## Exam 2 Results

- Top Score: 49
- Mean: 35.08
- Mode: 33
- Median: 35
- Standard Deviation: 6.27 *(n = 399)*
- To calculate your approximate grade on this exam, divide 48 by your score. (example: 36/49 = 73.5% = C)
- To calculate your approximate grade to date, divide by 95 (example: 37+36 = 73/95 = 77% = C+)

# Learning

Chapter 8

## Learning

### How Do We Learn?

### Classical Conditioning

- Pavlov's Experiments
- Extending Pavlov's Understanding
- Pavlov's Legacy



## Learning

### Operant Conditioning

- Skinner's Experiments
- Extending Skinner's Understanding
- Skinner's Legacy
- Contrasting Classical & Operant Conditioning



## Learning

### Learning by Observation

- Bandura's Experiments
- Applications of Observational Learning



## Definition

Learning is a relatively permanent change in an organism's behavior due to experience.

Learning is more flexible in comparison to the genetically-programmed behaviors of Chinooks, for example.

## To What Does Learning Apply?

- Information (for exams)
- Skills
  - Sports
  - Vocational
- Hobbies and Interests
  - Gambling
- Fears
- Rituals, behavioral predispositions (personality?)
- Beliefs
- Values
- Social behavior (how to behave among others)
- Attitudes, stereotypes, prejudices

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## How Do We Learn?

We learn by association. Our minds naturally connect events that occur in sequence.

2000 years ago, Aristotle suggested this law of association. Then 200 years ago Locke and Hume reiterated this law.

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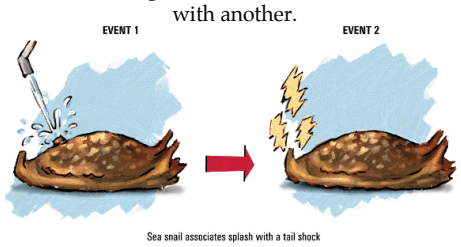
## Stimulus-Stimulus Learning

Learning to associate one stimulus with another.




Sea snail associates splash with a tail shock

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## Stimulus-Stimulus Learning

Learning to associate one stimulus with another.


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## Response-Consequence Learning

Learning to associate a response with a consequence.

(a) Response: balancing a ball (b) Consequence: receiving food (c) Behavior strengthened

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## Response-Consequence Learning

Learning to associate a response with a consequence.


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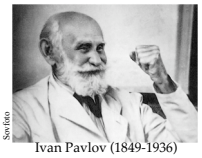
## Classical Conditioning

Ideas of classical conditioning originate from old philosophical theories. However, it was the Russian physiologist Ivan Pavlov who elucidated classical conditioning. His work provided a basis for later behaviorists like John Watson and B. F. Skinner.



Sovfoto

Ivan Pavlov (1849-1936)

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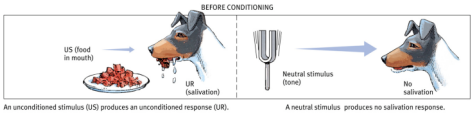
## Pavlov's Experiments

Before conditioning, food (Unconditioned Stimulus, US) produces salivation (Unconditioned Response, UR). However, the tone (neutral stimulus) does not.

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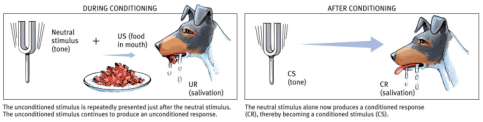
## Pavlov's Experiments

During conditioning, the neutral stimulus (tone) and the US (food) are paired, resulting in salivation (UR). After conditioning, the neutral stimulus (now Conditioned Stimulus, CS) elicits salivation (now Conditioned Response, CR)

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## Acquisition

Acquisition is the initial stage in classical conditioning in which an association between a neutral stimulus and an unconditioned stimulus takes place.

- In most cases, for conditioning to occur, the neutral stimulus needs to come *before* the unconditioned stimulus.
- The time in between the two stimuli should be about *half a second*.

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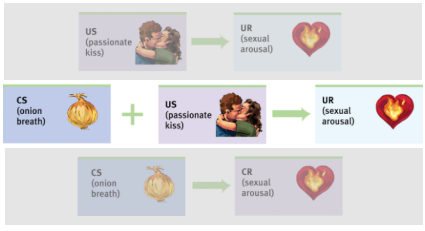
## Acquisition

The CS needs to come *half a second before* the US for acquisition to occur.

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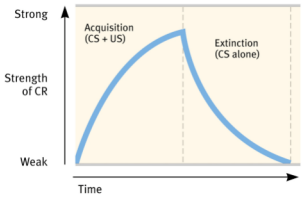
## Extinction

When the US (food) does not follow the CS (tone), CR (salivation) begins to decrease and eventually causes extinction.

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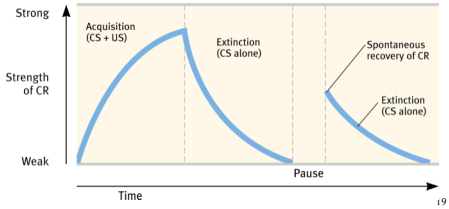
## Spontaneous Recovery

After a rest period, an extinguished CR (salivation) spontaneously recovers, but if the CS (tone) persists alone, the CR becomes extinct again.

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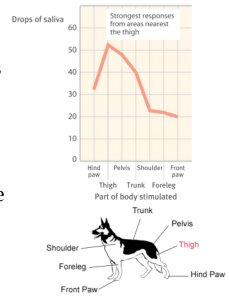
## Stimulus Generalization

Tendency to respond to stimuli similar to the CS is called generalization. Pavlov conditioned the dog's salivation (CR) by using miniature vibrators (CS) on the thigh. When he subsequently stimulated other parts of the dog's body, salivation dropped.

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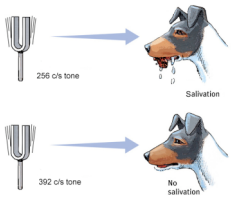
## Stimulus Discrimination

Discrimination is the learned ability to distinguish between a conditioned stimulus and other stimuli that do not signal an unconditioned stimulus.

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## Extending Pavlov's Understanding

Pavlov and Watson considered consciousness, or mind, unfit for the scientific study of psychology. However, they underestimated the importance of cognitive processes and biological constraints.

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## Cognitive Processes

Early behaviorists believed that learned behaviors of various animals could be reduced to mindless mechanisms.


However, later behaviorists suggested that animals learn the predictability of a stimulus, meaning they learn *expectancy* or *awareness* of a stimulus (Rescorla, 1988).

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## Biological Predispositions

Pavlov and Watson believed that laws of learning were similar for all animals. Therefore, a pigeon and a person do not differ in their learning.

However, behaviorists later suggested that learning is constrained by an animal's biology (i.e., Robert Bolles and "species-specific defense reactions").

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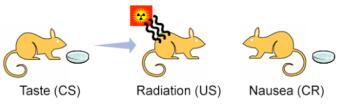
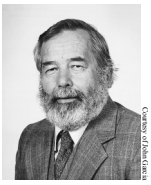
## Biological Predispositions




*The bright and noisy water studies.* Garcia showed that the duration between the CS and the US may be long (hours), but yet result in conditioning. A biologically adaptive CS (taste) led to conditioning and **not** to others (light or sound).




John Garcia

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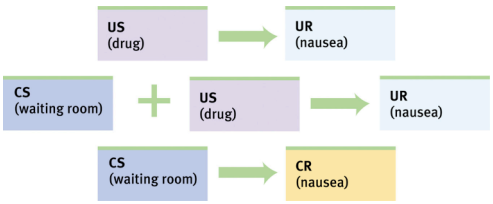
## Biological Predispositions

Even humans can develop classically to conditioned nausea.

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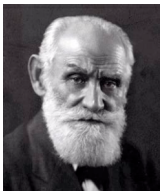
## Pavlov's Legacy

Pavlov's greatest contribution to psychology is isolating elementary behaviors from more complex ones through objective scientific procedures.



Ivan Pavlov
(1849-1936)

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## Applications of Classical Conditioning

- Alcoholics may be conditioned (aversively) by reversing their positive-associations with alcohol.
- Through classical conditioning, a drug (plus its taste) that affects the immune response may cause the taste of the drug to invoke the immune response.

A Clockwork Orange

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## Applications of Classical Conditioning

Watson used classical conditioning procedures to develop advertising campaigns for a number of organizations, including Maxwell House, making the "coffee break" an American custom.


John Broadus Watson

See also, "Little Albert" experiment

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## Two Famous John Watson Quotes

- "Psychology as the behaviorist views it is a purely objective experimental branch of natural science. Its theoretical goal is the prediction and control of behavior. Introspection forms no essential part of its methods, nor is the scientific value of its data dependent upon the readiness with which they lend themselves to interpretation in terms of consciousness. The behaviorist, in his efforts to get a unitary scheme of animal response, recognizes no dividing line between man and brute. The behavior of man, with all of its refinement and complexity, forms only a part of the behaviorist's total scheme of investigation."
- *"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, merchant-chief and, yes, even beggar-man and thief, regardless of his talents, penchants, tendencies, abilities, vocations, and race of his ancestors. I am going beyond my facts and I admit it, but so have the advocates of the contrary and they have been doing it for many thousands of years."*(1930)

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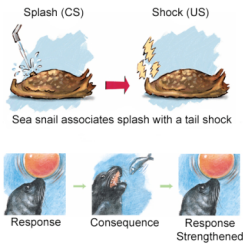
## Operant & Classical Conditioning

1. Classical conditioning forms associations between stimuli (CS and US). Operant conditioning, on the other hand, forms an association between behaviors and the resulting events.





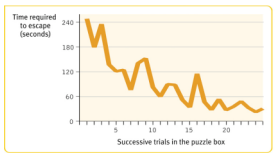

## Operant & Classical Conditioning

- Classical conditioning involves respondent behavior that occurs as an automatic response to a certain stimulus. Operant conditioning involves operant behavior, a behavior that operates on the environment, producing rewarding or punishing stimuli.



## Skinner's Experiments

Skinner's experiments extend Thorndike's thinking, especially his law of effect. This law states that rewarded behavior is likely to occur again.



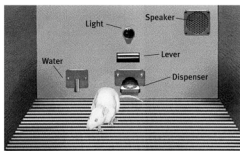

Yale University Library



## Operant Chamber

Using Thorndike's law of effect as a starting point, Skinner developed the Operant chamber, or the Skinner box, to study operant conditioning.

Walter Dawn/ Photo Researchers, Inc.

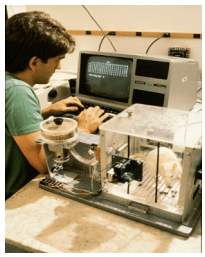



From *The Essentials of Conditioning and Learning*, 3rd Edition by Michael P. Domjan. 2006. Used with permission by Thomson Learning, Wadsworth Division



## Operant Chamber

The operant chamber, or Skinner box, comes with a bar or key that an animal manipulates to obtain a reinforcer like food or water. The bar or key is connected to devices that record the animal's response.





## Shaping

***Shaping*** is the operant conditioning procedure in which reinforcers guide behavior towards the desired target behavior through ***successive approximations***.

Khanne Ramadhan Pasaoran/ Getty Images

Fred Bavendam/ Peter Arnold, Inc.

A rat shaped to sniff mines. A manatee shaped to discriminate objects of different shapes, colors and sizes.

## Types of Reinforcers

Any event that strengthens the behavior it follows. A heat lamp positively reinforces a meerkat's behavior in the cold.

**WAYS TO INCREASE BEHAVIOR**

| Operant Conditioning Term | Description | Possible Examples |
|---|---|---|
| Positive reinforcement | *Add* a desirable stimulus | Getting a a hug; receiving a paycheck |
| Negative reinforcement | *Remove* an aversive stimulus | Fastening seatbelt to turn off beeping |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## *Learning to Bar Press: Shaping through Successive Approximations*

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## Rewards & Punishments

| | Something Desirable | Something Aversive |
|---|---|---|
| Add or Give | Positive Reinforcement | Positive Punishment |
| Take Away or Remove | Negative Punishment (i.e., time-out) | Negative Reinforcement |

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## Primary & Secondary Reinforcers

- Primary Reinforcer: An innately reinforcing stimulus like food or drink.
- Conditioned Reinforcer: A learned reinforcer that gets its reinforcing power through association with the primary reinforcer.

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## Immediate & Delayed Reinforcers

- Immediate Reinforcer: A reinforcer that occurs instantly after a behavior. A rat gets a food pellet for a bar press.
- Delayed Reinforcer: A reinforcer that is delayed in time for a certain behavior. A paycheck that comes at the end of a week.

We may be inclined to engage in small immediate reinforcers (watching TV) rather than large delayed reinforcers (getting an A in a course) which require consistent study.

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## Reinforcement Schedules

1. Continuous Reinforcement: Reinforces the desired response each time it occurs.
2. Partial Reinforcement: Reinforces a response only part of the time. Though this results in slower acquisition in the beginning, it shows greater resistance to extinction later on.

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## Ratio Schedules

- Fixed-ratio schedule: Reinforces a response only after a specified number of responses. e.g., piecework pay.
- Variable-ratio schedule: Reinforces a response after an unpredictable number of responses. This is hard to extinguish because of the unpredictability. (e.g., behaviors like gambling, fishing.)

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## Interval Schedules

- Fixed-interval schedule: Reinforces a response only after a specified time has elapsed. (e.g., preparing for an exam only when the exam draws close.)
- Variable-interval schedule: Reinforces a response at unpredictable time intervals, which produces slow, steady responses. (e.g., pop quiz.)

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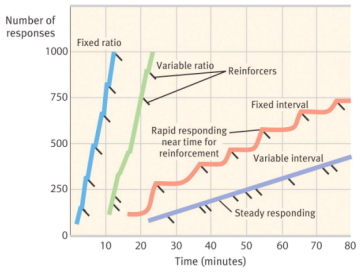
## Schedules of Reinforcement

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## Punishment

An aversive event that decreases the behavior it follows.

**WAYS TO DECREASE BEHAVIOR**

| Type of Punisher | Description | Possible Examples |
|---|---|---|
| Positive punishment | Administer an aversive stimulus | Spanking; a parking ticket |
| Negative punishment | Withdraw a desirable stimulus | Time-out from privileges (such as time with friends); revoked driver's license |

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## Punishment

Although there may be some justification for occasional punishment (Larzelaere & Baumrind, 2002), it usually leads to negative effects.

1. Results in unwanted fears.
2. Conveys no information to the organism as to what to do.
3. Justifies pain to others.
4. Causes unwanted behaviors to reappear in its absence.
5. Causes aggression towards the agent.
6. Causes one unwanted behavior to appear in place of another.

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## Extending Skinner's Understanding

Skinner believed in inner thought processes and biological underpinnings, but many psychologists criticize him for discounting them.

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## Cognition & Operant Conditioning

Evidence of cognitive processes during operant learning comes from rats during a maze exploration in which they navigate the maze without an obvious reward. Rats seem to develop cognitive maps, or mental representations, of the layout of the maze (environment).

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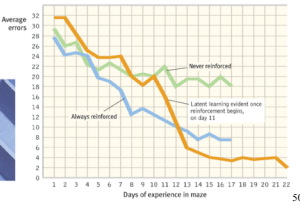
## Latent Learning

Such cognitive maps are based on latent learning, which becomes apparent when an incentive is given (Tolman & Honzik, 1930).

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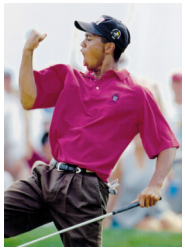
## Motivation

Intrinsic Motivation:
The desire to perform a behavior for its own sake.

Extrinsic Motivation:
The desire to perform a behavior due to promised rewards or threats of punishments.



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## Biological Predisposition

Biological constraints predispose organisms to learn associations that are naturally adaptive.

Breland and Breland (1961) showed that animals drift towards their biologically predisposed instinctive behaviors.


Marian Breland Bailey

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## Skinner's Legacy

Skinner argued that behaviors were shaped by external influences instead of inner thoughts and feelings. Critics argued that Skinner dehumanized people by neglecting their free will.


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## Applications of Operant Conditioning

Skinner introduced the concept of teaching machines that shape learning in small steps and provide reinforcements for correct rewards.


In School

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## Applications of Operant Conditioning

Reinforcement principles can enhance athletic performance.

In Sports

55

## Applications of Operant Conditioning

Reinforcers affect productivity. Many companies now allow employees to share profits and participate in company ownership.

At work

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## Applications of Operant Conditioning

In children, reinforcing good behavior increases the occurrence of these behaviors. Ignoring unwanted behavior decreases their occurrence (time-out).

Still, ignoring has other negative consequences that make it aversive; not just removing positive attention

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## Operant vs. Classical Conditioning

**COMPARISON OF CLASSICAL AND OPERANT CONDITIONING**

| | Classical Conditioning | Operant Conditioning |
|---|---|---|
| Response | Involuntary, automatic. | Voluntary, operates on environment. |
| Acquisition | Associating events; CS announces US. | Associating response with a consequence (reinforcer or punisher). |
| Extinction | CR decreases when CS is repeatedly presented alone. | Responding decreases when reinforcement stops. |
| Cognitive processes | Organisms develop expectation that CS signals the arrival of US. | Organisms develop expectation that a response will be reinforced or punished; they also exhibit latent learning, without reinforcement. |
| Biological predispositions | Natural predispositions constrain what stimuli and responses can easily be associated. | Organisms best learn behaviors similar to their natural behaviors; unnatural behaviors instinctively drift back toward natural ones. |

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## Learning by Observation: Social Learning

Higher animals, especially humans, learn through observing and imitating others.

The monkey on the right imitates the monkey on the left in touching the pictures in a certain order to obtain a reward.


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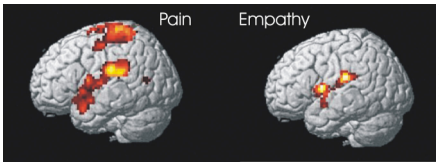
## Mirror Neurons

Neuroscientists discovered mirror neurons in the brains of animals and humans that are active during observational learning.



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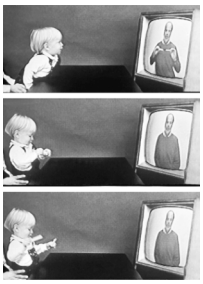
## Imitation Onset

Learning by observation begins early in life. This 14-month-old child imitates the adult on TV in pulling a toy apart.

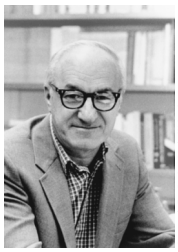


Meltzoff, A.N. (1988). Imitation of televised models by infants. Child Development, 59:1221-1229. Photos Courtesy of A.N. Meltzoff and M. Hanak.

61

## Bandura's Experiments

Bandura's Bobo doll study (1961) indicated that individuals (children) learn through imitating others who receive rewards and punishments.



Courtesy of Albert Bandura, Stanford University

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## Applications of Observational Learning

Unfortunately, Bandura's studies show that antisocial models (family, neighborhood or TV), if reinforced, may have antisocial effects.

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## Positive Observational Learning

Fortunately, prosocial (positive, helpful) models may have prosocial effects.

Bob Daemmrich/ The Image Works

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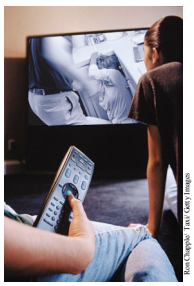
## Television and Observational Learning

Gentile et al., (2004) shows that children in elementary school who are exposed to violent television, videos, and video games express increased aggression.



Ron Chapple/ Taxi/ Getty Images

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## Modeling Violence

Research shows that viewing *reinforced* media violence leads to an increased expression of aggression.

Bob Daemmrich/ The Image Works

Ghassemi/ The Image Works

Children modeling after pro wrestlers

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