Classical Conditioning
- Define learning.
- Describe the elements of classical conditioning, distinguishing between unconditioned stimulus, unconditioned response, conditioned stimulus and conditioned response. Describe the process of establishing a classically conditioned response, including the effect of intermittent pairing.
- Provide examples of classical conditioning in humans, including desensitization therapy. Explain the statement that "classical conditioning is selective" and illustrate with examples of conditioned taste aversions.

Operant Conditioning
- Explain how operant conditioning differs from classical conditioning.
- Explain the law of effect (the principle of reinforcement) and the role of reinforcers, punishers and shaping in establishing an operantly conditioned response. Differentiate between positive reinforcers, negative reinforcers, and punishment. Explain the circumstances under which punishment can be effective and the drawbacks to using punishment.
- Explain what is meant by learned helplessness.
- Describe how biofeedback and neurofeedback can be used to change behavior.

Factors Shared by Classical and Operant Conditioning
- Describe the importance of contingencies in both operant and classical conditioning.
- Differentiate between the four schedules of reinforcement in operant conditioning and their effect on learned behavior.
- Describe the processes of extinction, spontaneous recovery, generalization and discrimination in classical and operant conditioning.
- Explain what is meant by higher order conditioning and differentiate between primary and secondary reinforcers.

Cognitive Learning
- Define cognitive learning and how it can be inferred from evidence of latent learning and cognitive maps.
- Explain what is meant by insight and its relation to learning sets.
- Explain the process of observational (vicarious) learning and the conditions under which it is most likely to be reflected in behavior.
- Give examples of cognitive learning in nonhumans.
WEB RESOURCES

A. General/Comprehensive

Association for Applied Behavior Analysis: http://www.abainternational.org/
An international organization “dedicated to promoting the experimental, theoretical, and applied analysis of behavior.”

Operant and Classical Conditioning: http://www.brembs.net/learning/drosophila/general_introduction.html
Compares and contrasts operant and classical conditioning. Provides helpful diagrams that your students can use while learning about learning.

Self-test examples of classical and operant conditioning – many vignettes illustrating examples of classical and operant conditioning. You are asked to figure out which it is. Answers and explanations are provided.

B. Classical Conditioning

An overview of classical conditioning with cute diagrams.

Conditioned Emotional Reactions: http://psychclassics.yorku.ca/Watson/emotion.htm
A reprint of the classic (1920) paper by John B. Watson and Rosalie Raynor (the story behind “Little Albert and the White Rat”), presented on the Web as part of the “Classics in the History of Psychology” series maintained by Christopher D. Green.

C. Operant Conditioning

A brief autobiography of B. F. Skinner is presented, including a postscript by B. F. Skinner himself.

A comprehensive site devoted to the legacy of B.F. Skinner.

Negative Reinforcement University: http://www.mcli.dist.maricopa.edu/proj/nru/
An interactive environment for learning about negative reinforcement.

Site designed to teach the concept of positive reinforcement. Lots of examples and nonexamples with analyses.

What is Clicker Training?: http://www.clickertrain.com/whatis.html
A concise informational article prepared by ClickerTrain.com. FYI, clicker training is a form of animal training using operant conditioning principles.

D. Observational/Social Learning

Observational (Social) Learning: http://chiron.valdosta.edu/whuitt/col/soccog/soclrn.html
A nice summary of basic principles of observational learning and an explanation of Bandura’s “Bobo” doll experiment.

An account of one of the “Bobo doll” studies of aggressive behavior, by Bandura, Ross, and Ross (1961), originally published in the Journal of Abnormal and Social Psychology, 63, 575–582. The online version is part of Classics in the History of Psychology, an Internet Resource developed by Christopher D. Green at York University, in Toronto.

E. Animal Training

Animal Cognition Web Site: http://www.pigeon.psy.tufts.edu/psych26/
Course homepage includes information on the history of animal learning, classical conditioning, operant conditioning, and complex animal behavior.

Animal Trainer’s Introduction to Operant and Classical Conditioning: http://www.wagntrain.com/OC/
A nicely written article by Stacy Braslau-Schneck, MA. Explains how basic principles of operant and classical conditioning are incorporated into clicker training.

Animal Training at Sea World: http://www.seaworld.org/infobooks/Training/home.html
Great site for students to see “fun” applications of operant conditioning principles.
LESSON PLANS (USE FILE: DISCUSSION TOPICS IN CH5 FOLDER)

Nov 28/29 Objective ONE - CLASSICAL CONDITIONING  pages 155-160
Lecture
Homework:
  • Read and outline 155-160
  • do all questions on page 160
  • annotate videos A & B
  • Do ch 5 CC practice quiz

Nov 30/Dec 1 Objective TWO - OPERANT CONDITIONING  pages 160-168
Do ch 5 CC quiz (real test)
Lecture
  Video Operant conditioning 4 minutes
  Video Visible Learning 2 minutes
Homework:
  • Read and outline 160-168
  • 5.3 Reinforcement versus Punishment
  • 5.4 Schedules of Reinforcement
  • annotate videos C
  • Do all questions on page 168
Assessment: Do Quiz OC

Dec 2 Objective THREE - FACTORS SHARED BY CLASSICAL AND OPERANT CONDITIONING  pgs 168-176
Lecture
Homework:
  • Read and outline 168-176
  • Do all questions on page 176
Assessment: Quiz CC/OC on pages 168-176

Dec 5 Objective FOUR - COGNITIVE LEARNING  pgs 176-183
Lecture
Draw Human Cognitive Maps
Homework:
  • Read and outline 176-183
  • annotate videos D & E
  • Do all questions on page 182
Dec 6 Objective FIVE - CHAPTER REVIEW  pgs 183-185
Lecture
Do Traffic/homework/stickers example

Homework: DO ★ ALL – memorize these items as any or all of them could be fill in the blanks.

5.3 Reinforcement versus Punishment
5.4 Schedules of Reinforcement
5.6 Learning Self-Test
5.7 Crossword Puzzle
5.8 Fill in the Blank

Dec 7 Reteach

Dec 8 Review

Dec 9 Assessment: Chapter 5 test
CLASSICAL CONDITIONING (TEXT PAGE 155)

Define learning (text p. 155).

Learning – any relatively permanent change in behavior brought about by experience or practice, and is different from maturation that is controlled by the genes.

Describe the elements of classical conditioning, distinguishing between unconditioned stimulus, unconditioned response, conditioned stimulus and conditioned response. Describe the process of establishing a classically conditioned response, including the effect of intermittent pairing (text pp. 156-157).

Elements of Classical Conditioning

- **Unconditioned stimulus** – a stimulus that invariably causes an organism to respond in a specific way.
- **Unconditioned response** – reflex, response to unconditioned stimulus.
- **Conditioned stimulus** – originally neutral stimulus that is paired with an unconditioned stimulus, and eventually produces the desired response in an organism when presented alone.
- **Conditioned response** – After conditioning, the response an organism produces after conditioned stimulus is presented.

Establishing a Classically Conditioned Response

- Pavlov paired a sound with the presentation of food to dogs and discovered several principles for classical conditioning: the neutral stimulus and UCS must be paired several times and the CS must precede the UCS by only a few seconds.
- **Intermittent pairing** – pairing the CS and the UCS on only a portion of the learning trials
  - Reduces rate of learning and final strength of learned response

Provide examples of classical conditioning in humans, including desensitization therapy (text pp. 158-159).

**Classical Conditioning in Humans**

- Watson was able to demonstrate that an emotional disorder called a phobia could be learned through classical conditioning by exposing a baby to a white rat and a loud noise, producing conditioned fear of the rat in the baby.
- **Desensitization therapy** – a conditioning technique designed to gradually reduce anxiety about a particular object or situation.

Explain the statement that "classical conditioning is selective" and illustrate with examples of conditioned taste aversions (text p. 159-160).

**Classical Conditioning is Selective**

- Phobias of potentially dangerous situations or items are more likely
- Conditioned taste aversions occur when an organism becomes nauseated some time after eating a certain food, which then becomes aversive to the organism.
- Some kinds of conditioned responses are more easily learned because of biological preparedness, which may cause humans to associate certain stimuli with danger to survival.
EXPLAIN HOW OPERANT CONDITIONING DIFFERS FROM CLASSICAL CONDITIONING (TEXT PP. 160-161).

Operant conditioning – the type of learning in which behaviors are emitted (in the presence of specific stimuli) to earn rewards or avoid punishments.

Explain the law of effect (the principle of reinforcement) and the role of reinforcers, punishers and shaping in establishing an operantly conditioned response. (text pp. 161-163).

Elements of Operant Conditioning

- Thorndike developed the Law of Effect: a response followed by a pleasurable consequence will be repeated, but a response followed by an unpleasant consequence will not be repeated.
- Behavior is encouraged or discouraged depending on reward/punishment not just pairing of events.
- Reinforcers – stimuli that follows a behavior and increases the likelihood that the behavior will be repeated.
- Punishers – stimuli that follows a behavior and decreases the likelihood that the behavior will be repeated.

Establishing an Operantly Conditioned Response

- Animal trainers often increase motivation by offering food as a reward for completing a task.
- Shaping – reinforcing successive approximations to a desired behavior.
- Animals are reinforced for individual steps toward a goal. Then expected to complete entire task successively.

DIFFERENTIATE BETWEEN POSITIVE REINFORCERS, NEGATIVE REINFORCERS, AND PUNISHMENT (PP. 163-164).

A Closer Look at Reinforcement

- Positive reinforcer – events whose presence increases the likelihood that ongoing behavior will recur.
- Negative reinforcer – events whose reduction or termination increases the likelihood that ongoing behavior will recur.
- Punishment – any event whose presence decreases the likelihood that an ongoing behavior will recur.

Accidental or coincidental pairings of behaviors and reinforcers can create superstitious behaviors. Once learned, these generally harmless superstitious behaviors are performed with the expectation that a reward will follow (e.g., wearing one’s “lucky shirt” while taking an exam with hopes that an “A” will follow).

EXPLAIN THE CIRCUMSTANCES UNDER WHICH PUNISHMENT CAN BE EFFECTIVE AND THE DRAWBACKS TO USING PUNISHMENT (PP. 164-166).

Punishment

Punishment adds something unpleasant to the environment and, therefore, tends to weaken the behavior that preceded it. There are, however, conditions under which punishment is effective and limits to its influence on behavior:

- To be effective, punishment should be swift and sufficient, without being cruel.
- Punishment must be applied in a consistent manner; all infractions of a rule must be punished, not just occasional infractions.

Drawbacks of punishment:

- Cannot unteach unwanted behaviors – behavior already learned cannot be unlearned – it can only be suppressed.
- Can backfire – punishment stirs up negative feelings that can interfere with the learning of more desirable behaviors, and the negative feelings can provoke more undesirable behaviors.
- Can teach aggression.

Avoidance training – learning a desirable behavior to prevent the occurrence of something unpleasant, such as a punishment. In some circumstances, after a few episodes involving punishment for a behavior, it may not need to occur again because the threat of punishment serves to deter the bad behavior.

EXPLAIN WHAT IS MEAN BY LEARNED HELPLESSNESS (TEXT PP. 166-167).

Learned helplessness – failure to take steps to avoid or escape from an unpleasant or aversive stimulus that occurs as a result of previous exposure to unavoidable painful stimuli.
Describe how biofeedback and neurofeedback can be used to change behavior (p. 167).

Shaping Behavioral Change Through Biofeedback

- **Biofeedback** – use of feedback about biological conditions such as blood pressure, skin temperature, or heart rate to bring involuntary responses such as blood pressure under control.
- **Neurofeedback** is a modified version of biofeedback in which the person is connected to an electroencephalograph, a machine that records the brain’s electrical activity.
- Biofeedback and neurofeedback have been used to control migraine headaches, hypertension, panic attacks, and anxiety that can interfere with athletic or musical performance.

**FACTORS SHARED BY CLASSICAL AND OPERANT CONDITIONING (TEXT PAGE 168)**

Describe the importance of contingencies in both operant and classical conditioning (text pp. 169-170).

The Importance of Contingencies

- **Contingency** – a reliable “if-then” relationship between two events, such as a CS and a US.
- **Contingencies in Classical Conditioning** – a contingency is perceived between the CS and the US.
  - The CS should occur in close proximity, either before or after, the US for true conditioning to occur.
  - If the CS occurs after the US, the process is called **backward conditioning**.
  - **Blocking** – a process whereby prior conditioning prevents conditioning to a second stimulus even when the two stimuli are presented simultaneously. Classical conditioning to a stimulus will only occur when the stimulus tells the learner something **new or additional** about the likelihood that a US will occur.

- **Contingencies in Operant Conditioning** – the connection between performing the action and receiving the reward or punishment must be made for conditioning to occur.

Differentiate between the four schedules of reinforcement in operant conditioning and their effect on learned behavior (text pp. 170-171)

- **Continuous reinforcement** occurs when each and every correct response is followed by a reinforcer.
- **Partial or intermittent reinforcement**, in which only some correct responses are followed by reinforcement, is much more resistant to extinction. This is called the **partial reinforcement effect**.
  - **Fixed ratio schedule** – a certain number of responses are required before reinforcement is given. (Response pattern: brief pause after reinforcement, then steady increase until next reinforcement)
  - **Variable ratio schedule** – a varying number of responses is required to obtain reinforcement. (Response pattern: no pause after reinforcement, high rate of improvement with reinforcement)
  - **Fixed interval schedule** – at least one correct response must be made within a set interval of time to obtain reinforcement. (Response pattern: performance falls after reinforcement, and picks up during reinforcement)
  - **Variable interval schedule** – reinforcement follows a varying interval of time. (Response pattern: slow and steady pattern of responses)

Describe the processes of extinction, spontaneous recovery, generalization and discrimination in classical and operant conditioning (text pp. 171-173).

**Extinction and Spontaneous Recovery**

Extinction and spontaneous recovery occur in both classical conditioning and operant conditioning, although the mechanisms for each phenomenon vary depending upon the conditioning paradigm.

- **Extinction** – a decrease in the strength or frequency, or stopping, of a learned response because of a failure to continue pairing the US and CS (in classical conditioning) or withholding the reinforcement (in operant conditioning).
- **Spontaneous recovery** – the reappearance of an extinguished response after the passage of time without retraining (pairing of the US & CS in classical conditioning), or reinforcement (in operant conditioning).
- A response that was operantly conditioned is especially difficult to extinguish if the original learning:
  - is strong or highly reinforced.
  - occurred on a partial schedule of reinforcement instead of a continuous schedule.
  - occurred in a variety of settings.
CHAPTER 5 LEARNING

- is of a complex behavior.
- occurred through punishment instead of reinforcement.

Stimulus Control, Generalization, and Discrimination

- **Stimulus control** – control of conditioned responses by cues or stimuli in the environment.
- **Stimulus generalization** – the transfer of a learned response to different but similar stimuli.
- **Stimulus discrimination** – learning to respond to only one stimulus and to inhibit the response to all other stimuli.
- **Response generalization** – giving a response that is somewhat different from the response originally learned with that stimulus; occurs only in operant conditioning.

Explain what is meant by higher order conditioning and differentiate between primary and secondary reinforcers (text pp. 175-176).

**New Learning Based on Original Learning**

- **Higher order conditioning** – conditioning based on previous learning. The CS serves as a US for further training.
- **Primary reinforcers** – reinforcers that are rewarding in themselves, such as food, water, or sex.
- **Secondary reinforcers** – reinforcers whose value is acquired through association with other primary or secondary reinforcers. Classical conditioning is involved in the creation of secondary reinforcers.

**COGNITIVE LEARNING (TEXT PAGE 176)**

Define cognitive learning and how it can be inferred from evidence of latent learning and cognitive maps (text pp. 176-178).

**Cognitive Learning** – learning that depends on mental processes that are not directly observable, but can be inferred from behavior.

**Latent Learning and Cognitive Maps**

- **Latent learning** – learning that is not immediately reflected in behavior change.
- **Cognitive map** – a learned mental image of a spatial environment that may be called on to solve problems when stimuli in the environment change.
- **Tolman’s Maze-Running Rats: Latent Learning**
  - Tolman found that rats which were allowed to wander in a maze but were not reinforced still showed evidence of having learned the maze once reinforcement becomes possible. He termed this hidden learning *latent learning*, a form of cognitive learning.
  - In response to Tolman’s theory of latent learning, Edward Thorndike proposed, but never conducted a study, where rats would be carried over a maze but would not navigate it themselves firsthand. Thorndike assumed that the rats would demonstrate no evidence of learning as compared to the rats that actually learned the maze on their own.
  - Two decades later (in the 1950s), other researchers conducted the study and found that, when they carried rats over the route taken by free-running rats in a maze, the carried rats had learned the maze just as well as the free-running rats, indicating that they had formed a cognitive map of the maze, consistent with Tolman’s notion of latent learning.

Explain what is meant by insight and its relation to learning sets (text pp. 178-179).

**Insight and Learning Sets**

- **Insight** – learning that occurs rapidly as a result of understanding all the elements of a problem.
- **Learning sets** – the ability to become increasingly more effective in solving problems as more problems are solved.
- Greater insight leads to greater ability to solve problems via learning sets.
Explain the process of observational (vicarious) learning and the conditions under which it is most likely to be reflected in behavior (text pp. 179-181).

Learning by Observing

- **Observational Learning (vicarious learning)** – learning by observing other people’s behavior and experiences.
- **Social learning theorists** – psychologists whose view of learning emphasizes the ability to learn by observing a model or receiving instructions, without firsthand experience by the learner.
- The Four Elements of Observational Learning
  - **Attention** - learner must first pay attention to the model.
  - **Memory** - learner must also be able to retain the memory of what was done.
  - **Imitation** - learner must be capable of imitating the actions of the model.
  - **Motivation** - the learner must have the desire to perform the action.
- Motivation is greatly influenced by the kind of consequences associated with an observed behavior – rewards or punishments. However, the observer need not receive the consequence directly. The consequences may happen to the person whom the observer is watching, a phenomenon called **vicarious reinforcement** or **vicarious punishment**. These vicarious consequences affect the willingness of others to perform the behaviors they learned by observing those of models.
- Albert Bandura – foremost proponent of social learning theory
  - **Social Cognitive Theory** – Bandura’s label for his version of social learning theory that emphasizes the thinking that is occurring underlying the observable, learned behavior.
  - Bandura’s classic BoBo doll experiment (1965) dramatically illustrated the influence of modeled aggression on preschool children (see photo sequence on page 180 of the text).

Give examples of cognitive learning in nonhumans (text pp. 181-182).

**Cognitive Learning in Nonhumans**

- Research with animals has revealed evidence of latent learning, learning cognitive maps, and insight.
- Experiments have revealed that chimpanzees, dolphins, cats, meerkats, chickens, octopi, whales, bumblebees and, of course, rats are capable of learning through observing others, experiencing pairing of stimuli and responses, and acquiring behaviors in response to rewards and punishments.
The chapter opens with several very different anecdotes whose common element is learning, and then aims to address the enduring issue of how humans and other animals acquire new behaviors as a result of their experiences. Learning is the process by which experience or practice produces a relatively permanent change in behavior or potential behavior. One basic form of learning involves learning to associate one event with another. Classical conditioning is a type of associative learning that Pavlov discovered while studying digestion. Pavlov trained a dog to salivate at the sound of a bell when he rang the bell just before food was given. The dog learned to associate the bell with food and began to salivate at the sound of the bell alone.

Suppose you wanted to classically condition salivation in your own dog. You know that food is an unconditioned stimulus (US) that automatically evokes the unconditioned response (UR) of salivation. By repeatedly pairing food with a second, initially neutral stimulus (such as a bell), the second stimulus would eventually become a conditioned stimulus (CS) eliciting a conditioned response (CR) of salivation.

Establishing a classically conditioned response usually is easier if the US and CS are paired with each other repeatedly, rather than a single time or even once in a while (intermittent pairing). That is why a single incident—for example, burning your finger on a match while listening to a certain song—is not usually enough to produce a classically conditioned response. It is also important that the spacing of pairings be neither too far apart nor too close together.

In the case of Little Albert, Watson conditioned a child to fear white rats by always pairing a loud, frightening noise with a rat. Perhaps you have acquired a classically conditioned fear or anxiety (to the sound of a dentist’s drill, for instance) in much the same way; or perhaps you have also unlearned a conditioned fear by repeatedly pairing the feared object with something pleasant. Mary Cover Jones paired the sight of a feared rat (at gradually decreasing distances) with a child’s pleasant experience of eating candy. This procedure was the precursor to desensitization therapy.

The concept of preparedness accounts for the fact that certain conditioned responses are acquired very easily. The ease with which we develop conditioned taste aversions illustrates preparedness. Because animals are biologically prepared to learn them, conditioned taste aversions can occur with only one pairing of the taste of a tainted food and later illness, even when there is a lengthy interval between eating the food and becoming ill. A fear of snakes may also be something that humans are prepared to learn.

The chapter turns its focus to the subject of operant conditioning. Operant or instrumental conditioning is learning to make or withhold a certain response because of its consequences. Operant behaviors are different from the responses involved in classical conditioning because they are voluntarily emitted, whereas those involved in classical conditioning are elicited by stimuli.

There are two essential elements involved in operant conditioning. One is an operant behavior, or a behavior performed by one’s own volition while “operating” on the environment. The second essential element is a consequence associated with that operant behavior. When a consequence increases the likelihood of an operant behavior’s being emitted, it is called a reinforcer. When a consequence decreases the likelihood of an operant behavior, it is called a punisher. These relationships are the basis of the law of effect, or principle of reinforcement: Consistently rewarded behaviors are likely to be repeated, whereas consistently punished behaviors are likely to be suppressed.

To speed up establishing an operantly conditioned response in the laboratory, the number of potential responses may be reduced by restricting the environment, as in a Skinner box. For behaviors outside the laboratory, which cannot be controlled so conveniently, the process of shaping is often useful. In shaping, reinforcement is given for successive approximations to the desired response. For example, a speech therapist might use shaping to teach a child to pronounce a certain sound correctly.

Several kinds of reinforcers strengthen or increase the likelihood of behavior. Positive reinforcers (such as food) add something rewarding to a situation. Negative reinforcers (for example, stopping an electric shock) subtracts something.
Unpleasant. When an action is followed closely by a reinforcer, we tend to repeat the action, even if it did not actually produce the reinforcement. Such behaviors are called superstitious.

Punishment is any unpleasant consequence that decreases the likelihood that the preceding behavior will recur. Whereas negative reinforcement strengthens behavior, punishment weakens it. Although punishment can be effective, it also can stir up negative feelings and serve to model aggressive behavior. Also, rather than teaching a more desirable response; it only suppresses an undesirable one. After punishment has occurred a few times, further repetitions sometimes are unnecessary because the threat of punishment is enough. With this process, called avoidance training, people learn to avoid the possibility of a punishing consequence.

When people or other animals are unable to escape from a punishing situation, they may acquire a “giving-up” response, called learned helplessness. Learned helplessness can generalize to new situations, causing resignation in the face of unpleasant outcomes, even when the outcomes can be avoided. For example, a college student who gives up trying to do well in school after a few poor grades on tests is exhibiting learned helplessness.

When operant conditioning is used to control biological functions, such as blood pressure or heart rate, it is referred to as biofeedback. When it is used to control brain waves it is called neurofeedback. Biofeedback and neurofeedback have been successfully applied to a variety of medical problems, including migraine headaches, hypertension, and asthma. Biofeedback has also been used by athletes and musicians to improve performance and control anxiety.

The chapter ties the previous material together by looking at factors that are shared by both classical and operant conditioning. Despite the differences between classical and operant conditioning, these two forms of learning have many things in common: (1) Both cases involve learned associations; (2) in both cases, responses come under control of stimuli in the environment; (3) in both cases, the responses will gradually disappear if they are not periodically renewed; and (4) in both cases, new behaviors can build upon previously established ones.

In both classical and operant conditioning, an “if–then” relationship, or contingency, exists either between two stimuli or between a stimulus and a response. In both these kinds of learning, perceived contingencies are very important.

In classical conditioning, the contingency is between the CS and the US. The CS comes to be viewed as a signal that the US is about to happen. For that reason, the CS must not only occur in close proximity to the US, but must also precede the US and provide predictive information about it. If the CS occurs after the US, it will come to serve as a signal that the US is imminent. Blocking is a process whereby prior conditioning prevents conditioning to a second stimulus even when the two stimuli are presented simultaneously.

In operant conditioning, contingencies exist between responses and consequences. Contingencies between responses and rewards are called schedules of reinforcement. Partial reinforcement, in which rewards are given only for some correct responses, generates behavior that persists longer than that learned by continuous reinforcement. A fixed-interval schedule, by which reinforcement is given for the first correct response after a fixed time period, tends to result in a flurry of responding right before a reward is due. A variable-interval schedule, which reinforces the first correct response after an unpredictable period of time, tends to result in a slow, but steady pattern of responding. In a fixed-ratio schedule, behavior is rewarded after a fixed number of correct responses, so the result is usually a high rate of responding. Finally, a variable-ratio schedule provides reinforcement after a varying number of correct responses. It encourages a high rate of response that is especially persistent.

Learned responses sometimes weaken and may even disappear, a phenomenon called extinction. The learning is not necessarily completely forgotten, however. Sometimes a spontaneous recovery occurs, in which the learned response suddenly reappears on its own, with no retraining.

Extinction is produced in classical conditioning by failure to continue pairing the CS and the US. The CS no longer serves as a signal that the US is about to happen, and so the conditioned response dies out. An important contributing factor is often new, learned associations that interfere with the old one. In situations in which you are reminded of the old association, spontaneous recovery may occur.

Extinction occurs in operant conditioning when reinforcement is withheld until the learned response is no longer emitted.
CHAPTER 5 LEARNING

The ease with which an operantly conditioned behavior is extinguished varies according to several factors: the strength of the original learning, the variety of settings in which learning took place, and the schedule of reinforcement used during conditioning.

When conditioned responses are influenced by surrounding cues in the environment, stimulus control occurs. The tendency to respond to cues that are similar, but not identical, to those that prevailed during the original learning is known as stimulus generalization. An example of stimulus generalization in classical conditioning is a student’s feeling anxious about studying math in college because he or she had a bad experience learning math in grade school. Stimulus discrimination enables learners to perceive differences among cues so as not to respond to all of them.

In operant conditioning, the learned response is under the control of whatever cues come to be associated with delivery of reward or punishment. Learners often generalize about these cues, responding to others that are broadly similar to the ones that prevailed during the original learning. An example is slapping any face card in a game of slapjack. Learners may also generalize their responses by performing behaviors that are similar to the ones that were originally reinforced. This result is called response generalization. Discrimination in operant conditioning is taught by reinforcing only a certain response and only in the presence of a certain stimulus.

In both classical and operant conditioning, original learning serves as a building block for new learning. In classical conditioning, an earlier CS can be used as an US for further training. For example, Pavlov used the bell to condition his dogs to salivate at the sight of a black square. This effect, which is called higher order conditioning, is difficult to achieve because of extinction. Unless the original unconditioned stimulus is presented occasionally, the initial conditioned response will die out.

In operant conditioning, initially neutral stimuli can become reinforcers by being associated with other reinforcers. A primary reinforcer is one that, like food and water, is rewarding in and of itself. A secondary reinforcer is one whose value is learned through its association with primary reinforcers or with other secondary reinforcers. Money is such a good secondary reinforcer because it can be exchanged for so many different primary and secondary rewards.

Despite their differences, classical and operant conditioning share many similarities: Both involve associations between stimuli and responses; both are subject to extinction and spontaneous recovery as well as generalization and discrimination; in both, new learning can be based on original learning. Operant conditioning can even be used, in biofeedback and neurofeedback training, to learn to control physiological responses that are usually learned through classical conditioning. Many psychologists now wonder whether classical and operant conditioning aren’t just two ways of bringing about the same kind of learning.

The chapter concludes with a detailed look at cognitive learning. Cognitive learning refers to the mental processes that go on inside us when we learn. Some kinds of learning, such as memorizing the layout of a chessboard, seem to be purely cognitive, because the learner does not appear to be “behaving” while the learning takes place. Cognitive learning, however, can always affect future behavior, such as reproducing the layout of a memorized chessboard after it is cleared away. It is from such observable behavior that cognitive learning is inferred.

Latent learning is any learning that has not yet been demonstrated in behavior. Your knowledge of psychology is latent if you have not yet displayed it in what you say, write, and do. One kind of latent learning is knowledge of spatial layouts and relationships, which is usually stored in the form of a cognitive map. Rewards or punishments aren’t essential for latent learning to take place. You did not need rewards and punishments to learn the layout of your campus, for example. You acquired this cognitive map simply by storing your visual perceptions.

A learning set is a concept or procedure that provides a key to solving a problem even when its demands are slightly different from those of problems you have solved in the past. As a student, you probably have a learning set for writing a term paper that allows you successfully to develop papers on many different topics. A learning set can sometimes encourage insight or the sudden perception of a solution even to a problem that at first seems totally new. In this case, you are perceiving similarities between old and new problems that weren’t initially apparent.

Social learning theorists argue that we learn much by observing other people who model a behavior or by simply hearing about something. This process is called observational (or vicarious) learning. It would be harder to learn to drive a car without ever having been in one because you would lack a model of “driving behavior.” It is hard for deaf children to learn...
spoken language because they have no auditory model of correct speech.

The extent to which we imitate behaviors learned through observation depends on our motivation to do so. One important motivation is any reward or punishment that we have seen the behavior bring. When a consequence isn’t experienced firsthand, but only occurs to other people, it is called vicarious reinforcement or vicarious punishment.

Research has shown that many animals, including chimpanzees, dolphins, whales, rats, octopi, and even bumblebees are capable of various forms of cognitive learning.

Lecture/Discussion: Punishment

Students often have difficulty distinguishing between negative reinforcement and punishment. These examples of types of punishment may clarify what it is and when it should be used.

Physical punishment or aversive punishment involves administering a stimulus that evokes discomfort. Spankings, electric shock, harsh sounds, or pinches would be included in this category. Aversive punishment is typically used in extreme cases, as it is neither pleasant to administer nor to receive. Reprimands are strong verbal commands (“No!” “Stop that!” “Bad!”) used when an inappropriate behavior is displayed. They are sometimes accompanied by physical or nonverbal reprimands. Timeout can be exclusionary or nonexclusionary. Exclusionary timeout involves removing an individual for a short time from a situation that he or she finds reinforcing. Nonexclusionary timeout involves introducing a stimulus that is less reinforcing. For example, children might be given a “good conduct” badge to wear while playing in a classroom. If the child becomes disruptive, the badge will be removed, and the child will be ignored by the teacher and not allowed to play with the others. Finally, response cost involves removing a specified amount of reinforcement after an undesired behavior occurs. Parking tickets, bank fees, or library fines would be examples of this type of punishment.

As the text mentions, to be effective punishment must be swift, certain, and sufficient. Some guidelines for deciding to use punishment include selecting a specific response to punish (such as spitting out food) rather than a general category of behavior (such as not eating or being finicky); maximizing the conditions for a desirable alternative response and minimizing the conditions for the causes of the undesirable response; and selecting an effective punisher (i.e., one that can be delivered immediately and will not be associated with subsequent positive reinforcement).

■ HANDOUT MASTERS
  5.3 Reinforcement versus Punishment
  5.4 Schedules of Reinforcement
  5.6 Learning Self-Test
  5.7 Crossword Puzzle
  5.8 Fill in the Blank
Reinforcement vs. Punishment

Instructions. For each example presented below, identify whether positive reinforcement (PR), negative reinforcement (NR), or punishment (PUN) is illustrated by placing the appropriate abbreviation in the blank next to the item.

____ 1. Police pulling drivers over and giving prizes for buckling up
____ 2. Suspending a basketball player for committing a flagrant foul
____ 3. A soccer player rolls her eyes at a teammate who delivered a bad pass
____ 4. A child snaps her fingers until her teacher calls on her
____ 5. A hospital patient is allowed extra visiting time after eating a complete meal
____ 6. Receiving a city utility discount for participating in a recycling program
____ 7. Grounding a teenager until his or her homework is finished
____ 8. Scolding a child for playing in the street
____ 9. A prisoner loses TV privileges for one week for a rule violation
____ 10. A parent nagging a child to clean up her room
____ 11. A rat presses a lever to terminate a shock or a loud tone
____ 12. A professor gives extra credit to students with perfect attendance
____ 13. A dog is banished to his doghouse after soiling the living room carpet
____ 14. A defendant is harassed and tortured until he confesses
____ 15. A young child receives $5 for earning good grades in school
____ 16. A mother smiles when her child utters “Mama”
____ 17. A child is put into “time out” for misbehaving
____ 18. Employee of the month gets a reserved parking space
____ 19. At a party, a husband becomes sullen when his wife flirts with a colleague
____ 20. A woman watching a football game offers her child candy to play quietly
Schedules of Reinforcement

*Instructions.* Identify the reinforcement schedule illustrated in the following examples by placing the appropriate abbreviation in the blank next to the item. Use the following code:

<table>
<thead>
<tr>
<th></th>
<th>Fixed Ratio (FR)</th>
<th>Variable Ratio (VR)</th>
<th>Fixed Interval (FI)</th>
<th>Variable Interval (VI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Getting a paycheck every other week</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Pop quizzes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Slot machines at gambling casinos</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Calling the mechanic to find out if your car is fixed yet</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>A factory worker who is paid on piece work</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>Fly fishing: casting and reeling back several times before catching a fish</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>Looking at your watch during a lecture until the end of the lecture</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>A salesperson who gets paid on commission</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td>Calling a friend and getting a busy signal because he or she is frequently on the phone</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td>Signaling with your thumb while hitchhiking</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11.</td>
<td>Frequent flyer program: rewards after flying X amount of miles</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.</td>
<td>Collecting bottles, cans, or other recyclables for cash</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13.</td>
<td>An athlete’s contract specifies salary increases to be renegotiated every three years</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14.</td>
<td>Buying lottery tickets</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15.</td>
<td>A person refrains from drugs for fear of random drug testing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16.</td>
<td>Checking the refrigerator to see if the JELL-O is ready</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17.</td>
<td>Watching for shooting stars</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18.</td>
<td>Checking the mail, assuming the mail carrier comes at the same time every day</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19.</td>
<td>Playing Bingo</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20.</td>
<td>A worker receives $1 for every 100 envelopes stuffed and sealed</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Learning Self Test

For each situation below, indicate whether it is an example of:

A. classical conditioning  
B. operant conditioning  
C. insight  
D. observational learning

1. Susie is a four-year-old child. One day she watches her mother vacuum the living room. Her mother comments to Susie, “Doesn’t the living room look nice now that I’ve cleaned it?” The next day, her mother finds Susie “vacuuming” the living room with her toy vacuum.

2. You are thinking of asking the teacher for an extension on your paper. Just as you are about to go up to the teacher, another student approaches the teacher with the same request. The teacher appears angry, and very loudly and rudely turns down the student’s request for an extension. You decide not to ask for an extension.

3. Until she was eight, Barbara liked cats. When she was eight, she was bitten through the hand by a cat as she tried to get it out from under a bed. This was an upsetting experience. Since that time, Barbara experiences anxiety whenever she is near a cat.

4. Alison, age four, needs to learn to speak up louder in class. Her parents and teacher agree that whenever Alison speaks up loudly in class, she will get a star on her chart. Whenever she accumulates 25 stars, she will get to go to Baskin-Robbins for ice cream. Alison starts speaking up in class more frequently.

5. Scott, age six, has difficulty in reaching clothes hanging from the clothes bar in his closet because the clothes bar is too high. He figures out that if hangers simply had longer necks, he would be able to manage with the clothes bar at the current height. Working with his father, he creates a set of long-necked hangers and enters them in the “Invent America” contest at his school.

6. Tom is hammering nails into planks to build a fence. He experiments with holding the nail a different way and immediately hits his thumb with the hammer. OUCH! He continues his work, but he never holds the nail that way again.

7. It is summer time. Sarah and Jeremy are in love. They enjoy being together and are thoroughly relaxed and content in each other’s presence. The hit song that summer is “Buckets of Love” and they hear that song a lot when they are together. At the end of the summer, they have to return to their separate colleges, which are quite far apart. That fall, every time Sarah hears the tune “Buckets of Love,” she experiences the same feelings of relaxation and contentment that she felt when she was with Jeremy.

In the following examples, identify which is being used to control behavior:

A. positive reinforcement  
B. negative reinforcement  
C. punishment  
D. extinction

8. The smoke detector in Jesse’s house is low on batteries. It emits an annoying chirp every few seconds. Jesse installs a new battery so it will stop making that noise.

9. Dr. Smith, a Doe College instructor, is having difficulty getting students to turn in papers. Previously, he had not assigned credit for homework; rather, he had simply assumed that students would do it for the practice. Dr. Smith establishes a policy that all students who turn in papers will get full credit for their work. Students now turn in papers much more often.
10. Robert puts $0.85 in the Coke machine to buy his daily Coke. Today, nothing comes out, and he does not get his money back. Robert does not put any more money in the machine.

11. Jeff is playing with his food at the dinner table. His mother tells him to stop playing with his food. When he does not stop, she takes his food away, leaving Jeff hungry all night. Jeff never plays with his food again.

12. Jeff is playing with his food at the dinner table while his parents are trying to carry on an adult conversation. When his mother notices what Jeff is doing, she stops talking with her husband and directs her attention to Jeff. She yells at him to stop playing with his food, and says that playing with his food is a horrible and disgusting habit. Jeff plays with his food again several times during that meal, and even more frequently the next night.

13. Jeff is diligently working on an art project at school. His teacher notices how nicely he is working and praises him loudly for his efforts. Jeff immediately seems less interested working on his project. The teacher praises the little bits he completes as time goes on, and Jeff stops working on the art project entirely.

For each example given, identify the unconditioned stimulus (US), unconditioned response (UR), conditioned stimulus (CS) and conditioned response (CR):

14. Art goes to a meeting in New Orleans and tries some oysters at the oyster bar. He likes the taste and eats quite a few. Soon he becomes very ill with an upset stomach. Now, even the thought of oysters makes him nauseous.

<table>
<thead>
<tr>
<th>US</th>
<th>CS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

15. When Trudy was four, Trudy did not have any particular reaction to, or interest in, yardsticks. From the time she was five, until she was eight, Trudy’s parents beat her with a yardstick. Trudy was very upset every time she was beaten. Now Trudy becomes very upset every time she sees a yardstick.

<table>
<thead>
<tr>
<th>US</th>
<th>CS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
CHAPTER 5 LEARNING

Fill in the Blank Class Activity

1. Any relatively permanent change in behavior brought about by experience or practice is called _______________.

2. The Russian physiologist (person who studies the workings of the body) who discovered classical conditioning through his work on digestion in dogs was _______________ _______________.

3. _______________ is learning that makes a reflex response to a stimulus other than the original, natural stimulus that normally produces the reflex.

4. A(n) _______________ _______________ is a naturally-occurring stimulus that leads to an involuntary response.

5. A(n) _______________ _______________ is an involuntary response to a naturally-occurring or unconditioned stimulus.

6. A stimulus that becomes able to produce a learned reflex response by being paired with the original unconditioned stimulus is called a(n) _______________ _______________.

7. _______________ _______________ is the tendency to respond to a stimulus that is only similar to the original conditioned stimulus with the conditioned response.

8. _______________ _______________ the tendency to stop making a generalized response to a stimulus that is similar to the original conditioned stimulus because the similar stimulus is never paired with the unconditioned stimulus.

9. A(n) _______________ _______________ is any event or object which, when following a response, increases the likelihood of that response occurring again.

10. The reappearance of a learned response after extinction has occurred is called _______________ _______________.

11. Thorndike’s _______________ _______________ is a law stating that if a response is followed by a pleasurable consequence, it will tend to be repeated, and if followed by an unpleasant consequence, it will tend not to be repeated.

12. Any behavior that is voluntary is called _______________.

13. The reinforcement of a response by the addition or experiencing of a pleasurable stimulus is called _______________.

14. The reinforcement of a response by the removal, escape from, or avoidance of an unpleasant stimulus is called _______________.

15. The reinforcement of simple steps in a behavior that lead to a desired, more complex behavior is called _______________.

16. The reinforcement of each and every correct response is called _______________.

17. Any event or object that, when following a response, makes that response less likely to happen again is said to be _______________.

18. In a _______________ _______________ schedule of reinforcement, a certain number of responses are required before reinforcement is given.

19. In a _______________ _______________ schedule of reinforcement, a varying number of responses is required to obtain reinforcement.

20. In a _______________ _______________ schedule of reinforcement, at least one correct response must be made within a set interval of time to obtain reinforcement.

21. In a _______________ _______________ schedule of reinforcement, reinforcement follows a varying interval of time.

22. The use monitoring devices to provide precise information about internal physiological processes in order to teach people to gain voluntary control over these functions is called _______________.

23. Learning new behavior by watching a model perform that behavior is known as _______________.

Words to Use: biofeedback classical conditioning conditioned stimulus continuous reinforcement fixed interval fixed ratio Ivan Pavlov law of effect learned helplessness learning negative reinforcement observational learning operant positive reinforcement punishment reinforcer shaping spontaneous recovery stimulus discrimination stimulus generalization unconditioned response unconditioned stimulus variable interval variable ratio
Crossword Puzzle Activity

Chapter 5: Learning
Across

4. learning that remains hidden until its application becomes useful.
6. classical conditioning of a reflex response or emotion by watching the reaction of another person.
9. any event or object that, when following a response, decreases the likelihood of that response occurring again.
10. the use of feedback about biological conditions to bring involuntary responses such as blood pressure and relaxation under voluntary control.
11. the reinforcement of a response by the addition or experiencing of a pleasure stimulus.
13. the strengthening of a response that occurs when that response is followed by a pleasurable consequence.
14. any behavior that is voluntary.
15. any event or object that, when following a response, makes that response more likely to happen again.
16. the disappearance or weakening of a learned response.
17. stimulus that has no effect on the desired response.
18. type of behavior modification in which desired behavior is rewarded with tokens.

Down

1. the tendency to fail to act to escape from a situation because of a history of repeated failures in the past.
2. learning to make a reflex response to a stimulus other than the original, natural stimulus that normally produces the reflex.
3. the use of operant conditioning techniques to bring about desired changes in behavior.
5. the reinforcement of simple steps in behavior that lead to a desired, more complex behavior.
7. learned reflex response to a conditioned stimulus.
8. the sudden perception of relationships among various parts of a problem, allowing the solution to the problem to come quickly.
12. the reinforcement of each and every correct response.
5.3 ANSWERS

1. PR 6. PR 11. NR 16. PR
2. PUN 7. NR 12. PR 17. PUN
3. PUN 8. PUN 13. PUN 18. PR
5. PR 10. NR 15. PR 20. PR

5.4 ANSWERS

1. FI 6. VR 11. FR 16. FI
2. VI 7. FI 12. FR 17. VI
3. VR 8. FR 13. FI 18. FI

5.6 ANSWERS

Questions 1–13:
1- d, 2- d, 3- a, 4-b, 5-c, 6-b, 7-a, 8-b, 9-a, 10-d, 11-c, 12-a, 13-c

Questions 14–15:
14. US= eating oysters CS= thinking of oysters
   UR= nausea CR= nausea
15. US= beating CS= yardstick
   UR= upset CR= upset

5.7 ANSWERS

Across
4. learning that remains hidden until its application becomes useful. Latent
6. classical conditioning of a reflex response or emotion by watching the reaction of another person. Vicarious
9. any event or object that, when following a response, decreases the likelihood of that response occurring again. Punishment
10. the use of feedback about biological conditions to bring involuntary responses such as blood pressure and relaxation under voluntary control. Biofeedback
11. the reinforcement of a response by the addition or experiencing of a pleasure stimulus. Positive
13. the strengthening of a response that occurs when that response is followed by a pleasurable consequence. Reinforcement
14. any behavior that is voluntary. Operant
15. any event or object that, when following a response, makes that response more likely to happen again. Reinforcer
16. the disappearance or weakening of a learned response. Extinction
17. stimulus that has no effect on the desired response. Neutral
18. type of behavior modification in which desired behavior is rewarded with tokens. Token Economy
Down
1. the tendency to fail to act to escape from a situation because of a history of repeated failures in the past. Learned Helplessness
2. learning to make a reflex response to a stimulus other than the original, natural stimulus that normally produces the reflex. Classical
3. the use of operant conditioning techniques to bring about desired changes in behavior. Behavior Modification
5. the reinforcement of simple steps in behavior that lead to a desired, more complex behavior. Shaping
7. learned reflex response to a conditioned stimulus. Conditioned Response
8. the sudden perception of relationships among various parts of a problem, allowing the solution to the problem to come quickly. Insight
12. the reinforcement of each and every correct response. Continuous

5.8 ANSWERS – fill in the blank

1. Learning
2. Ivan Pavlov
3. Classical conditioning
4. Unconditioned Stimulus
5. Unconditioned Response
6. Conditioned Stimulus
7. Stimulus generalization
8. Stimulus discrimination
9. Reinforcer
10. Spontaneous recovery
11. Law of Effect
12. Operant
13. Positive reinforcement
14. Negative reinforcement
15. Shaping
16. Continuous reinforcement
17. Punishment
18. Fixed ratio
19. Variable ratio
20. Fixed interval
21. Variable interval
22. Biofeedback
24. Observational learning