• We have already covered memory for information, experiences and how to do things, but haven’t talked about the most basic, primitive forms of learning which produce “non-declarative memories”

Basic Forms of Learning
• Learning – a relatively enduring change in behavior as a result of previous experience
• The most basic forms of learning occur automatically, subconsciously – without any particular effort on our part.
• 2 forms of basic learning or “conditioning” involve learning associations between environmental events or stimuli and our behavioral responses

Ivan Pavlov
Classical Conditioning or Pavlovian Conditioning
• Note: Classical Conditioning homework due Wed.

Classical Conditioning
• We automatically learn what stimuli are associated with situations that trigger a reflexive bodily or emotional response. Those stimuli, because of learning, can come to trigger a similar body or emotion response.
• Classical conditioning is useful because learning to predict what’s coming allows the body to get ready ahead of time.

[Images of Ivan Pavlov and his experiments]
Evidence of Learning

• After repeated pairings, Bell Ringing (on its own) produced salivation.
• That response (e.g. salivating to the sound of a bell) would never occur if learning had not taken place. It is a "conditioned" (learned) response (CR).

Example: Emotional & Sexual Responses

• Classical conditioning is not just about drooling dogs – it's the basis for all sorts of learned (conditioned) emotional responses as well. Our body has many natural emotional reflexes.

Remember:

• Classical conditioning always begins with a stimulus (US) that triggers an unavoidable reflexive or emotional response of the body (UR).
• Neutral stimuli that regularly precede or accompany the US register in memory.
• Then those stimuli become CS for a learned response (CR) similar to original UR.

Another example....

John B. Watson

• And the tale of Little Albert
• Initially all sorts of stimuli presented to Albert seemed to be "neutral" stimuli, not triggering a response.
• Paired with US of a very loud noise → previously neutral stimuli come to trigger fear
• Now the stimuli are CS → CR

Note: Noise in video is not the actual loud sound
Examples

- (see next slide)

My Own “Conditioned Emotional Response”

- Although this conditioned emotional response may be funny, such conditioning is not funny when it causes PTSD & disruptive emotional responses to the least little stimulus that had been associated with the previous trauma!!

Remember:

- Classical conditioning always begins with a stimulus (US) that triggers an automatic reflexive or emotional response of the body (UR)
- Neutral stimuli that regularly precede or accompany the US register in memory.
- Then those stimuli become CS for a learned response (CR) similar to original UR.

- You will have to figure out the US, UR, CS and CR in several real life situations in the homework for Wed

- Watson realized the “power of pairing” (that our brain registers things that occur together and these learned associations can change our future behavior)

When he got fired from his university position, he then applied classical conditioning to marketing and advertising and was highly successful.

Much of advertising is based on trying to build an association between a product and a UCS that naturally triggers a positive body response and attraction.

Are you staring at my crisps?

Jewel sponsors of Irish Rugby...
Classical Conditioning of Worms

- Presenting neutral smell along with noxious chemical → learned retraction

Classical Conditioning of Bees

- Presenting a neutral smell with sucrose → learned extension of proboscis to smell alone

Thorndike's “Instrumental Conditioning” and B. F. Skinner's “Operant Conditioning”

We automatically learn the association between behavior & the consequences that follow the behavior. That learning influences the future likelihood of the behavior.
Behavior is Controlled by
2 Types of Consequences:
• Reinforcement: a consequence that increases the likelihood of the behavior it follows
• Punishment: a consequence that decreases the likelihood of the behavior it follows

• A consequence is defined by its effect on behavior. Let’s watch Skinner using reinforcement to change behavior:
http://www.youtube.com/watch?v=TtfQlkGwE2U

2 Kinds of Reinforcement

2 Kinds of Punishment

• Positive (+) Punishment – Behavior is followed by the presenting (or adding) of something good
• Example – child cussing → spanking presented
  Child cusses less in future.

Negative (-) Punishment - Behavior is followed by the taking away of something good
• Example – Teen misses their curfew → parents take away driving privileges
  Teen is late less often in the future.

Types of Consequences
**Operant Conditioning**

**Reinforcement Schedules**

**Schedules of Partial Reinforcement**

- **Fixed Ratio (FR)**
  - Reinforcement occurs after a fixed number of responses.
  - Examples: number of correct responses before a reward.

- **Variable Ratio (VR)**
  - Reinforcement occurs after a variable number of responses.
  - Examples: correct responses before a reward, with the number varying.

- **Fixed Interval (FI)**
  - Reinforcement occurs after a fixed period of time, regardless of the number of responses.
  - Examples: after a certain time, regardless of previous responses.

- **Variable Interval (VI)**
  - Reinforcement occurs after a variable period of time, regardless of the number of responses.
  - Examples: after a certain time, with the time varying.

**Partial Reinforcement or Intermittent Reinforcement**

- **Continuous Reinforcement**
  - Every correct response is followed by a reinforcing consequence.
  - Not ideal in the long run due to diminishing returns.

- **Partial Reinforcement or Intermittent Reinforcement**
  - Every correct response is not followed by a reinforcing consequence.
  - Reinforcement occurs only some of the time, according to some “schedule” or “contingency.”

- **Different schedules of reinforcement** generate different patterns of behavior.

**Common Schedules of RF**

- **Fixed ratio (FR)**: Reinforcement depends on a definite number of responses.
- **Variable ratio (VR)**: Number of responses needed for reinforcement varies.
- **Fixed interval (FI)**: Reinforcement depends on a fixed time.
- **Variable interval (VI)**: Reinforcement depends on a variable time.

**Ways to Decrease Behavior**

- **Punishment**
  - Administer an aversive stimulus or event.
  - Examples: a fine for speeding, a blackout for violating a rule.

- **Positive punishment**
  - Introduces an event or stimulus.
  - Examples: a traffic ticket for a minor infraction, a penalty for a minor violation.

**“Schedule” of reinforcement**

- The schedule refers to the details concerning what behavior has to occur before the consequence is delivered.

**One Possibility:**

- "Continuous Reinforcement"
  - Every correct response is followed by the reinforcing consequence.
  - Continuous reinforcement is often used early in the training of a response.
  - Not ideal in the long run:
    - Consequence may lose its value.
    - Not typical in the real world.

**“Schedule” of reinforcement**

- Every correct response is followed by the reinforcing consequence.
- Not ideal in the long run:
  - Consequence may lose its value.
  - Not typical in the real world.
If the reinforcing consequences no longer follow the behavior, the behavior may disappear or show extinction.

(If the behavior was only sometimes reinforced, the behavior will persist longer after the PR has been discontinued.)

Partial Reinforcement or Intermittent Reinforcement

- Partial reinforcement more similar to real life.
- Behaviors reinforced on a schedule of partial reinforcement are more resistant to extinction.
  (Individual is used to not getting reinforcement all the time so are more likely to persist longer when not receiving reinforcement)

Go Panthers!

- [http://www.youtube.com/watch?v=fflsn5UphsA](http://www.youtube.com/watch?v=fflsn5UphsA)
- [http://www.youtube.com/watch?v=7W0VNCzaXSM](http://www.youtube.com/watch?v=7W0VNCzaXSM)
- [http://www.youtube.com/watch?v=JTxRelqMKlaNo](http://www.youtube.com/watch?v=JTxRelqMKlaNo)
- [http://www.youtube.com/watch?v=viEuYvUuwmo](http://www.youtube.com/watch?v=viEuYvUuwmo)
- [https://www.youtube.com/watch?v=tJYN-eG1zk](https://www.youtube.com/watch?v=tJYN-eG1zk)

Punishment Problems

- Only indicates what not to do – doesn’t necessarily increase the correct response
- Often not delivered immediately after the undesired behavior – not as effective
- May trigger emotional responses, sometimes even aggression.

- “Negative punishment” has fewer side effects

Pay Attention to Consequences

- Consider what consequences may be maintaining the behaviors of the people around you.
- You can use consequences to change the occurrence of almost any behavior
- Try using social reinforcers to modify the behaviors of those around you
Pay attention to inadvertent reinforcement of behaviors you don’t want to encourage

- Desired consequences should only follow behaviors you wish to encourage

Shaping a Behavior
- Reinforcing successive approximations that get closer and closer to the desired behavior
- Skinner shaping turning behavior in a pigeon
- A pet example [https://www.youtube.com/watch?v=pKdSTp62vW0](https://www.youtube.com/watch?v=pKdSTp62vW0)

Operant Conditioning is How Trainers Modify the Behavior of Animals
- [How to Become a SeaWorld Trainer](http://www.youtube.com/watch?v=q4txGv9FbqM)
- [Example of Training Service Dogs](http://www.youtube.com/watch?v=eJ0XscXn5q4)

Contrasting Classical & Operant Conditioning

Both classical and operant conditioning are forms of associative learning. Both involve acquisition, extinction, spontaneous recovery, generalization, and discrimination.

<table>
<thead>
<tr>
<th>Classical Conditioning</th>
<th>Operant Conditioning</th>
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</thead>
<tbody>
<tr>
<td>Reflexive reactions</td>
<td>Contingent responses</td>
</tr>
<tr>
<td>Unconditioned stimulus</td>
<td>Reinforcer</td>
</tr>
<tr>
<td>Conditioned stimulus</td>
<td>Punishment</td>
</tr>
<tr>
<td>US</td>
<td>Schedules</td>
</tr>
<tr>
<td>CS</td>
<td>Reinforcement</td>
</tr>
<tr>
<td>Correlation</td>
<td>Contingency</td>
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</tbody>
</table>

Table 2.4

- Think about the 2 types of basic learning or conditioning we have covered.
Does all learning require direct experience?
Can you learn without being reinforced?
Do some learned responses require more mental processing than the simple learned associations of classical and operant conditioning?

Cognitive Learning

• Learning based on observation and mental processing of what we’ve observed
• Does not require reinforcement
• Does not always require direct experience

Examples

• Edward Tolman – “latent” learning of a cognitive map
• Wolfgang Kohler’s “insight” learning
• Albert Bandura- observational learning, modeling, or “social learning”

Edward Tolman’s “Latent Learning”

• Believed we are learning about our environment all the time – don’t need reinforcement to do so
• May not see evidence of this learning until some later time when you need that info
• Example: building a “cognitive map” of your surroundings

• Rats allowed to become familiar with the maze with no reinforcement present did better than rats without this experience once reward was available.

Another example
https://www.youtube.com/watch?v=fPz6uvIbWZE
Observational learning: Learning without direct experience by watching and imitating others
• Albert Bandura is the pioneering researcher of observational learning, famous for the Bobo doll experiment
• Modeling is the process of observing and imitating a specific behavior

We often learn through observation of others ("observational learning" or "social learning"), with no reinforcement, and then model our behavior after what we observed.

The Famous Bobo Doll Experiment

• Although Bandura’s classic study examined learning of antisocial, aggressive behaviors through observation, prosocial, positive behaviors can be learned through observation just as easily.

Biological Basis for Imitation and Empathy

• Mirror neurons: Frontal lobe neurons that fire when performing certain actions or when observing another doing so; provide a neural basis for everyday imitation and observational learning.
• The brain’s mirroring/representation of another’s action may enable imitation and empathy.

Use of Social Learning Model to Create Soap Operas to Bring About Social Change

• Public gets attached to characters on long running radio or TV dramas which are crafted to raise awareness and offer strategies for dealing with numerous social issues. Dramas bring about significant changes in social norms and attitudes.
• http://www.youtube.com/watch?v=xijbKaXM3A

Twende na Wakali in Tanzania
Ven Conmigo in Mexico
Hum Log in India