Basic learning mechanisms

Will be tested on Exam 2, not Exam 1

Learning

• Organisms have to adapt to their environment
• For all animals, this involves:
  – Habituation and dishabituation
  – Conditioning: classical and instrumental
• For people this also involves:
  – Observational learning, skill learning, conceptual learning, ...

Behaviorism and learning

• Behaviorism: a movement that dominated psychology from 1920s-1950s
• Assumptions:
  – Behavior was the only valid target of study
  • Mental processes were not
  • Introspection had recently failed as a scientific method
  – Complex behavior could emerge from simple initial behavior plus learning

Behaviorist manifesto

“Give me a dozen healthy infants, well-formed, and my own specified world to bring them up in and I’ll guarantee to take any one at random and train him to become any type of specialist I might select - doctor, lawyer, artist, merchantchief, and yes, even beggar-man and thief, regardless of his talents, penchant, tendencies, abilities, vocations, and the race of his ancestors” (From Behaviorism, by John Watson, 1924)

Conditioning

• Learning associations from
  – A stimulus to a response (classical/Pavlovian)
  – A response to a stimulus (instrumental/operant)
• Important distinctions:
  – A stimulus is part of the environment
    • Bell ringing, smell of food, ...
  – A response is part of the organism
    • Motor action, a thought or emotion, a physiological change, ...

Classical conditioning

• Unconditioned stimulus (US):
  – A stimulus that elicits a response before learning
• Unconditioned response (UR):
  – The response elicited by the US before learning
Classical conditioning

- Conditioned stimulus (CS):
  - Initially neutral (elicits no response)
  - Elicits a response after learning
  - Learning involves repeated pairing of CS and US
  - The organism learns that the CS predicts the US

- Conditioned response (CR):
  - The response elicited by the CS after learning
  - May resemble UR, but may not

Example: Little Albert

- US?
  - Clang
- UR?
  - Cry
- CS?
  - Rat
- CR?
  - Cry
- CR = UR, in this case

Stimulus generalization:
  - Other furry animals could act as CS
  - Maybe not as strongly

Role of predictiveness

- Learning requires that the CS predicts the US
  - After learning, the organism uses the CS as a signal to prepare for the US
  - The preparation involves the CR

Example

- US?
  - Smell/sight of food
- UR?
  - Eat
- CS?
  - Sound of can opener
- CR?
  - Approach the can

Example: Dentist

- US?
  - Needle poke
- UR?
  - Flinch
- CS?
  - Sight of needle
- CR?
  - Hold still, to prevent the flinch

Homeostasis

- Stability in body state maintained through self-regulation
  - Control centers in the brain detect deviations in temperature, glucose levels, etc.
  - Centers then trigger internal adjustments or behaviors that restore the target level

- Basis for the homeostatic model of drug tolerance
  - Which assumes classical conditioning
Homeostatic model

- **US**: Heroin
- **UR**: Relaxed state, dry mouth
- **CS?**: Sights and sounds of the context where the user usually uses
- **CR?**: Neural and hormonal responses to maintain homeostasis
  - In absence of drug, produces agitated state, salivation

("Wetter" and "drier" may be reversed in Fig. 7.15.)

Instrumental conditioning

**Initial trials:**
- Reinforcer

**Later trials:**
- Reinforcer

**Instrumental conditioning**

- **Response**: Some action by organism
- **Reinforcement**: A stimulus delivered after response to make that response more likely
- **Shaping**: Reinforcing behaviors that are increasingly similar to the desired response

Example

- **Cat**:
  - **Response?**
    - Jump in tub
  - **Reinforcement?**
    - Water
  - **Shaping?**
    - Reinforce going into bathroom, then reinforce jumping on tub deck

- **Dad**:
  - **Response?**
    - Turn on water
  - **Reinforcement?**
    - Adorable cat behavior

Classical interpretation

- **US?**
  - Water
- **UR?**
  - Drink
- **CS?**
  - Dad in bathroom
- **CR?**
  - Jump in tub
Conditioning can produce complex behavior

Exam

• Extra office hours:
  – Wednesday 10/5, 1pm-3pm
• Will cover Chapters 1, 3-6
  – For exclusions, see slides from last class
• Format:
  – 32 multiple choice (1 point each)
  – 6 short answer (points vary)

Short-answer questions

• 3 questions on Karpicke and Roediger (2008)
  – Know the method and results at the level described in the lecture notes
• Draw a corner of the impossible triangle
• Be able to reconstruct the “toad + stool” example from Severed Corpus Callosum
• Be able to label cortical lobes, the primary sensory and motor areas of cortex, and CNS “stick figure” from Sept. 13 class
  – Sensory: visual, auditory, somatosensory