

# Review of Classical and Instrumental Conditioning

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## Classical (Pavlovian) Conditioning



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## Watson's Little Albert

- Little Albert was afraid of loud noises (*but not white rats*)
  - UCS (loud noise) → UCR (fear)
- A loud noise was made while Albert was with a white rat
  - CS (white rat) + UCS (loud noise) → UCR (fear)
- Albert learned to fear white rats due to the association
  - CS (white rat) → CR (fear)



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## Classical Conditioning

- Pavlov's salivating dog
- a form of learning in which a hitherto neutral stimulus, the conditioned stimulus (CS) is paired with an unconditional stimulus (UCS) regardless of what an animal does
- Conditioned Response (CR) a response *elicited* by some initially neutral stimulus, the (CS) and the (UCS). (*Bell elicits Salivation*)

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## Classical Conditioning

- Conditioned Stimulus (CS) the stimulus which comes to elicit a new response by virtue of pairings with the UCS (*Bell elicits Salivation*)
- Unconditioned Stimulus (UCS or US) the stimulus which elicits the unconditioned response and the presentation of which acts as reinforcement (*Food elicits Salivation*)
- Experimental Extinction the weakening of the tendency of the CS to elicit the CR by unreinforced presentations of the CS. The CS is presented without UC. After some trials, the CS no longer elicits the CR

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## Classical Conditioning

### Unconditioned Reflex

- An inborn, "hardwired" responses (e.g., the knee-jerk response)

### Conditioned Reflex

- Reflex acquired through pairings of the CS and UCS; the "learning" that takes place in classical conditioning

### Stimulus Generalization

- Tendency to respond to stimuli other than the original CS. The greater the similarity between the CS and the new stimulus, the greater this tendency will be

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## Fear and the Brain

... creates both the fear memory and the fear-  
 memory but the medial prefrontal cortex (mPFC) stored  
 the fear-inhibiting memory

Location in a Human Brain

Medial Prefrontal Cortex (mPFC)

Amygdala

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## Illustration Using Human Brain

Safety Memory  
Fear was  
Unlearned

Prefrontal cortex  
memory of safety

Amygdala  
memory of fear

No Fear

Insult → Safety Memory  
Unable to be Stored and  
Fear Still Evident

Prefrontal cortex  
memory of safety  
stopped

Amygdala  
memory of fear

FEAR

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## Classical Extinction

- Pavlov believed that during extinction, non-reinforced presentations of a CS result in learned inhibition that either suppress or replace previously learned excitatory associations between the CS and UCS
- After a period of time following extinction, if the CS is again presented to the animal the CR will temporarily reappear

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# Classical Extinction

## Bouton (1994)

- During extinction, presentation of a CS without a US results in new learning (including inhibition of the CR) that interferes with a previously learned CS-UCS association
- Original CS-UCS association remain alongside the newly acquired CS-extinction associations.
  - Specific responses observed under subsequent test conditions will depend on experimental-contextual cues other than the CS itself

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# Instrumental (Operant) Conditioning



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# Instrumental Conditioning

- Instrumental (Operant) Conditioning a form of learning in which a reinforcer (e.g., food) is given only if the animal performs the instrumental response (e.g., pressing a lever). In effect, what has to be learned is the relationship between the response and the outcome.
- Operant (R) according to Skinner, in instrumental response; a behavior that is *emitted* to receive the reinforcer

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## Instrumental Conditioning

- Discriminative Stimulus ( $S^D$ ) a stimulus (e.g., a tone, light, a behavior) that sets the occasion for the operant response to be performed in order to receive the reinforcer.
- The  $S^D$  signals a particular relationship between the instrumental response and the reinforcer
- A discriminative stimulus can also be a signal that the instrumental response will not currently deliver the reinforcer ( $S^\Delta$ )

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## Instrumental Conditioning

- *Contingent* a relation between two events in which one is dependent upon another (the animal *must* press the lever for food to be delivered)
- *Reinforcement* ( $S^R$ ) the procedure by which the instrumental response is made contingent upon some sought-after outcome
- *Three-Term Contingency* the relationship between the  $S^D$ , the R and the  $S^R$ ; the  $S^R$  can then serve as the  $S^D$  for a different three-term contingency

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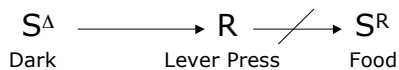
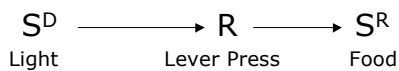
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## Instrumental Conditioning



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## Instrumental Conditioning

### Types of Learning

- Positive Reinforcement any stimulus the *presentation* of which strengthens the behavior upon which it is made contingent. (e.g., lever pressing for food)
- Negative Reinforcement any (aversive) stimulus the *withdrawal* of which strengthens the behavior. (e.g., lever pressing to terminate or escape shock)

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## Instrumental Conditioning

### Types of Learning

- Positive Punishment any (aversive) stimulus the *presentation* of which weakens a behavior. (e.g., spanking a child for misbehaving)
- Negative Punishment any stimulus the *withdrawal* of which weakens a behavior. (e.g., taking candy from a child for misbehaving)

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## Behavioral Model of Phobias

- Some neutral stimulus takes on the properties of the fight or flight response
- Individuals conditioned to CS learn certain behaviors or responses that lessen the amount of fear experienced or avoid the situation entirely
- Escape or avoidance responses are instrumentally conditioned by negative reinforcement
- Phobias become troublesome when the escape behaviors become elaborate and begin to interfere with an individual's day-to-day functioning
  - Bridge-phobic from Marin County, CA accepts a job in SF and must cross the Golden Gate Bridge each day

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## Behavioral Models of Anxiety Disorders

- Panic Disorder
  - With or without Agoraphobia
- Specific phobias
- Obsessive-Compulsive Disorder
- Social Phobia
- GAD
- PTSD

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## Behavioral Models

- Principles of classical conditioning at the heart of exposure based therapies
- Exposure therapy alone has effect sizes as large or larger than pharmacotherapy in the acute treatment of ALL anxiety disorders
- Exposure therapy shows durable gains SUPERIOR to medication alone
- Understanding neuroscience holds the promise of enhancing efficacy of exposure therapy

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## Behavioral Models

- Neuroscience will improve the way we conduct exposure therapy
  - Need to expose person to context (Conditioned Reflex) and not just phobic stimulus (CS) (Bouton)
- Growing enthusiasm for pharmacological agents that might augment efficacy of exposure therapy
  - D-Cycloserine

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## Behavioral Models

### Depression

#### Learned Helplessness

- (Seligman, 1975) "A dog that had been given inescapable shock showed a strikingly different pattern. The dog's first reactions to shock in the shuttle box were much the same as those of a naive dog: it ran around frantically for about thirty seconds. But then, it stopped moving; to our surprise, it lay down and quietly whined . . . on the next trial, the dog did it again . . . on all succeeding trials, the dog failed to escape. This is the paradigmatic learned-helplessness effect." (p.22)

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## Behavioral Models

### Depression

#### Learned Helplessness

- Extended to compelling approach to human depression
- Helpless organism has lost the ability to see the contingencies in one's life
- Expectancy to fail and an expectancy that one's responses will have no effect on the outcomes

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## Behavioral Models

### Depression

#### Lewinsohn's Model

- Similar to learned helplessness
- Considers that depressed people suffer from deficits in skills that could produce positive reinforcement or skills that could minimize unpleasant outcomes
- As a person becomes more depressed, they become less active, emit fewer behaviors, thus limiting further, the opportunity to receive reinforcement

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