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
    - Focus of today’s class
- 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 subject of study
    - Mental processes were not a valid subject
    - **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” means “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

  - Here, the UR and CR are the same
  - Other furry animals could act as the CS
    - Though maybe not as strongly
    - Stimulus generalization

Prediction is important

- Associative learning only happens if 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
- It takes many trials to know if the CS predicts the US, so associative learning takes a while

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.
  - Deviations 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

- **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

Instrumental conditioning

- **Initial trials:**
- **Later trials:**

Example

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

Example

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

Viewed as classical conditioning

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

Exam
- Will cover Chapters 1, 3-6
- Format:
  - 32 multiple choice (1 point each)
  - 6 short answer (points vary)

Multiple-choice questions
- 32 total
- 4 book only (Ch. 1, 3, 4, and 6)
- 19 on material discussed in class and in book

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Multiple-choice questions
- 9 class-only questions
  - Types of research in MSU psych department
  - Relative size of association areas across species
  - Location of face area
  - How a neuron increases its signal strength
  - Receptive fields of ganglion cells (2)
  - Stroop effect
  - Bottom-up factors in selective attention
  - Sensemaking process

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. 12 class
  - Sensory areas: visual, auditory, somatosensory