducing the motivation to respond to the US
    - Sexual Pavlovian conditioning with a male quails
    - Males motivated to copulate with receptive females
    - Light : Receptive Female (10 trials)
    - Light $\rightarrow$ Males Very Motivated (approached the light!!!)
    - Half the males - brightness in lab changed to reflect winter conditions when birds do not copulate (reduced sex drive group)
    - S-R model predicts the CS (light) is
      - If S-R is correct, reducing motivation to perform UR (light) should

Holloway & Domjan (1993) - Results

- Reduction in motivation $\rightarrow$
- Contrary to predictions of S-R learning mechanisms because
  - Best explained by S-S theory because this does not involve learning a specific UR
  - S-S theory – association is learned between CS and mental representation of US
Conclusions: S-R vs. S-S theory

• Some evidence for both theories

• Majority of evidence is for S-S theory, particularly simple Pavlovian processes

That brings us to WHY does Classical Conditioning exist?

• Perhaps it is there to help get us ready for things that are going to happen!

  – Stimulus-substitution theory - Pavlov (1927)

  – Preparatory-Response theory - Kimble (1961)
Stimulus-substitution theory

- Stimulus-substitution theory - Pavlov (1927)
  - S-S theory of conditioning
  - CS should elicit the same response as the US
    - Light (CS) : Food (US) $\rightarrow$ Salivation (UR)
    - Light (CS) $\rightarrow$ Salivation (CR)
  - But…shouldn’t the dog try to eat the light??

Stimulus-substitution theory

- Jenkins & Moore (1973)
  - Food - pigeons peck with open beak, closed eyes
  - Water - pigeons peck with closed beak, open eyes
    - Light (CS) : Food (US) $\rightarrow$ Peck (UR)
    - Light (CS) : Water (US) $\rightarrow$ Peck (UR)
  - According to Stimulus-Substitution hypotheses
    - Pigeons should peck at the lighted key paired with food with
    - Pigeons should peck at the lighted key paired with water with
Stimulus-Substitution cont.

- Results
  - Pigeons tried to eat the lighted key paired with food
  - Pigeons tried to drink the lighted key paired with water

- Does the CS elicit the same response US (i.e., is the CR the same as the UR)???
Preparatory Response Theory

- Faneslow (1989)
  - Rats placed in cage and administered foot shocks
    - Phase 1
      - Foot-Shock (US) $\rightarrow$ Jump (UR)
      - Tone (NS) : Foot-Shock (US) $\rightarrow$ Jump (UR)
    - Test Phase
      - Tone (CS) $\rightarrow$
  - Suggests CS has not become the US
  - Perhaps evolutionary explanation
    - Jump to actual bite; freeze (hide) in anticipation

Preparatory Response Theory

- Preparatory Response Theory
  - The purpose of the CR is to
    - Can explain topographical similarity of some CS to US
      - Metronome : Food $\rightarrow$ Salivate
      - Metronome $\rightarrow$ Salivate
    - Can explain topographical dissimilarities
      - Foot Shock $\rightarrow$ Jump
      - Tone : Foot Shock
      - Tone $\rightarrow$ Freeze
Compensatory Response Model

• The compensatory after-reactions to the US are elicited by the CS
  – Pre-conditioning phase
    • Shock (US) → Increased Heart Rate (UR)
  – Conditioning phase
    • Tone(NS) : Shock (US) → Increased Heart Rate (UR)
    • Tone (CS) → Increased Heart Rate (CR)
  – Extended conditioning trials
    • Tone(NS) : Shock (US) → Increased Heart Rate (UR)
    • Tone (CS) →

• Can be explained by

Compensatory Response Model

• Compensatory after-reactions to a US

• Purpose of this is probably to
  – If compensatory processes came before the US
    – more effective in minimising effects of US
• Because CS elicits compensatory responses to counter effects of US –
Compensatory Response Model & Drug Tolerance

- Some CSs (neutral stimuli) begin to signal that the drug is coming
- Therefore, when you see these CSs, your heart rate lowers, etc., thus moderating the effects of the drug (once you ingest it)
  - Examples of some CSs for alcohol or drug use?

Compensatory Response Model & Drug Overdose

- Siegel, Hinson, Krank & McCully (1982)
  - Rats injected with heroin every second day for 30 days
  - Alternate days injected with dextrose (sugar) solution
  - Administered either in home room or different room
  - Half received heroin in home room; dextrose in other room; other half received opposite injecting room order
  - Heroin intake increased each day
  - Third group of rats (controls) received dextrose only in both rooms
  - Test – double dose of heroin given to all animals
    - Half experimental group in room where heroin normally received; half in other room; control group also got double dose
  - DV = mortality
Drug Overdose - Results

- Context cues where the same room group normally received drug
- When large heroin dose administered in new context
- Opponent-process theory
  - a-process direct effect of the drug
  - b-process conditioned to the contextual cues (room)

More Evidence for this theory

- McCusker and Brown 1990
  - Alcohol-expected vs. alcohol-unexpected environments (e.g. drinking at the office vs. drinking in a bar)
    - Implications for drinking and driving
    - Implications for drug overdose fatalities
Compensatory Response Model

- Drug tolerance
  - Repeated use of drug in specific context → b-process becomes stronger → reduced net effect of drug → need increased quantity of drug for same effect
  - Repeated experience with drug results in less of a ‘high’ (a-process)
- Drug withdrawal
  - With repeated exposure to the drug in specific context, the b-process increases in strength & duration
  - a-process ceases immediately but b-process declines slowly
  - Negative effects of b-process become extreme → withdrawal