

Learning

- Relatively permanent change in an organism
 - Result of experience
 - Exhibited in behavior
- Similar for humans and non-humans

I. Classical Conditioning

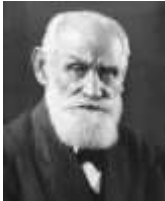
- A. Basics
 - **Reflexes**
 - Automatic behavior → no prior learning
 - **Conditioning**
 - Systematic procedure
 - Associations & responses to stimuli are learned

A. Basics of Classical Conditioning

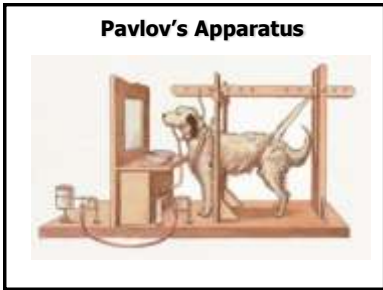
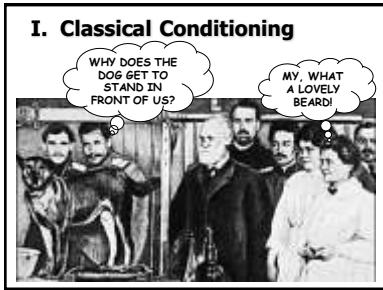
- **Conditioning vs. reflexes**
 - Conditioning requires learning
 - Learned association between neutral stimulus and stimulus that evokes reflex



I. Classical Conditioning



- **B. Ivan Pavlov (1849 – 1936)**
 - Studied digestion in dogs

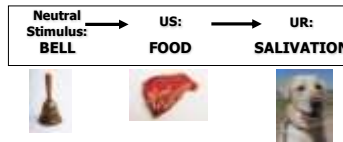


I. Classical Conditioning

- **B. Ivan Pavlov (1849 – 1936)**
 - Discovered Classical Conditioning (Pavlovian Conditioning)
 - Neutral stimulus, by pairing with stimulus that naturally produces response, comes to elicit similar or identical response

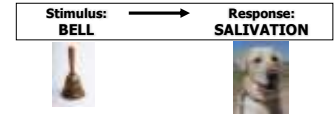
C. Terms and Procedures

- **Procedure**
 - Present neutral stimulus immediately before unconditioned stimulus



C. Terms and Procedures

- **Procedure**
 - Repeat many, many times
 - Remove US:



Original stimulus no longer neutral!

I. Classical Conditioning

- **C. Terms and Procedures**
 1. **Unconditioned Stimulus (US)**
 - Automatically produces response
 - Unlearned
 - E.g., Food
 2. **Unconditioned Response (UR)**
 - Automatic response to US
 - E.g., Salivation

C. Terms and Procedures

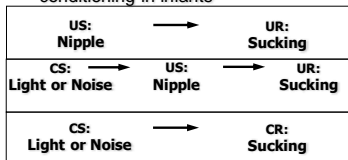
- **3. Conditioned Stimulus**
 - Neutral stimulus that, through association with US, becomes capable of eliciting response
 - E.g., Bell
- **4. Conditioned Response**
 - Response to the CS
 - E.g., Salivating

I. Classical Conditioning

- Conditioning doesn't occur immediately
 - Requires repeated pairings
 - Process called an "acquisition process"

D. Classical Conditioning in Humans





- Marquis (1931) showed classical conditioning in infants



D. Classical Conditioning in Humans

- Many responses can be conditioned in humans
- Can occur
 - Without our awareness
 - Pleasant and unpleasant reactions

D. Classical Conditioning in Humans

- **Little Albert**
 - John Watson and Rosalie Raynor (1920)
- | | | | | |
|---|---|-------------------------|---|---|
| White Rat | → | Frightening, loud noise | → | Fear |
|  | | | |  |
- After many pairings:
- | | | |
|---|---|---|
| White Rat | → | Fear |
|  | |  |

D. Classical Conditioning in Humans

- **Little Albert**

- Probably the source for fear and anxiety in many children



View by American Science Photo

E. Higher-Order Conditioning

- Neutral stimulus takes on conditioned properties through pairing with CS
- “Remote” associations possible
- Factors regulating HOC:
 - Similarity between new and old CSs
 - Frequency/consistency of pairings

F. Key Variables in Classical Conditioning

1. **Strength, timing and frequency**
 - a. Strength of US
 - b. Timing of US
 - c. Frequency of Pairings
2. **Predictability**

F. Key Variables in Classical Conditioning

3. Extinction and Spontaneous Recovery

- a. **Extinction**
 - CS no longer elicits UR
- b. **Spontaneous Recovery**
 - Extinguished CR reappears

F. Key Variables in Classical Conditioning

4. Stimulus Generalization and Discrimination

- a. **Stimulus Generalization**
 - Stimulus *similar to* CS causes CR
 - Phobias
- b. **Stimulus Discrimination**
 - Respond only to *specific* CS
 - When difficult → frustration/aggression

G. Classical Conditioning in Daily Life

1. Garcia Effect

- John Garcia (Garcia & Koelling, 1971)
- **Conditioned taste aversion**
- Two surprises:
 - Could occur even if nausea came several hours after eating/drinking
 - Not all stimuli could be conditioned

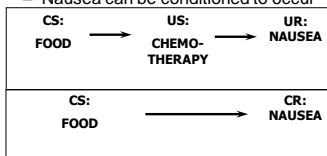
1. The Garcia Effect

- Do US and CS “belong” together in nature?
- Can occur after only one pairing
 - Survival value
- Practical applications
 - Coyotes
 - Chemotherapy...

G. Classical Conditioning in Daily Life

2. Learning and chemotherapy

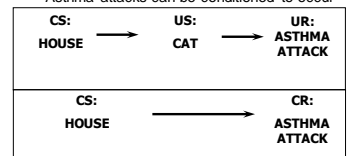
- Nausea can be conditioned to occur



G. Classical Conditioning in Daily Life

3. Conditioning of the immune system

- Asthma attacks can be conditioned to occur



Classical Conditioning in Advertising

- Associate products with:
 - Positive emotions
 - Trusted spokesperson
- Two questions to ask:
 1. Who is the likely **target audience** in this ad?
 2. What **associations** are being made with the product?

H. Pavlov’s Understanding Reinterpreted

- **Pavlov**
 - simple associations between stimuli
- **Today’s researchers**
 - considering how **imagined** stimuli (e.g., thoughts) can produce a response

II. Operant Conditioning

- How does classical conditioning differ from operant conditioning?
 - CC focuses on **stimuli and responses**
 - OC focuses on **behaviors and consequences**
 - Voluntary behavior

II. Operant Conditioning



1874-1949

- Pioneer*
- Edward Thorndike
 - **Law of Effect**
 - Behavior followed by:
 - pleasant thing → **strengthened**
 - unpleasant thing → **weakened**
- “instrumental conditioning”

II. Operant Conditioning



1904 – 1990

- Pioneer*
- **B.F. Skinner**
 - 3 consequences to behavior
 - Ignored
 - Rewarded (reinforced)
 - Punished

II. Operant Conditioning

- People “operate” on environment for desired consequence
- S**timulus **R**esponse **C**onsequence
- OR
- A**ntecedent **B**ehavior **C**onsequence

All reinforcers
make behaviors
more likely!

II. Operant Conditioning

Reinforcement

1. **Reinforcer** - increases likelihood of behavior
2. Reinforcement types
 - a. **Positive Reinforcement** (“+”)
 - stimulus **presented** after behavior that **increases** likelihood
 - Example: \$1 for cleaning room

All reinforcers
make behaviors
more likely!

2. Reinforcement Strategies

- b. Negative Reinforcement (“-”)
 - Stimulus **removed** after behavior **increases** likelihood
 - Stimulus usually unpleasant
 - Example: Take aspirin to get rid of headache

All reinforcers
make behaviors
more likely!

b. Negative Reinforcement

- Another example:
 - Apologizing after being sent to time-out
 - Apologizing removes being confined to your room
- **Escape conditioning**
- May lead to **avoidance conditioning**

B. Reinforcement

3. The Nature of Reinforcers

– Two types:

a. Primary Reinforcer

– Examples: Food, water, pain avoidance

b. Secondary Reinforcer

– Examples: Money, good grades, praise

B. Reinforcement

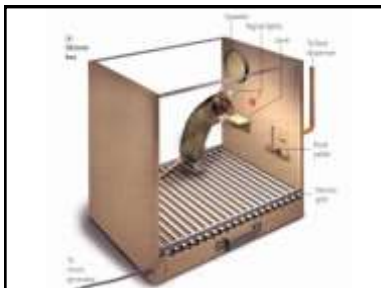
- **Premack Principle**
 - More frequent behavior can reinforce less frequent behavior
 - E.g., TV as reinforcer for cleaning room

II. Operant Conditioning

C. The Skinner Box and Shaping

– **Skinner box**

- Animal randomly emits behaviors
- Target behaviors are reinforced

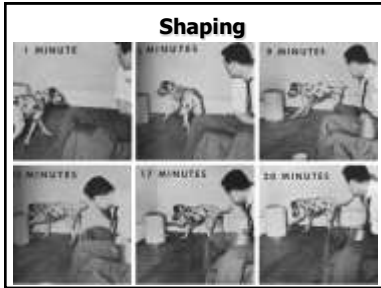


II. Operant Conditioning

• C. The Skinner Box and Shaping

– **Shaping**

- “method of successive approximations”
- reinforcing behaviors that gradually approach target behavior



All reinforcers
make behaviors
more likely!

All punishers
make behaviors
less likely!

II. Operant Conditioning

- D. Punishment
 - Types of Punishment
 - a. **Positive punishment (punishment by application)**
 - stimulus **presented** in order to **decrease** likelihood of behavior
 - E.g. → Getting yelled at for hitting sister

1. Types of Punishment

- b. **Negative Punishment (Punishment by Removal)**
 - stimulus **removed** to **decrease** likelihood of behavior
 - Example: Losing license after accident

All punishers
make behaviors
less likely!

D. Punishment

- 2. The Nature of Punishers
 - Two types of punishers:
 - a. **Primary punisher**
 - Example: Pain
 - b. **Secondary punisher**
 - Example: Getting bad grade

All punishers
make behaviors
less likely!

D. Punishment

3. Limitations of Punishment

- Only **suppresses** behavior
- Social consequences → **escape**
- May not control behavior **outside** home
- Physical punishments → **aggression**
- Inconsistent punishment → **learned helplessness**

**All punishers
make behaviors
less likely!**

II. Operant Conditioning

E. Punishment Plus Reinforcement

- Effective way of controlling behavior is:
 - punish undesirable behavior
 - reinforce desirable one

II. Operant Conditioning

F. Key variables in Operant Conditioning

1. Strength, Timing, and Frequency
 - a. Strength of Consequences
 - Stronger reinforcement
 - Punishment in moderation
 - b. Timing of Consequences
 - c. Frequency of Consequences
 - **Schedules of reinforcement**

Schedules of Reinforcement

i. Continuous Reinforcement

- Reinforcement is given for every occurrence of the target behavior

ii. Intermittent reinforcement

a) Interval schedules

- Based on **time**
- **i) Fixed-interval**
 - Reinforcement given for first response after specific time interval
 - Leads to uneven response pattern
 - E.g. → salary

ii. Intermittent Reinforcement

- a) Interval schedules
 - **ii) Variable-interval**
 - Reinforcement given for first response after varying time interval
 - E.g., checking friend's Facebook status
 - Leads to slow, regular response rate

ii. Intermittent Reinforcement

b) Ratio schedules

- Based on **number** of responses
- **i) Fixed-ratio**
 - Reinforcement given for specific number of responses
 - e.g. → commission sales
 - Leads to fast, regular response rate

ii. Intermittent Reinforcement

- **ii) Variable-ratio**
 - Reinforcement given for varying number of responses
 - E.g., slot machine, superstitions
 - Leads to highest response rate

F. Key variables in Operant Conditioning

2. Stimulus Generalization
3. Stimulus Discrimination
4. Extinction
 - **Resistance to extinction** provides measure of conditioning
 - Rate of extinction varies by schedule
 - When reinforcers are withheld, behavior may initially **increase**
5. Spontaneous Recovery

G. Operant Conditioning in Daily Life

1. Superstitious Behaviors
2. Intrinsically Motivated Behavior
 - May actually **decrease** if externally reinforced

The Major Criticisms of Skinner

- Dogmatic
- Applied his theory to humans
 - No research on humans
 - Human behavior is far more complex

A. Observational Learning

2. Key Variables in Observational Learning
 - a. Type and Power of Model
 - b. Personality & Independence
 - c. Situation
3. Observational Learning in Daily Life
 - a. Gender role development
 - b. Cultural values

The Bobo Doll Study



III. Cognitive Learning

- A. Observational Learning
 - 1. The Power of Modeling
 - Albert Bandura
 - **Social learning theory**
 - Showed that children played more aggressively after observing films with aggressive content
 - Observational learning can occur without being reinforced
 - Brain activity is similar for models and those observing the models

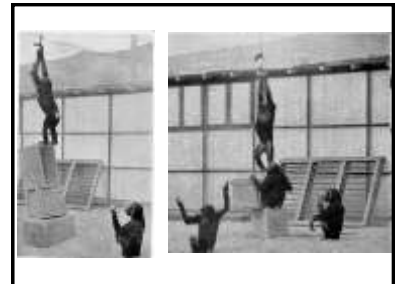


III. Cognitive Learning

- B. Other Types of Cognitive Learning
 1. Insight
 - Wolfgang Köhler
 - insight in chimpanzees



A Chimpanzee Demonstrates Insight Learning



III. Cognitive Learning

2. Latent Learning

- Tolman (1886 – 1959)
- Hungry rats placed in a maze
 - When reinforced on day 10, able to quickly reach the goal



B. Other Types of Cognitive Learning

2. Latent Learning

- Demonstrates the rats had learned the maze without being reinforced

3. Cognitive Maps

- Tolman proposed people and animals generate a mental map of the world

C. Brain Changes and Learning

- Genes and Brain Changes
 - The CREB gene is crucial for consolidation
 - Without this gene
 - Certain proteins are not formed
 - Memories are temporary
- Brain changes due to learning demonstrate plasticity of the brain
 - The hippocampus is particularly plastic, or changeable