



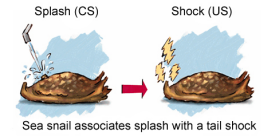
# Learning

Chapter 7 (continued)  
Mike Baysinger

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## Operant & Classical Conditioning

1. Classical conditioning forms associations between stimuli (CS and US).



2. Operant conditioning, on the other hand, forms an association between behaviors (responses) and the resulting events (consequences).



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## Response-Consequence Learning

Learning to associate a response with a consequence.



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## 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.

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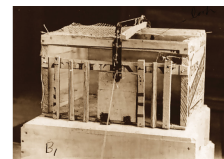
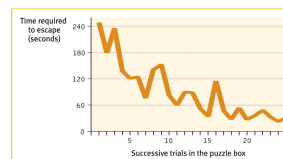
## B.F. Skinner: Master of Pigeons



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## Skinner's Experiments

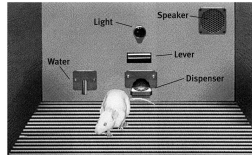
Skinner's experiments extend Thorndike's thinking, especially his **law of effect**. This law states that rewarded behavior is likely to occur again.



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## 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.

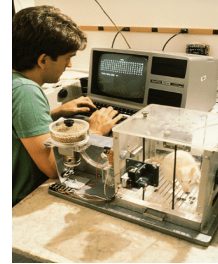


From *The Elements of Conditioning and Learning*, 3rd Edition, Copyright 1991, by Skinner Technologies, Inc. Adapted by Thomson Learning, Wadsworth Division

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## 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 **(rate of) response**.



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## 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 hug; receiving a paycheck
Negative reinforcement	Remove an aversive stimulus	Fastening seatbelt to turn off beeping



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## Shaping

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



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

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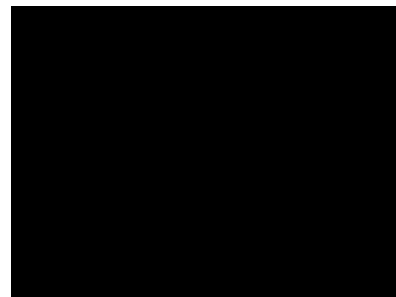
## Shaping Application - Minesweeping

Rats can be trained to detect buried mines via the scent of TNT.



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## Learning to Bar Press: Shaping through Successive Approximations



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# The Skinner Box: Not Just for Rats

<http://www.youtube.com/watch?v=PS1KXYpRZbM>



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<http://www.youtube.com/watch?v=PS1KXYpRZbM>

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# Primary & Secondary Reinforcers

- **Primary Reinforcer:** An innately reinforcing stimulus like food or drink.
- **Conditioned (Secondary) 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 pursue small immediate reinforcers (watching TV) rather than large delayed reinforcers (getting an A in a course) which require consistent study.

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# Instant Gratification and Procrastination

- Immediate Smaller Pay, or Delayed Larger Pay?
  - Many chose to accept an immediate smaller amount after participating in an experiment for money.
  - Yet, most of those who received the smaller amount (in the form of a check) did not cash that check until after those who chose the larger delayed amount received their check!
  - Application to lottery winners

Reuben, E., Sapienza, P., & Zingales, L. (2008). *Procrastination and impatience*.  
<http://www.fairfield.edu/economics/workingpapers/wp08-01main@fairfield.edu/>

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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*. This results in slower acquisition than continuous reinforcement.

But, more resistant to extinction (e.g., Skinner's pigeon).

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# Ratio Schedules

- **Fixed-ratio schedule:** Reinforces a response only after a specified number of responses.
  - Piecework pay, frequent flyer miles, coffee cards
- **Variable-ratio schedule:** Reinforces a response after an unpredictable number of responses.
  - Fishing, door to door sales

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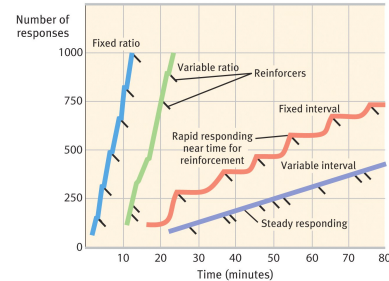
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## Interval Schedules

- **Fixed-interval schedule:** Reinforces a response only after a specified time has elapsed.
  - 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.
  - Pop quiz, in-class extra credit

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## Schedules of Reinforcement



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## Question

- Say I want to instill a behavior that is *resistant to extinction* (that is, the behavior persists even after the reinforcer is removed). Which schedule of reinforcement should I apply?
  - Fixed Ratio
  - Fixed Interval
  - Variable Ratio**
  - Variable Interval

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## Where Do We See Variable Reinforcement?



**Gambling Rewards on a Variable Ratio Schedule**

Skinner discussing schedules of reinforcement

<http://www.youtube.com/watch?v=AcpqpTtKbwo>

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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 (Larzelere & 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 (just, what *not* to do).
3. Justifies pain to others.
4. Causes unwanted behaviors to reappear in its absence (e.g. spanking).
5. Causes aggression towards the agent.
6. Causes one unwanted behavior to appear in place of another or in other settings (e.g., modeling aggression).

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## Review of 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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## Distinguishing Reinforcement from Punishment

Remember that all reinforcers (both positive AND negative) are meant to **increase the likelihood** of a behavior occurring

Example: A baby's cries **increase the likelihood** that parents will attend to the baby's needs (negative reinforcement)

On the other hand, all punishments (both positive AND negative) are meant to **decrease the likelihood** of a behavior occurring

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## One Last Example... Singing a Song for a Baby



Singing the song can make a baby happy, which is pleasant for the parent (**positive reinforcement**)



However, singing the song can also soothe the baby when it's upset, which stops it from crying (**negative reinforcement**)

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## Extending Skinner's Understanding

Skinner believed in inner thought processes and biological underpinnings, but did not feel it was necessary to consider them seriously in psychology (because they were unobservable).

Many psychologists criticize him for discounting them.

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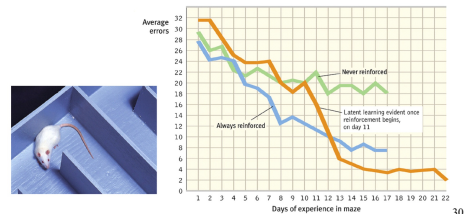
## Cognition & Operant Conditioning

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).

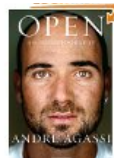
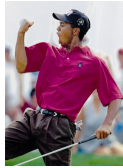


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## Motivation

**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 responses.



In School

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## Applications of Operant Conditioning

Reinforcement principles can enhance athletic performance.



In Sports

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## 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

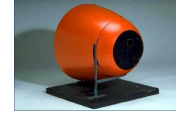
In children, reinforcing good behavior increases the occurrence of these behaviors. Ignoring unwanted behavior decreases their occurrence.

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

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## Little Known Fact: Project Pigeon

During WW II, Army approached Skinner to determine if pigeons could be used as guidance systems for missiles



<http://www.youtube.com/watch?v=IMsSCryLMog>

While Skinner felt that he had some success, the idea quickly became obsolete with the invention of radar

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## Operant vs. Classical Conditioning

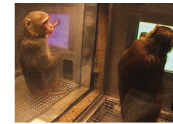
### COMPARISON OF CLASSICAL AND OPERANT CONDITIONING

	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.



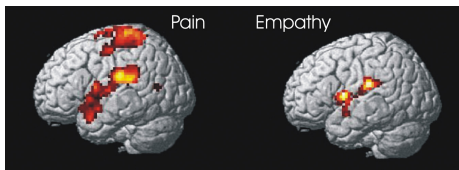
The monkey on the right imitates the monkey on the left in touching the pictures in a certain order to obtain a reward.



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## Mirror Neurons

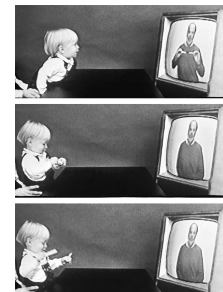
Neuroscientists discovered mirror neurons in the brains of animals and humans that are active during observational learning.



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## Imitation Onset

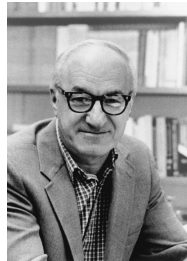
Learning by observation begins early in life. This 14-month-old child imitates the adult on TV in pulling a toy apart.



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## 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 D'Amico/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.

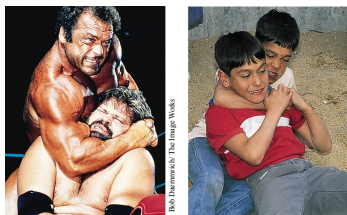


Bob D'Amico/The Image Works

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## Modeling Violence

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



Bob D'Amico/The Image Works

Glenn Feldman/The Image Works

Children modeling after pro wrestlers

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