Chapter 6:

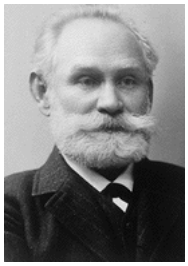
Learning

Basic Terminology

- **Learning** - change in an organism's behavior or thought as a result of experience
- **Habituation** - process by which we respond less strongly over time to repeated stimuli
- **Sensitization** - process by which we respond more strongly over time (especially for dangerous, irritating stimuli)

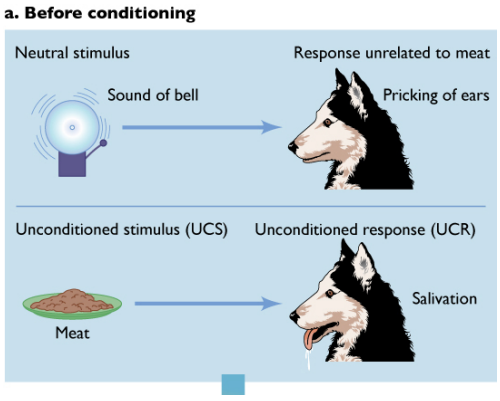
Ivan Petrovich Pavlov

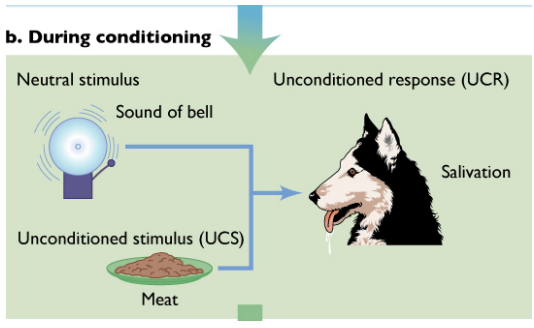
- Russian physiologist and 1904 Nobel Prize winner
- Decided to be a scientist after reading the works of Charles Darwin
- Most famous for his work on the digestion of the dog, which included the first work on classical conditioning

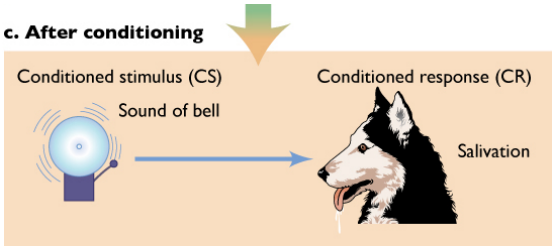


Classical Conditioning

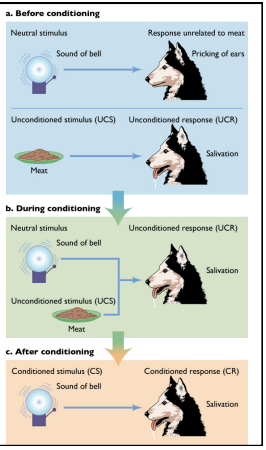
- **Pavlov** described **classical conditioning**, involving:
  - **UCS** unconditioned stimulus - biologically significant stimulus that produces automatic response
  - **UCR** unconditioned response - automatic response to a UCS that occurs without learning
  - **CS** conditioned stimulus - initially neutral stimulus, becomes associated with the UCS through conditioning
  - **CR** conditioned response - learned response
- By virtue of CS-UCS pairing, the CS comes to elicit the CR, a response closely related, but not identical, to the UR







Pavlov's Classical Conditioning Model



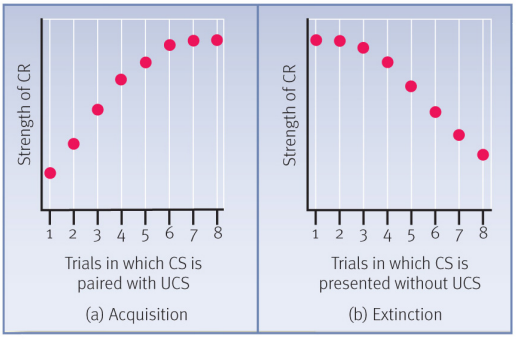
Classical Conditioning

- **Aversive conditioning** - classical conditioning to an unpleasant UCS
  - Avoidance response
- Classical conditioning is **adaptive** in preparing the organism for the impending US
  - Psychopathic personalities - indifferent to signals of threat

Classical Conditioning

- **Acquisition** - learning phase during which a CR is established
- **Extinction** - gradual decrease and elimination of the CR when the CS is presented repeatedly without the UCS

Acquisition and Extinction



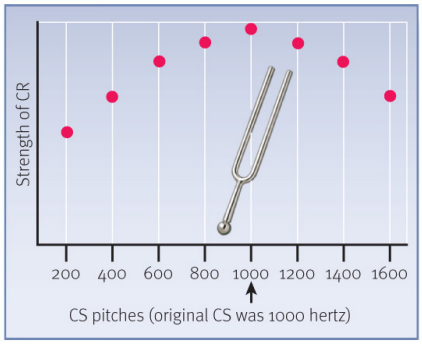
Classical Conditioning

- **Spontaneous recovery** - sudden reemergence of an extinguished CR after a delay
- **Phobias -** intense and irrational fears
  - Some acquired via classical conditioning
  - Subject to spontaneous recovery and renewal

Classical Conditioning

- **Stimulus generalization** - elicitation of a CR to stimuli that are highly similar to, but not identical to, the CS
  - Generalization gradient - the more similar to the original CS the new CS is, the stronger will be the CR
- **Stimulus discrimination** - opposite of stimulus generalization; occurs when we exhibit a CR to certain CSs, but not others

Generalization Gradient



Concept Check:

A puff of air is blown into a rabbit's eye just after a musical tone is played. After several repetitions of this procedure, the rabbit closes its eye when the musical tone is played.

What are the:

- US
- UR
- Neutral Stimulus/CS
- CR

CC in Daily Life

Acquisition of fears: Little Albert

- Watson & Reyner (1920) sought to disprove the Freudian view of phobia, reflecting deep-seated unconscious conflict
- They recruited an infant, Albert, and paired a white rat (CS) with a loud clanging metal noise (UCS)
- Five days later, Albert exhibited fear of the rat, and similar stimuli, including a rabbit, dog, furry coat, and Santa Claus mask (generalization of phobia)

CC in Daily Life

- Led to the conditioning model of phobias
- Classical conditioning also offers a way to get rid of phobia
  - Mary Clover Jones (1924) successfully treated three-year-old Peter, who had a phobia of rabbits, by slowly introducing a rabbit paired with candies
  - Similar exposure therapy is still the main behavioral treatment for irrational fears

CC in Daily Life

Disgust reactions - in most cases, a product of classical conditioning because CSs associated with disgusting UCSs come to elicit disgust themselves

- Rozin's (1986) subjects show a great reluctance to eat a piece of fudge shaped like dog feces
- Subjects show a great reluctance to drink a sucrose solution labeled poison, even when they put the meaningless label on there ("better safe than sorry" heuristic)

Operant Conditioning

- Or *instrumental conditioning* - acquiring behaviors as a result of the outcome or consequence of those behaviors
  - The organism gets something out of the response or "operates" on its environment (e.g., using biscuits as a treat, a trainer teaches a dog to sit)

Operant vs Classical Conditioning

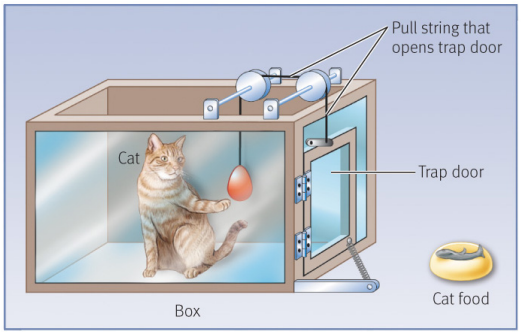
	Classical	Operant
Response	Elicited by UCS or CS	Organism emits response in a seemingly voluntary fashion
Reward	Independent of what the animal does	Organism must make response
Body System	Often involves autonomic nervous system	Often involves the skeletal muscles

Law of Effect

- E. L. Thorndike (1898) studied cats in puzzle boxes, which led to the **law of effect***:*

  If a response, in the presence of a stimulus, is followed by a satisfying state of affairs, the bond between stimulus and response will be strengthened
  - According to Thorndike and others, learning involves an association between a stimulus and response (S-R), with the reward stamping in this connection

Thorndike's Puzzle Box



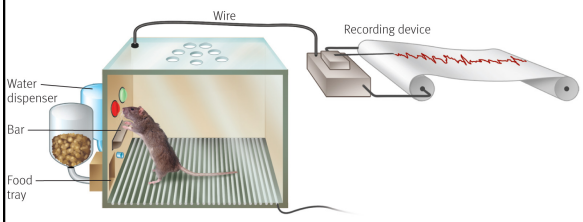
B.F. Skinner

- Followed up on Watson and Thorndike's work on behavior
- Next to Freud, probably the most influential psychologist

B. F. Skinner and Reinforcement

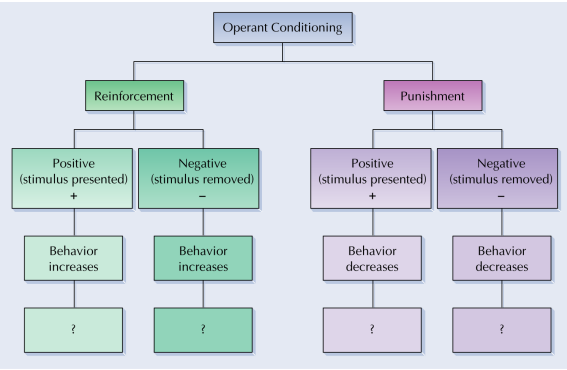
- Skinner developed a highly efficient conditioning chamber (**Skinner box**) that allows for conditioning and automated behavior measurement
  - Typically contains bar that delivers food when pressed, food dispenser, and light that signals when reward is forthcoming

Rat in Skinner Box and Electronic Device for Recording the Rat's Behavior



Terminology in OC

- **Positive reinforcement -** pleasant stimulus is given to increase the probability of a response
  - E.g., Get a cell phone for good grades
- **Negative reinforcement** - unpleasant stimulus is *removed* to increase the probability of a response
  - E.g., Aidan's mother's nagging stops when he picks up his room
- **Punishment -** unpleasant stimulus is given, or pleasant stimulus is taken away, to decrease the probability of a response
  - E.g., cell phone taken away for breaking curfew



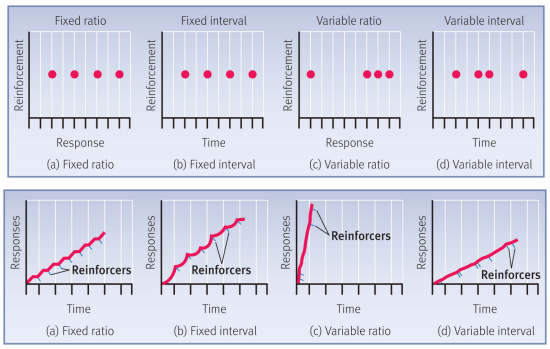
Punishment tends to be ineffective

- It tells the organism what *not* to do, rather than what to do
- Creates anxiety that can interfere with future learning
- Encourages subversive behavior (sneakiness)
- Provides a model for aggressive behavior
  - Physical punishment is associated with aggression in adulthood

Principles of Reinforcement

- **Partial reinforcement** - behaviors that we reinforce only occasionally are slower to extinguish than those we reinforce continuously
- **Schedules of reinforcement** - pattern of reinforcing a behavior
  - Fixed Ratio - after regular number of responses
  - Variable Ratio - after specific number of responses, on average
  - Fixed Interval - after specific amount of time
  - Variable Interval - after an average time interval

Four Major Reinforcement Schedules and Typical Response Patterns



Conditioning Terminology

- **Discriminant stimulus** (S_d) - stimulus associated with the presence of reinforcement
  - (e.g., whistle for dog, gets treat when approaches)
- **Acquisition, extinction, spontaneous recovery, stimulus generalization,** and **stimulus discrimination** are concepts common to both classical and operant conditioning

Applications of OC

- **Shaping by successive reinforcement -** reinforcing behaviors that aren't quite the target behavior but that are progressively closer versions of it
- **Chaining -** linking a number of interrelated behaviors to form a longer series
- **Premack principle** - a less frequently performed behavior can be increased by reinforcing it with a more frequent behavior
  - Grandma's rule - vegetables before dessert

Applications of OC

- **Superstitious behavior** - behavior linked to reinforcement by sheer coincidence (e.g., lucky charm effect)
  - Pigeons, athletes, etc.
- **Token economies -** mental hospital staff can reinforce patients who behave in a desired fashion using tokens, chips, points, or other secondary reinforcers
  - Secondary reinforcers - neutral objects that patients can later trade in for…
  - Primary reinforcers - items or outcomes that are naturally pleasurable, such as a favorite food or drink

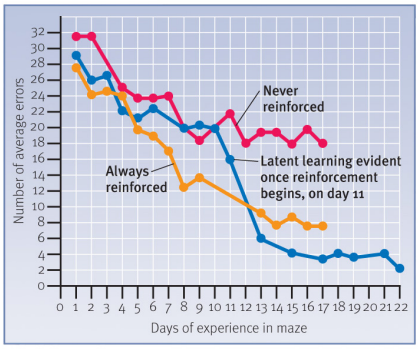
Radical Behaviorism & Cognitive Psychology

- Skinner was a radical behaviorist: thinking, emotion, and observable behavior are all dictated by operant and classical conditioning; viewed cognitive psychology as a pseudoscience
- Cognitive learning theorists focus on how the organism *interprets* the stimulus before generating a response
  - They contend that behavior is not automatic or inflexible, rather, classical and operant conditioned responses usually depend on thinking

Other Forms of Learning

- **Latent learning** - learning that isn't directly observable; we learn many things without showing them
  - Emphasizes the difference between competence (what we know) and performance (showing what we know)
  - Challenge to radical behaviorism, implies reinforcement isn't necessary

Tolman & Honzik Maze Trials: Learning All Along…



Social Cognitive Learning

- **Observational learning** - learning by watching others (models), without instruction or reinforcement
  - Brain basis? Perhaps **mirror neurons**
  - Aggressive behavior: Bandura (1963) had children watch an adult ignoring or punching a Bobo doll and shouting things like "Kick him"
  - Children who watched the aggressive adult model were aggressive to the Bobo doll later