

introduction to

human behavior

edited by
Linda Levine

s e c o n d e d i t i o n

Introduction to Human Behavior

Second Edition

**edited by
Linda Levine**



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Chapter 5: Basic Principles of Learning
*from **Psychology***
by Stephen F. Davis and
Joseph J. Palladino

BASIC PRINCIPLES OF LEARNING

CHAPTER 5

Chapter Outline

What Is Learning?

Classical Conditioning

Pavlov and the Elements of Classical Conditioning

Phobias

John Watson, Little Albert, and the Ethics of Research

Pleasant Unconditioned Stimuli

Other Aspects of Classical Conditioning

New Directions in Classical Conditioning

Taste-Aversion Learning and Preparedness

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Operant Conditioning

Reinforcers

B. F. Skinner and the "Skinner Box"

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Schedules of Reinforcement

The Role of Cognition

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Extinction

The Partial-Reinforcement Effect

Operant Conditioning and Stimulus Control

Observational Learning

Behavior Modification

The previous chapters examined the physical structures and processes we use to interact with our environment. Some responses to environmental stimuli, such as reflexively blinking in response to a puff of air, are very short-lived and may be forgotten almost as soon as they occur. In other instances it is important to remember the consequences of our interactions with our environment. For example, we need to remember the painful consequences of touching a hot stove. Similarly, once a field rat has found a way into a farmer's corn crib it is important for the rat to remember how to return to this food source on later occasions. These longer-lasting effects of interactions with the environment are the subject of the next two chapters. They are what we mean when we speak of learning. (In this chapter we discuss basic forms of learning; more complex forms of human learning and memory are discussed in the next chapter.)

WHAT IS LEARNING?

If you grew up in a small town, driving in big-city traffic can be a terrifying experience. The fast pace and large number of vehicles may be overwhelming at first; cars to your left, cars to your right, and not much sanity in sight! After several months of driving to and from work in the rush-hour traffic of Chicago, Belinda has become a real pro at driving in city traffic.

Why should Belinda's improved driving ability be considered an example of learning?

• learning

Relatively permanent change in behavior that occurs as a result of experience.

Most psychologists define **learning** as a relatively permanent change in behavior potential that occurs as a result of experience. This definition distinguishes learned responses from behaviors that occur automatically in response to external events, such as shivering in a cold wind. Including experience in our definition allows us to distinguish learned behaviors from those that occur as a result of the development of our physical capabilities—that is, *maturation*. For example, when you were 2 years old you could not lift a 5-pound weight, but by the time you were 10 years old this was an easy task because your muscles had developed.

To return to our earlier question, why should Belinda's improved driving ability be considered an example of learning? Unless Belinda was very young at the time she was exposed to big-city driving, we can rule out maturation as a cause for the change in her behavior. Likewise, the change in Belinda's driving behavior was not an automatic response, like shivering in a cold wind. Rather, the experience of driving in the city has brought about a change in her behavior; she has learned.

In Chapter 3 we discussed how psychologists study color vision in animals like Ruby the elephant. Ruby's painting also provides us with a good example of learning. Initially, the sound of the word *paint* had no meaning, and Ruby made no response to it. After the word was associated or paired with one of her favorite activities, Ruby began to squeal when her trainer said "paint." Ruby had learned that this word signaled the opportunity to engage in an enjoyable activity. The elephant's response is an example of a relatively permanent change in behavior that occurs as a result of experience; she has learned.

Two basic types of learning, *classical conditioning* (or training) and *operant*, or *instrumental, conditioning* (or training) are discussed in this section and the next one. Later in the chapter we encounter a third basic type of learning, observational learning. The word *conditioning* refers to the fact that the learner is “conditioned”—the learner forms an association, usually between a stimulus and a response or between two stimuli. Note that classical and operant conditioning are *basic*, not *simple*. As you will see, recent research has shown that these forms of learning are far from simple.

CLASSICAL CONDITIONING

Your psychology class is participating in an unusual demonstration of learning. First the instructor passes a can of powdered lemonade mix around the room; each student puts a spoonful on a sheet of paper. Then the students are instructed to wet a finger. When the instructor says the word “now,” each student puts a small amount of lemonade powder on his or her tongue with the moistened finger. The effect of putting lemonade powder on the tongue is predictable: The mouth puckers and saliva begins to flow. The instructor repeats this procedure several times during the class period until all the lemonade powder is gone. A bit later the instructor says “now.” The students’ mouths pucker and saliva flows.

■■■ What is the purpose of this demonstration?

Classical conditioning has become so closely associated with the Russian scientist Ivan Pavlov (1849–1936) that it is often called Pavlovian conditioning. Although much of Pavlov’s research used dogs as subjects, examples of classical conditioning can be found in many aspects of everyday life. **Classical conditioning** is a form of learning that occurs when two stimuli that are “paired”—presented together—become associated with each other. Thus, after the word *paint* was paired with a pleasurable activity, Ruby associated it with that activity. Similarly, the sight of the golden arches at McDonald’s and the taste of a juicy burger have occurred together, and as a result many people associate the golden arches with tasty fast food.

• **classical conditioning**

Learning that occurs when two stimuli, a conditioned stimulus and an unconditioned stimulus, are paired and become associated with each other.

Pavlov and the Elements of Classical Conditioning

As noted earlier, the procedure for establishing classical conditioning is to present two events (called *stimuli*) to a subject. We hope that the pairing of these two events causes our subject to make an association between them. At the start of conditioning, the first event, which in a laboratory setting may be the presentation of a light or tone, is neutral with regard to the response to be established. When this **neutral stimulus (NS)** is presented, the subject may notice that it is there, but it does not cause any particular reaction. However, by presenting the second event, called an **unconditioned stimulus (US)**, after the first event, we transform the

• **neutral stimulus (NS)**

Stimulus that, before conditioning, does not elicit a particular response.

• **unconditioned stimulus (US)**

Event that automatically produces an unconditioned response without any previous training.

* **conditioned stimulus (CS)**

Neutral stimulus that acquires the ability to elicit a conditioned response after being paired with an unconditioned stimulus.

* **unconditioned response (UR)**

Reaction that is automatically produced when an unconditioned stimulus is presented.

* **conditioned response (CR)**

Response elicited by a conditioned stimulus that has been paired with an unconditioned stimulus. It is similar to the unconditioned response.

The sights and sounds of a favorite restaurant may become conditioned stimuli (CSs).



NS into a **conditioned stimulus (CS)**. The NS becomes a CS because it is paired with a US. This pairing causes the subject to establish an association between the two events.

As the term suggests, the US automatically produces a reaction; you do not have to be trained to react to it. The US never fails to produce the same reaction. Food in your mouth causes you to salivate; touching a hot stove causes you to jerk your hand away. In psychological terms, the US *elicits*, or calls forth, a response. The reaction that is elicited by the US is called the **unconditioned response (UR)**. If you have a feeling that we have already discussed this type of response, you are correct. These URs are reflexes, just like those we described in Chapter 2. You do not have to learn a UR. For example, you do not learn to feel the pain that you experience when you touch a hot stove; you feel it automatically. It is a built-in response.

When a subject associates the NS (for example, a light or tone) with the US, the NS is transformed into a CS that can elicit a response similar to the UR. The response elicited by the CS is known as the **conditioned response (CR)**. When the CS elicits the CR, we say that classical conditioning has occurred. Pavlov (1927) used food as the US in his pioneering studies. While a metronome was ticking (CS), he placed a small amount of meat powder (US) into a hungry dog's mouth. The meat powder caused the dog to begin salivating (UR). Later, when just the tone was presented, the dog salivated (CR). Pavlov is shown with one of his subjects in Figure 5-1.

Recall the demonstration with lemonade powder described at the beginning of this section. What was its purpose? The demonstration associating lemonade powder with the word *now* (Cogan & Cogan, 1984) is an easy way to experience classical conditioning at first hand. To understand why, complete the following sentence:

The CS, _____,
paired with the US, _____,
results in the UR, _____.

The CS is the word *now*. The lemonade powder is the US; it automatically elicits the *unconditioned* response (UR) of puckering and salivating. After the word *now* has been paired with the lemonade powder several times, it elicits the *conditioned* response (CR) of puckering and salivating.

Let's put these elements together in another example. Suppose that your younger brother is just tall enough to reach a hot skillet on top of the stove. He grabs it and immediately drops it. His pain is obvious, and you try to comfort him. Finally his tears stop and you put the incident out of your mind. Three days later, however, the same skillet is again on the stove. Your brother enters the kitchen, sees the skillet, and begins to cry. Clearly, the skillet has taken on a new meaning for him.



FIGURE 5-1 Ivan Pavlov (1849–1936), a Russian physiologist, was awarded the Nobel Prize in 1904 for his research on the digestive system. Here Pavlov (seated, back to the camera) is shown in his laboratory studying classical conditioning in a dog.

In classical conditioning terms, initially the skillet was an NS; after conditioning, it became the CS. The intense heat was the US, which always elicits pain and an avoidance response. Those responses—the pain and jerking your hand away or dropping the skillet—constituted the UR. Remember, the classical conditioning sequence involves first presenting the NS and then following it with the US. If these two events are associated, the NS becomes a CS that signals that the US is on its way. After a conditioning experience of this type, when the CS is encountered *alone* it produces a response, the CR, that is very similar to the UR. In our example, the sight of the skillet reminds your brother of the pain he experienced. The classical conditioning sequence is presented in diagrammatic form in Figure 5-2.

We encourage you to think of your own examples of classical conditioning. You probably will find it easiest to start with the US, then decide what the UR is, and finally determine what CSs might readily occur in the presence of the US. When someone mentions your favorite food, does your mouth begin to water? The food you enjoy is the US. What is the UR? the CS? the CR? List those items and then read the following section, in which you meet Scott, who is intensely afraid of snakes and anything related to them. After you finish reading about Scott, list the elements of classical conditioning that were involved in the development of his fear. (The answers for these two examples appear at the end of the chapter.)

CRITICAL INQUIRY

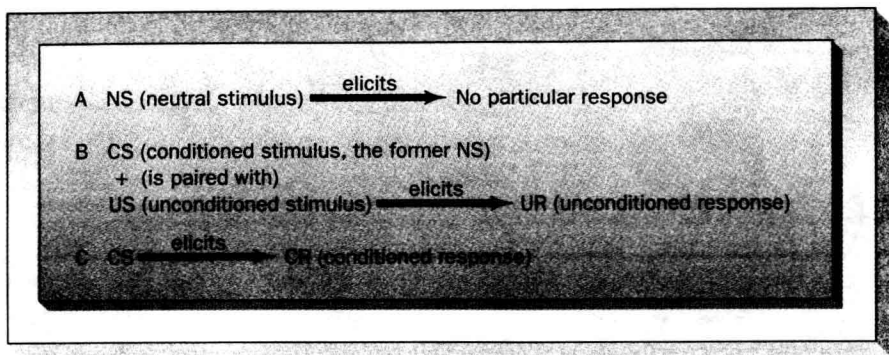


FIGURE 5-2 Using our symbols, we can describe classical conditioning in the following manner: (A) The NS originally does not elicit a specific response. (B) An NS (now called the CS) is presented just before the US. The US automatically elicits a UR. (C) Later, when the CS is presented by itself, a CR, which is similar to the UR, occurs. In short, a new response, the CR, has been conditioned to the CS because it has been paired with the US.

CONDITION YOUR FRIENDS

The ease by which classical conditioning is demonstrated in class can be duplicated in real life. This exercise was developed by Mark Vernoy (1987) and rests on the premise that most of us have been conditioned to flinch when we see someone stick a balloon with a pin. (The pin is the CS, the bang is the US, and the startle response is the UR.) "In this way we have learned that needles always pop balloons" (Vernoy, 1987, p. 177). By using the following procedure you may be able to surprise your friends and observe classical conditioning at the same time.

According to Vernoy (1987), "The equipment needed for this demonstration includes about 20 to 30 good quality, round balloons and a needle. Any sharp sewing needle will do, but for dramatic effect I use a foot-long needle that I borrow from a colleague who is an amateur magician. You can acquire these needles at any good magic shop" (p. 177). The procedure is simple. Start by blowing up several balloons; 15 or 20 should be sufficient. Then have your friends pop five or six of them with the needle you provide. Next, you should use the needle to pop five or six more balloons. Once you have popped several, stick the needle into an area of the balloon where there is less tension (such as the nipple or around the knot). Because there is less tension at these points, the rubber is relatively thick and the balloon does not pop when it is stuck. However, your friends still flinch. Why? This reaction occurs because they have been conditioned to expect a loud bang. If you are using a foot-long needle, you can make the effect even more dramatic by passing the needle completely through the balloon (enter at the nipple and exit at the knot).



Phobias

When Scott was 3 years old he was bitten by a poisonous snake and nearly died. Ever since that time he has avoided snakes. Now, 30 years later, he is still deathly afraid of snakes and anything that reminds him of them. Seeing a picture of a snake or a piece of rope, or even hearing the word *snake*, makes him break out in a cold sweat. If you did not know Scott's background, his intense fear of snakes and related items

might seem rather strange. You may not fear snakes to the same degree as Scott, but the chances are good that you are afraid of some objects or situations that most other people do not fear. How do we acquire these apparently unrealistic, irrational fears?

Many of our fears and anxieties may have been classically conditioned, as in the case of Scott's fear of snakes. Scott has a condition known as a phobia; more specifically, he is suffering from *ophidiophobia* (*ophidio* = "snake"; *phobos* = "fear"). A **phobia** is an irrational fear of an object, situation, or activity that is out of proportion to the actual danger it poses. Because phobias involve sufficient anxiety to interfere significantly with normal functioning, they are classified as anxiety disorders (see Chapter 14).

We frequently hear about people who have *claustrophobia*, an intense fear of enclosed places. In some cases this phobia developed because the individual was locked in an abandoned refrigerator (US) as a child and nearly died from suffocation (UR). Now the person fears anything that remotely resembles a closed space (CS)—elevators, small cars, small rooms, and so forth.

As you might expect, phobias can interfere with one's daily activities. For example, a business executive suffering from claustrophobia would not do very well in New York City, where meetings are frequently held on the top floors of tall buildings. Climbing the stairs to avoid the elevator could be time consuming and very tiring. Psychologists have developed a procedure, known as *systematic desensitization*, to help eliminate phobias. Basically, systematic desensitization involves classically conditioning a desired response, relaxation, to the phobic stimuli. Thus, the claustrophobic person is conditioned to relax in enclosed spaces. We have more to say about systematic desensitization in Chapter 15.

• **phobia**

Irrational fear of an activity, object, or situation that is out of proportion to the actual danger.

John Watson, Little Albert, and the Ethics of Research

In 1913 John B. Watson proclaimed that psychologists should study only directly observable behaviors. As noted in Chapter 1, Watson's view was called *behaviorism*, and his followers were called *behaviorists*. The main business of psychology, according to the behaviorists, was the study of behaviors such as jogging in the park, leaving the scene of an accident, running through an airport so as not to miss a plane, and even expressing emotion. Anything having to do with thinking, feeling, or consciousness was not an appropriate subject of psychological study because those processes could not be observed directly.

What the behaviorists were interested in was discovering which stimuli elicit which responses (observable behaviors). In an experiment that applied this approach to human emotions, Watson and his assistant, Rosalie Rayner, classically conditioned a 9-month-old infant, "Little Albert," to fear a white rat (Watson & Rayner, 1920). Initially Albert showed no fear of the rat and even allowed it to crawl on him. While he was playing with the rat, Watson hit a large steel rod with a heavy hammer, making a sudden, deafening noise. Not surprisingly, Albert was startled and scared. Each time the loud noise was paired with the presence of the rat, Albert cried in fear. After numerous pairings of the two

stimuli, he started crying at the sight of the rat, even when there was no noise, and he eventually came to fear any object that resembled a rat, such as the white whiskers on a Santa Claus mask. Just as Scott developed a fear of snakes and things that reminded him of snakes, Albert developed a phobia for rats and ratlike objects.

Let's analyze the elements of Little Albert's fear. What US was used? What was the UR? What were the CS and the CR? While you think about these questions, do not forget that the rat was also exposed to a frightening situation. Many people have wondered what became of Little Albert, but one could also wonder what became of the rat. It is entirely possible that the unfortunate animal developed an intense fear of people!

For both Little Albert and the rat, the US was the loud noise. The UR was being startled and scared. For Albert, the CS was the rat; for the rat, the CS was Albert. The CR for both of them was fear of an object that signaled that a loud noise might follow. These relationships are diagrammed in Figure 5-3.

CRITICAL INQUIRY

Although Watson's study is important because it was one of the first experiments to show that an emotional reaction, such as fear, could be classically conditioned, it raises some questions about the ethics of psychological research (see Chapter 1). Was it acceptable for Watson purposely to frighten Little Albert so intensely? Would you allow such an experiment to be conducted with your child? Would such a procedure be acceptable if the child's parents authorized it? Write down your responses and the reasons for them before reading further.

Ethical Principles of Psychologists and Code of Conduct, a manual published by the American Psychological Association, would probably say no to all of the preceding questions (American Psychological Association, 1992). If John Watson were conducting his research with Little Albert in the 1990s, he would have difficulty meeting the ethical standards you read about in Chapter 1.

Pleasant Unconditioned Stimuli

Up to this point we have focused on USs that produce disagreeable or unpleasant effects. Thankfully, the US does not have to be a painful event like heat, electric shock, or hitting your finger with a hammer (Capaldi & Sheffer, 1992; Owens, Capaldi, & Sheffer, 1993). A bite of your favorite food when you are hungry automatically causes you to salivate. Food in your mouth is the US; salivation is the UR.

Obviously, psychologists do not hide in restaurants to present a tone while you are eating, nor do many instructors bring lemonade powder to class with them. Yet people become classically conditioned in much the same way that Pavlov's dogs did. For example, the sights and sounds that accompany our meals can become CSs. For many people the unique decor of a restaurant or even a menu may act as a CS. Have you ever found yourself salivating as you looked at the tempting pictures on a menu or browsed up and down the aisles of a grocery store?

Examples of classical conditioning of pleasant CRs abound in everyday life. Is there a particular song (CS) that prompts you to recall (CR)

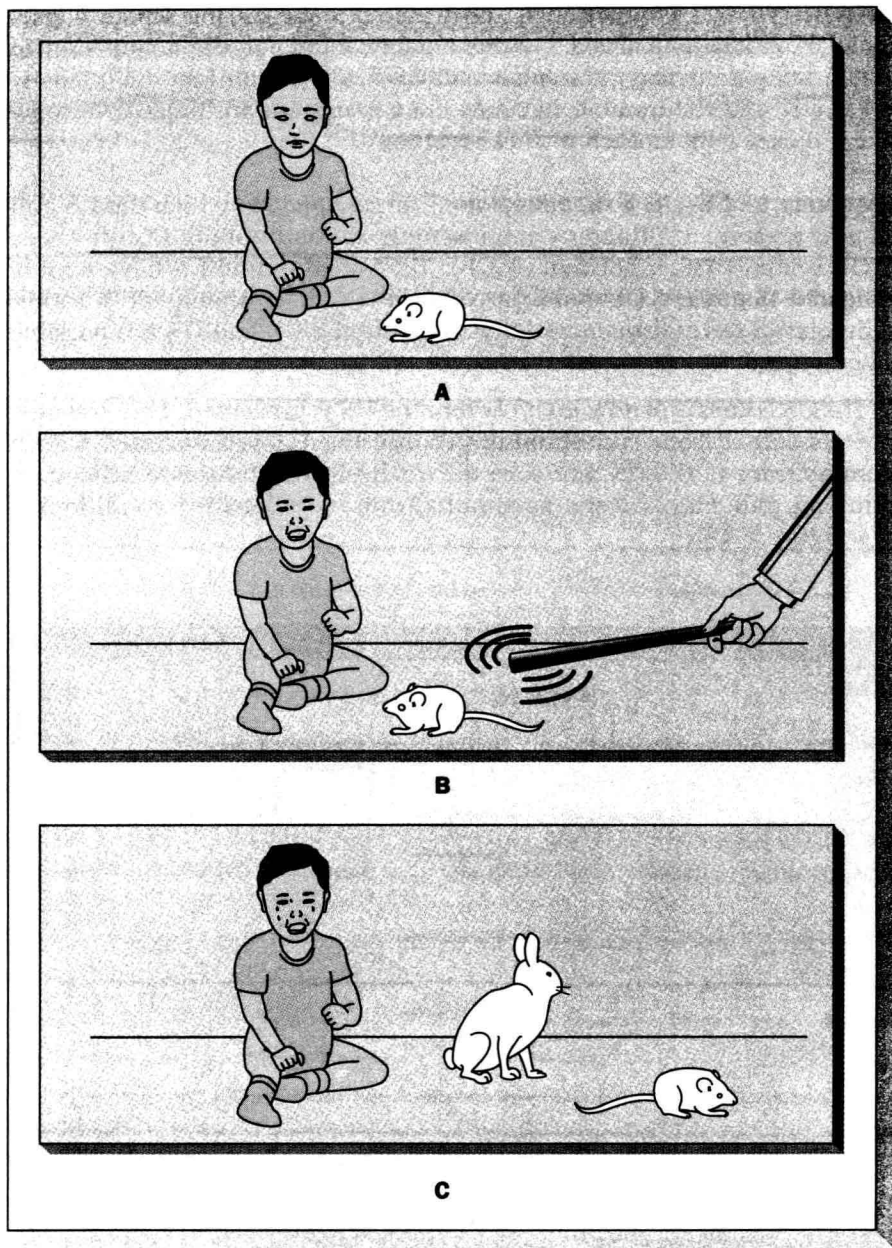


FIGURE 5-3 Conditioning Little Albert to fear a white rat. (A) Originally Little Albert had no fear of the white rat (the NS for Albert); the rat had no fear of Little Albert (the NS for the rat). (B) While Little Albert is playing with the rat, John Watson strikes a steel bar. The loud noise (US) elicits a startle and fear response (UR). The white rat (now the CS) is associated with the loud noise for Little Albert. Little Albert (now the CS) is associated with the loud noise for the rat. (C) Later, the white rat elicits fearfulness in Little Albert. Other objects, such as a rabbit and a Santa Claus mask, which are similar to the white rat, now elicit fear in Little Albert. Little Albert elicits fear in the rat.

a happy moment? Do you know someone who purchases only cars of a certain color because that color is associated with a favorite car?

Other Aspects of Classical Conditioning

Pavlov's research revealed several additional characteristics of classical conditioning besides those discussed so far. These findings fall into two categories: acquisition, or how we acquire CRs, and extinction, or how we eliminate those responses.