

## Operant Conditioning

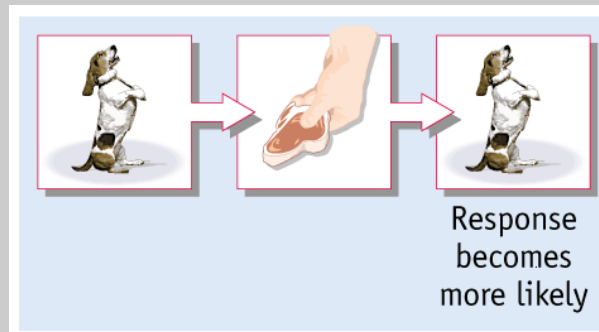
Operant conditioning a type of learning in which the consequences of an organism's behavior determines whether it will be repeated in the future.

These consequences are called reinforcements and punishments.

### Reinforcements

A consequence that follows a behavior that makes that behavior more likely to occur in the future.

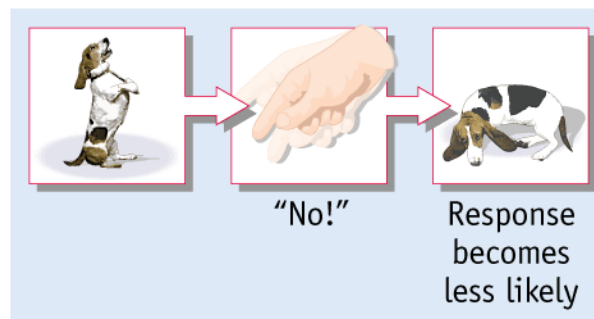
Behaviors that are reinforced are more likely to occur.



### Punishments

A consequence that follows a behavior that makes that behavior less likely to occur in the future.

Behaviors that are punished are less likely to occur.



Reinforcements and punishments are defined by the effect they produce.

- Money is not a reinforcement if it doesn't increase behavior.
- Spankings are not punishments if they don't modify behavior (in some cases they are reinforcements because they increase the likelihood of behavior).

### POSITIVE REINFORCEMENT

Behavior is followed by a desirable event or state.



\$10 for an A makes it more likely a student will earn more As.

### NEGATIVE REINFORCEMENT

Behavior ends an undesirable event or state.



Taking aspirin relieves headaches and makes it more likely that aspirin will be taken in the future.

### TWO FORMS OF PUNISHMENT

Behavior is followed by an undesirable event.



A toddler burned by a hot stove will be less likely to touch the stove again.

Behavior ends a desirable event or state.



A boy who loses his TV privileges for pulling his sister's hair will be less likely to pull her hair again.

## Descriptions of Reinforcement and Punishment

- Behaviors that are reinforced are more likely to be repeated.
- Behaviors that are punished are more likely to be reduced.

		<i>the CONSEQUENCE</i>	
		Adds (+)	Removes (-)
<u>BEHAVIOR that</u>	Increases	<p><u>Positive reinforcement</u> occurs when a behavior is strengthened by the subsequent addition of a (pleasant) consequence.</p> <p><u>Examples:</u></p> <ul style="list-style-type: none"> <li>• <u>Yelling at a clerk</u> gets them <i>to give you a refund</i></li> <li>• Giving <i>dog biscuits</i> for <u>doing a trick</u></li> </ul>	<p><u>Negative reinforcement:</u> A behavior is strengthened by the subsequent removal (or avoidance) of a (unpleasant) consequence.</p> <p><u>Example:</u></p> <ul style="list-style-type: none"> <li>• <u>Smoking</u> to <i>relieve anxiety</i></li> <li>• <u>Skipping class</u> to <i>avoid a bully</i></li> </ul>
	Decreases	<p><u>Positive punishment (aversive punishment):</u> A behavior is weakened by the subsequent addition of a (aversive) consequence.</p> <p><u>Examples:</u></p> <ul style="list-style-type: none"> <li>• <u>Spanking</u> a dog for <u>getting into the garbage</u></li> <li>• <u>Scolding</u> a coworker for <u>making a mistake</u></li> </ul>	<p><u>Negative punishment (punishment by removal or response cost):</u> A behavior is weakened by the subsequent removal of a (desired) consequence.</p> <p><u>Examples:</u></p> <ul style="list-style-type: none"> <li>• <u>Time-out</u>, or the <i>loss of privileges</i> (driver's license, video game, sitting out a hockey game, etc.) for <u>misbehaving</u></li> </ul>

## **Examples of Negative Reinforcement**

**Negative reinforcement:** A situation in which a response is followed by the *removal, avoidance, or escape* of a punishing stimulus, that increases the likelihood that the response will be *repeated* in similar situations.

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1. Jane stops telling her husband how she feels to avoid getting yelled at by him.
2. Smoking to relieve anxiety.
3. Smoking helps a person avoid the withdrawal symptoms of nicotine.
4. Using caller ID or the answering machine to answer the phone and avoid telemarketers.
5. Giving into your dog that barks at the dinner table until fed.
6. Small doses of alcohol can initially make people feel good, relaxed and sociable. When alcohol is eliminated from the body, these feelings can be replaced with drowsiness. To avoid these withdrawal effects, people may be motivated to drink more to maintain this initial pleasant buzz.
7. Giving into an argument.
8. Saying "uncle" to stop being beaten.
9. Following prison rules to be released from confinement.
10. Feigning a stomachache to avoid school.
11. Skipping class because you don't like it.
12. Putting on a seatbelt to stop an irritating buzz.
13. Turning down the volume of a very loud radio.
14. I never call home to talk to my parents because mother always seems to have something bad to say to me.
15. Avoiding spiders or snakes because you don't like them.

### **Other examples**

- Hurrying home in the winter to get out of the cold.
- Fanning yourself off to escape the heat.
- Leaving a movie theater if the movie is bad.
- Putting up an umbrella to escape the rain.
- Taking aspirin to relieve a headache.
- Averting your eyes from images you don't like (e.g. Nazi death camps, starving children, scary movies, etc.)

## Using Operant Conditioning to Explain Behavior



**Daughter**

**Behavior:**  
Screaming tantrum

**Consequence:**  
Receiving a candy bar

**Result:**  
More tantrums in  
the future

**Mother**

**Behavior:**  
Give candy

**Consequence:**  
Screaming tantrum ends

**Result:**  
More candy buying  
in the future

## Tao Te Ching (81)

**True words are not beautiful;  
Beautiful words are not true.**

**A good man does not argue;  
He who argues is not a good man.**

**A wise man has no extensive  
knowledge.  
He who has extensive knowledge is  
not a wise man**

**The more he gives to others, the  
more he possess of his own  
The Way of the sage is to act, but not  
compete**

## Tao Te Ching (81)

### True words are not beautiful

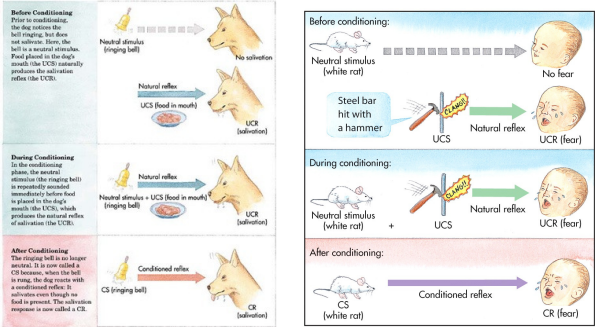




<b>Behavior</b>	<b>Consequence</b>	<b>Effect on Behavior</b>	
Telling people things that are psychological threatening them or are unpleasant to hear	A person could yell at them, ignore them, fire them, withhold promotions, affection, etc.	It makes it less likely a person is going to tell someone unpleasant news or information	<b>Punishment</b>

### Beautiful words are not true

<b>Behavior</b>	<b>Consequence</b>	<b>Effect on Behavior</b>	
Saying what people want to hear	People complement you	You are more likely to say what people want to hear	<b>Positive reinforcement</b>



## Differences Between Classical and Operant Conditioning

Classical Conditioning	Operant Conditioning
<p>In classical conditioning, the organism learns an <i>association between two stimuli</i>—the UCS and NS (eg. food and tone)—that occurs before the natural response (eg. salivation).</p>	<p>In operant conditioning, the organism learns an <i>association between behavior and its consequences</i>. Behavior changes because of the consequence that occur <i>after</i> it.</p>
 <p style="text-align: center;">UCS → UCR NS</p> <p style="text-align: center;">CS → CR</p>	<div style="display: flex; justify-content: space-around;"> <div data-bbox="824 947 1117 1234"> <p><b>POSITIVE REINFORCEMENT</b> Behavior is followed by a desirable event or state.</p>  <p>\$10 for an A makes it more likely a student will earn more As.</p> </div> <div data-bbox="1133 947 1421 1234"> <p><b>NEGATIVE REINFORCEMENT</b> Behavior ends an undesirable event or state.</p>  <p>Taking aspirin relieves headaches and makes it more likely that aspirin will be taken in the future.</p> </div> </div> <div style="display: flex; justify-content: space-around; margin-top: 10px;"> <div data-bbox="824 1255 1117 1543"> <p><b>TWO FORMS OF PUNISHMENT</b> Behavior is followed by an undesirable event.</p>  <p>A toddler burned by a hot stove will be less likely to touch the stove again.</p> </div> <div data-bbox="1133 1255 1421 1543"> <p><b>TWO FORMS OF PUNISHMENT</b> Behavior ends a desirable event or state.</p>  <p>A boy who loses his TV privileges for pulling his sister's hair will be less likely to pull her hair again.</p> </div> </div>
<p>Classical conditioning usually deals with reflexive or involuntary responses such as physiological or emotional responses.</p>	<p>Operant conditioning usually deals with voluntary behaviors such as active behaviors that operate on the environment.</p>

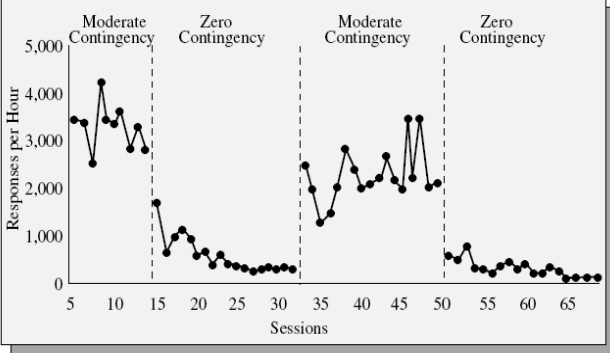
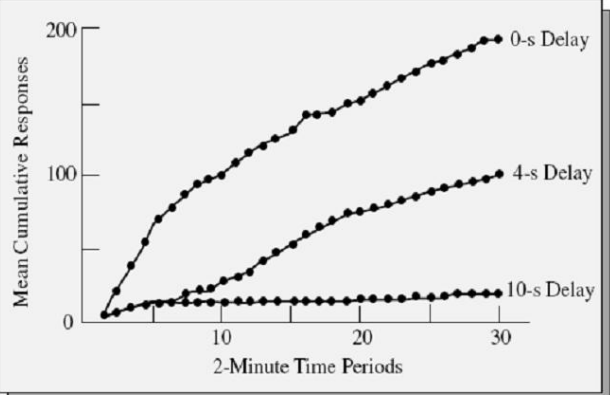
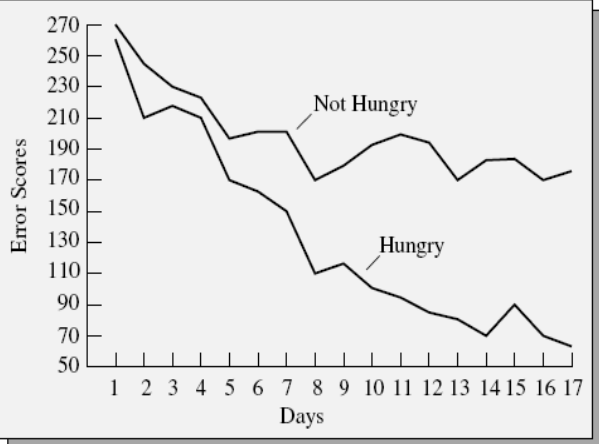
## Classical Conditioning or Operant Conditioning

Check your understanding of the usual differences between classical conditioning and operant conditioning by indicating the type of conditioning process involved in each of the following examples. In the space on the left, place a

- **C** if the example involves classical conditioning,
- **O** if it involves operant conditioning, or
- **B** if it involves both.
- **N** if not sure

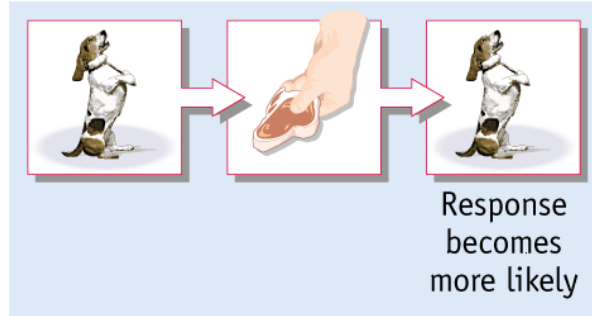
1. Whenever Marcia takes her dog out for a walk, she wears the same old blue windbreaker. Eventually, she notices that her dog becomes very excited whenever she puts on this windbreaker.
2. *The Creatures* are a successful rock band with three hit albums to their credit. They begin their U. S. tour featuring many new, unreleased songs, all of which draw silence from their concert fans. The same fans cheer wildly when *The Creatures* play any of their old hits. Gradually, the band reduces the number of new songs it plays and starts playing more of the old standbys.
3. When Cindy and Mel first fell in love, they listened constantly to *The Creatures'* hit song *Transatlantic Obsession*. Although several years have passed, whenever they hear this song, they experience a warm, romantic feeling.
4. For nearly 20 years Ralph has worked as a machinist in the same factory. His new foreman is never satisfied with his work and criticizes him constantly. After a few weeks of heavy criticism, he experiences anxiety whenever he arrives at work. He starts calling in sick more and more frequently to evade this anxiety.

## Factors that Affect Reinforcement

<p>Contingency</p>	 <p>The graph plots Responses per Hour (Y-axis, 0 to 5,000) against Sessions (X-axis, 5 to 65). It is divided into four segments by vertical dashed lines: Moderate Contingency (Sessions 5-15), Zero Contingency (Sessions 15-30), Moderate Contingency (Sessions 30-50), and Zero Contingency (Sessions 50-65). In the moderate contingency segments, response rates fluctuate between approximately 1,000 and 4,000 responses per hour. In the zero contingency segments, response rates drop significantly, staying below 1,000 responses per hour.</p>
<p>Contiguity</p>	 <p>The graph plots Mean Cumulative Responses (Y-axis, 0 to 200) against 2-Minute Time Periods (X-axis, 0 to 30). Three lines represent different delay intervals: 0-s Delay (top line, reaching ~190), 4-s Delay (middle line, reaching ~100), and 10-s Delay (bottom line, reaching ~20). All lines show an upward trend that levels off over time.</p>
<p>Reinforcer Characteristics</p>	
<p>Task Characteristics</p>	
<p>Motivating Operations</p>	 <p>The graph plots Error Scores (Y-axis, 50 to 270) against Days (X-axis, 1 to 17). Two lines are shown: 'Not Hungry' (top line) and 'Hungry' (bottom line). Both lines show a general downward trend. The 'Not Hungry' line starts at ~260 and ends at ~170. The 'Hungry' line starts at ~260 and ends at ~60.</p>
<p>Other Variables</p>	

## Contingency

Contingency refers to the degree of correlation between a behavior and its consequences.



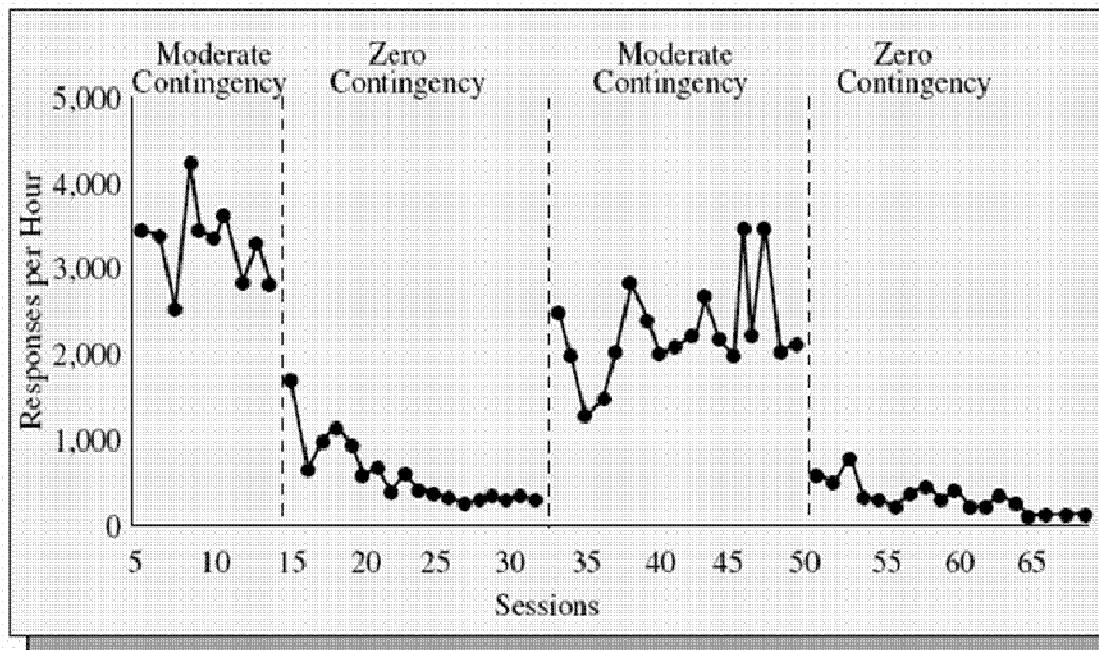
Behavior = sitting up

Consequence = food

- If there is a relationship between getting food and sitting up, the dog's behavior will increase.
- If there is no relationship between getting food and sitting up, then the dog's sitting up behavior will decrease.

Good Contingency		Bad Contingency	
 Response becomes more likely	 Response becomes more likely	 Response becomes less likely	 Response becomes more likely
 Response becomes more likely	 Response becomes more likely	 Response becomes more likely	 Response becomes less likely
 Response becomes more likely	 Response becomes more likely	 Response becomes less likely	 Response becomes less likely
 Response becomes more likely	 Response becomes more likely	 Response becomes more likely	 Response becomes more likely

## Contingency

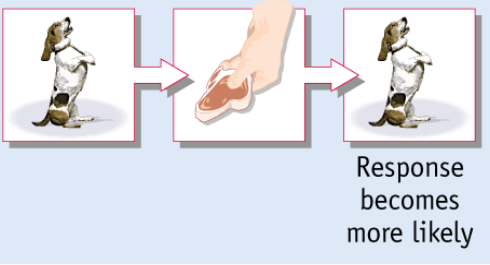
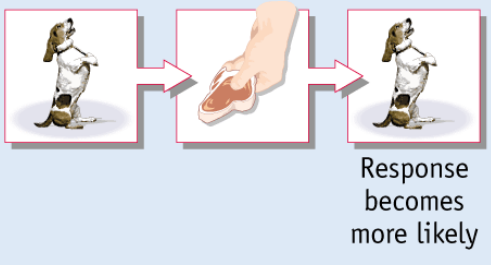


*Figure 5-8. Contingency and reinforcement. The mean response rate of lever pressing for ten rats when food was contingent and noncontingent. (Adapted from "The Effect of Contingency upon the Appetitive Conditioning of Free-Operant Behavior," by L. J. Hammond, 1980, Journal of the Experimental Analysis of Behavior, 34[3], p. 300. Copyright © 1980 by the Society for the Experimental Analysis of Behavior, Inc. Reprinted with permission.)*

Small reinforcers can be effective when there is a strong correlation between behavior and consequence. Numerous small reinforcers, when contingent on behavior, are generally more effective than a few large ones (page 145).

## Contiguity

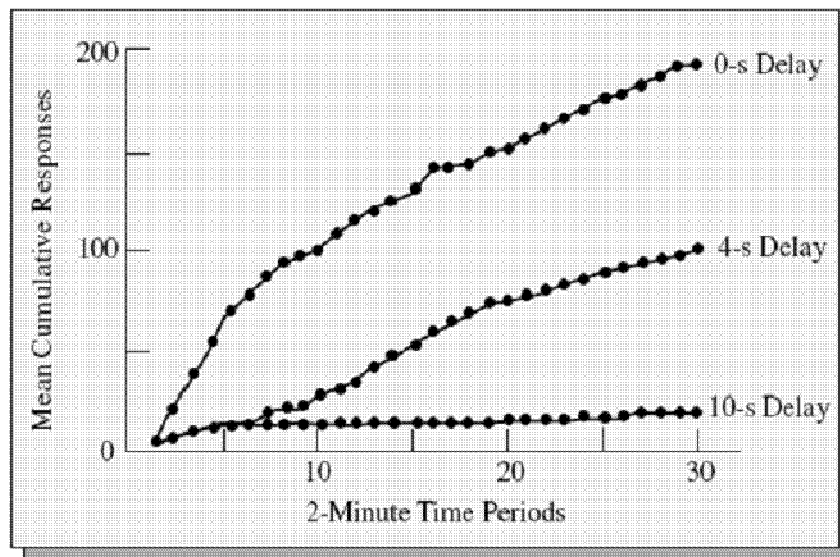
The gap (in time) between a behavior and its reinforcing consequence is contiguity. In general, the shorter the time interval is, the faster learning occurs.

High Contiguity	Low Contiguity
 <p>Response becomes more likely</p>	 <p>Response becomes more likely</p>
2 second delay	10 second delay

High contiguity makes it easier to learn the relationship between your behavior and its consequences

- Scores on the exam are known 2 weeks after the exam
- “Just wait until your father gets home”\*
- Sex and pregnancy\*
- Eating fast food and health problems\*

## Contiguity



*Figure 5-9 Contiguity and reinforcement. Mean cumulative responses when reinforcement was immediate, delayed 4 seconds, and delayed 10 seconds. (Adapted from "The Effects of Delayed Reinforcement and a Response-Produced Auditory Stimulus on the Acquisition of Operant Behavior in Rats," by H. D. Schlinger, Jr., and E. Blakely, 1994, The Psychological Record, 44, p. 396, Figure 1. Copyright © 1994 The Psychological Record. Reprinted with permission.)*

## **Reinforcer Characteristics**

Not all reinforcers are created equal. Smaller reinforcers given frequently tend to produce faster learning than large reinforcers given infrequently. However, holding other variables constant, larger reinforcers tend to facilitate learning than smaller reinforcers.

From your textbook, seeing a \$100 bill on the ground will make you look harder in the area for more money than a \$1 bill.

There are diminishing returns with the reinforcer and behavior. As described in your textbook (page 148), those who received a bonus (3% to 55%) for assembling parts were more productive than those who did not receive a bonus. However, there was no statistically significant difference in the productivity of those who received a bonus.



## Task Characteristics

Qualities of the behavior being reinforced affect the ease with which it can be strengthened. Learning to walk a balance beam is easier than learning to walk a tightrope. Behavior that depends on smooth muscles and glands is harder to reinforce than behavior that depends on skeletal muscles ([page 147](#)).

Working with an animal's biological predisposition can facilitate learning. Learning that is inconsistent with an animal's biological predisposition can make learning more difficult.



## **Task Characteristics**

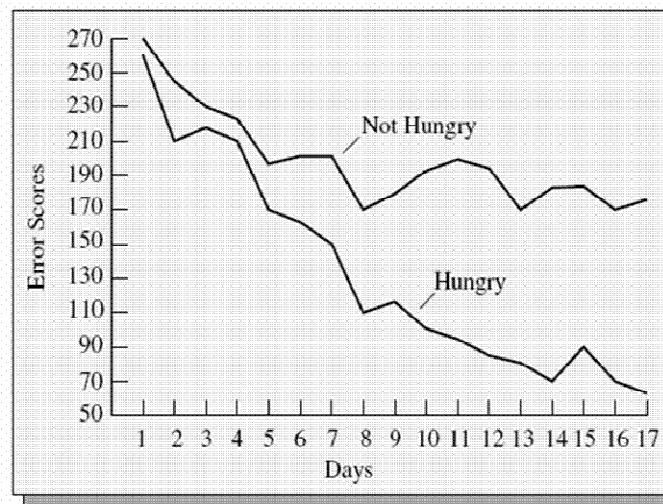
It is easier to train a pigeon to peck a lighted disk than to train a hawk to do the same thing. Pigeons are seed eaters, so pecking is part of their repertoire of behaviors. Hawks do not peck. They use their beaks to tear their prey apart ([page 148](#)).

Likewise, it is probably easier to train an athlete a new game than it is to train a non-athlete.

It is probably easier to train a mechanic to fix computers than it is to train a diplomat to fix a computer.

## Motivating Operations

A motivating operation is anything that establishes conditions that improve the effectiveness of a reinforcer. Food is more reinforcing to an animal when it is hungry, so depriving it of food several hours before training establishes food as an effective reinforcer (page 148).



**Figure 5-11** Food deprivation and learning. Rats that had been deprived of food learned to run a maze (at the end of which they found food) more efficiently than rats that had not been deprived of food. (Adapted from Tolman and Honzik, 1930b.)

The same basic principles apply to deprivation of social contact, rest, warmth, a quiet environment, and water.

## **Other Variables**

# **Neuromechanics of Reinforcement**