Chapter III

LEARNING AND CONDITIONING

The area of psychology concerned with learning has produced a rather well-defined body of literature explaining the process underlying how animals and humans learn. Some of the most famous names in the history of psychology have made their most influential discoveries in this field—names that are easily recognized by those both inside and outside the behavioral sciences, such as Pavlov, Watson, Skinner, and Bandura. Picking a few of the most significant studies from this branch of psychology and from these researchers is no easy task, but the articles selected here can be found in nearly every introductory psychology textbook and are representative of the enormous contributions of these scientists.

For Ivan Pavlov, we take a journey back to the early 1900s to review his work with dogs, metronomes, bells, salivation, and the discovery of the *conditioned reflex*. Second, John Watson, known for many contributions, is probably most famous (notorious?) for his 1920 ethically challenged experiment with Little Albert, which demonstrated for the first time how emotions could be shown to be a product of the environment rather than purely internal processes. For the third study in this section, we discuss B. F. Skinner's famous demonstration of superstitious behavior in a pigeon and his explanation for how humans become superstitious in exactly the same way. Fourth, we examine the well-known "Bobo Doll Study," in which Albert Bandura established that aggressive behaviors could be learned by children through their modeling of adult violence.

Reading 9: IT'S NOT JUST ABOUT SALIVATING DOGS!

Pavlov, I. P. (1927). *Conditioned reflexes*. London: Oxford University Press.

Have you ever walked into a dentist's office where the odor of the disinfectant made your teeth hurt? If you have, it was probably because the odor triggered an association that had been conditioned in your brain between that smell and your past experiences at the dentist. When you hear "The Star Spangled Banner" played at the Olympic Games, does your heart beat a little faster? That happens to most Americans. Does the same thing happen when you hear the Italian national anthem? Unless you were raised in Italy, most likely it does not, because you have been conditioned to respond to one anthem but not to the other. And why do some people squint and become nervous if you inflate a balloon near them? It is because they have learned to associate the expanding balloon with something fearful (such as a loud *pop!*). These are just a few of countless human behaviors that exist because of a process known as *classical conditioning*.

The classical conditioning theory of learning was developed and articulated nearly a hundred years ago in Russia by one of the most familiar names in the history of psychology, Ivan Petrovich Pavlov (1849–1946). Unlike most of the research presented in this book, Pavlov's name and his basic ideas of learning by association are widely recognized in popular culture (even a Rolling Stones song from the 1970s contained the line "I salivate like a Pavlov dog"). However, how Pavlov came to make his landmark discoveries and the true significance of his work are not so widely understood.

Although Pavlov's contributions to psychology were among of the most important ever made, technically he was not a psychologist at all but, rather, a prominent Russian physiologist studying digestive processes. In 1904, his research on digestion earned him the Nobel Prize for science. Yet the discoveries that dramatically changed his career, and the history of psychology, began virtually by accident. In the late 1800s, psychology was a very young field of scientific study and was considered by many to be something less than a true science. Therefore, Pavlov's decision to make such a radical turn from the more solid and respected science of physiology to the fledgling study of psychology was a risky career move. He wrote about this dilemma facing a physiologist in the early 1900s whose work might turn to studying the brain and behavior:

> It is logical that in its analysis of the various activities of living matter, physiology should base itself on the more advanced and more exact sciences, physics and chemistry. But if we attempt an approach from this science of psychology . . . we shall be building our superstructure on a science that has no claim to exactness . . . . In fact, it is still open to discussion whether psychology is a natural science, or whether it can be regarded as a science at all. (p. 3)

Looking back on Pavlov's discoveries, it was fortunate for the advancement of psychological science and for our understanding of human behavior that he took the risk and made the change.

Pavlov's physiological research involved the use of dogs as subjects for studying the role of salivation on digestion. He or his assistants would introduce various types of food or nonfood substances into a dog's mouth and observe the rate and amount of salivation. To measure salivation scientifically, minor surgery was performed on the dogs so that a salivary duct was redirected through an incision in the dog's cheek and connected to a tube that would collect the saliva. Throughout this research, Pavlov made many new and fascinating discoveries. For example, he found that when a dog received moist food, only a small amount of saliva would be produced, compared with a heavy flow when dry food was presented. The production of saliva under these varying conditions was regarded by Pavlov as a reflex, that is, a response that occurs *automatically* to a specific stimulus without the need for any learning. If you think about it, salivation is purely reflexive for humans, too. Suppose I ask you, as you read this sentence, to salivate as heavily as you can. You cannot do it. But if you are hungry and find yourself sitting in front of your favorite food, you will salivate whether you want to or not.

As Pavlov continued his research, he began to notice strange events that were totally unexpected. The dogs began to salivate *before* any food reached their mouths and even before the odor of food was present. After a while, the dogs were salivating at times when no salivary stimulus was present at all. Somehow, the reflexive action of the salivary glands had been altered through the animals' experience in the lab: "Even the vessel from which the food has been given is sufficient to evoke an alimentary reflex [of salivation] complete in all its details; and, further, the secretion may be provoked even by the sight of the person who has brought the vessel, or by the sound of his footsteps" (p. 13).

This was the crossroads for Pavlov. He had observed digestive responses occurring to stimuli seemingly unrelated to digestion, and pure physiology could not provide an explanation for this. The answer had to be found in *psychology*.

THEORETICAL PROPOSITIONS

Pavlov theorized that the dogs had learned from experience in the lab to expect food following the appearance of certain signals. Although these *signal stimuli* do not naturally produce salivation, the dogs came to associate them with food, and thus responded to them with salivation. Consequently, Pavlov determined two kinds of reflexes must exist.

Unconditioned reflexes are inborn and automatic, require no learning, and are generally the same for all members of a species. Salivating when food enters the mouth, jumping at the sound of a loud noise, and the dilation of your pupils in low light are examples of unconditioned reflexes. *Conditioned reflexes*, on the other hand, are acquired through experience or learning and may vary a great deal among individual members of a species. A dog salivating at the sound of footsteps, or you feeling pain in your teeth when you smell dental disinfectant, are conditioned reflexes.

Unconditioned reflexes are formed by an *unconditioned stimulus* (UCS) producing an *unconditioned response* (UCR). In Pavlov's studies, the UCS was food and the UCR was salivation. *Conditioned reflexes* consist of a *conditioned stimulus* (CS), such as the footsteps, producing a *conditioned response* (CR), salivation. You will notice that the response in both these examples is salivation, but when the salivation results from hearing footsteps, it is the *learning*, and not the dog's natural tendencies, that produced it.

Pavlov wanted to answer this question: Conditioned reflexes are not inborn, so exactly how are they acquired? He proposed that if a particular stimulus in the dog's environment was often present when the dog was fed, this stimulus would become associated in the dog's brain with food; it would signal the approaching food. Prior to being paired with the food, the environmental stimulus did not produce any important response. In other words, to the dogs, it was a *neutral stimulus* (NS). When the dogs first arrived at the lab, the assistant's footsteps might have produced a response of curiosity (Pavlov called it the "What is it?" response), but hearing the footsteps certainly would not have caused the dogs to salivate. The footsteps, then, were a neutral stimulus. However, over time, as the dogs heard the same footsteps just prior to being fed every day, they would begin to associate the sound with food. Eventually, according to the theory, the footsteps alone would cause the dogs to salivate. Pavlov proposed that the process by which a neutral stimulus becomes a conditioned stimulus could be diagrammed as follows:

Step 1			UCS (food)	⟶	UCR (salivation)
Step 2	NS (footsteps)	+ +	UCS (food)	⟶	UCR (salivation)
Step 3	(Repeat step 2 several times)				
Step 4			CS (footsteps)	⟶	CR (salivation)

Now that he had a theory to explain his observations, Pavlov began a series of experiments to prove that it was correct. It is commonly believed that Pavlov conditioned dogs to salivate at the sound of a bell, which was true of his later studies. But as you will see, his early experiments involved a metronome.

METHOD AND RESULTS

Pavlov was able to build a special laboratory at the Institute of Experimental Medicine in Petrograd (which became Leningrad following Lenin's death and has now returned to its original name of St. Petersburg) with funds donated by a philanthropic businessman from Moscow. This soundproof lab allowed for complete isolation of the subjects from the experimenters and from all extraneous stimuli during the experimental procedures. Therefore, a specific stimulus could be administered and responses could be recorded without any direct contact between the experimenters and the animals.

After Pavlov had established this controlled research environment, the procedure was quite simple. Pavlov chose food as the unconditioned stimulus. As explained previously, food will elicit the unconditioned response of salivation. Then Pavlov needed to find a neutral stimulus that was, for the dogs, completely unrelated to food. For this he used the sound of the metronome. Over several conditioning trials, the dog was exposed to the ticking of the metronome and then was immediately presented with food. "A stimulus which was neutral of itself had been superimposed upon the action of the inborn alimentary reflex. We observed that, after several repetitions of the combined stimulation, the sounds of the metronome had acquired the property of stimulating salivary secretion" (p. 26). In other words, the metronome had become a conditioned stimulus for the conditioned response of salivation.

Pavlov and his associates elaborated on this preliminary finding by using different unconditioned and neutral stimuli. For example, they presented the odor of vanilla (NS) to the subjects prior to placing a lemon juice-like solution in the dog's mouth (the UCS). The juice caused heavy salivation (UCR). After 20 repetitions of the pairing, the vanilla alone produced salivation. For a visual test, the dogs were exposed to an object that began to rotate just prior to the presentation of food. After only 5 pairings, the rotating object by itself (CS) caused the dogs to salivate (CR).

The importance and application of Pavlov's work extends far beyond salivating dogs. His theories of classical conditioning explained a major portion of human behavior and helped to launch psychology as a true science.

SIGNIFICANCE OF THE FINDINGS

The theory of classical conditioning (also called Pavlovian conditioning) is universally accepted and has remained virtually unchanged since its conception through Pavlov's work. It is used to explain and interpret a wide range of human behavior, including where phobias come from, why you dislike certain foods, the source of your emotions, how advertising works, why you feel anxiety before a job interview or an exam, and what arouses you sexually. Several later studies dealing with some of these applications are discussed here.

Classical conditioning focuses on reflexive behavior: those behaviors that are not under your voluntary control. Any reflex can be conditioned to occur to a previously neutral stimulus. You can be classically conditioned so that your left eye blinks when you hear a doorbell, your heart rate increases at the sight of a flashing blue light, or you experience sexual arousal when you eat strawberries. The doorbell, blue light, and strawberries were all neutral in relation to the conditioned responses until they somehow became associated with unconditioned stimuli for eye blinking (e.g., a puff of air into the eye), heart rate increase (e.g., a sudden loud noise), and sexual arousal (e.g., romantic caresses).

To experience firsthand the process of classical conditioning, here is an experiment you can perform on yourself. All you will need is a bell, a mirror, and, to serve as your temporary laboratory, a room that becomes completely dark when the light is switched off. The pupils of your eyes dilate and constrict reflexively according to changes in light intensity. You have no voluntary control over this, and you did not have to learn how to do it. If I say to you "Please dilate your pupils now," you would be unable to do so. However, when you walk into a dark theater, they dilate immediately. Therefore, a decrease in light would be considered an unconditioned stimulus for pupil dilation, the unconditioned response. In your temporary lab, ring the bell and, immediately after, turn off the light. Wait in the total darkness about 15 seconds and turn the light back on.

Wait another 15 seconds and repeat the procedure: bell . . . light off . . . wait 15 seconds . . . light on . . . . Repeat this pairing of the neutral stimulus (the bell) with the unconditioned stimulus (the darkness) 10 to 20 times, making sure that the bell *only* rings just prior to the sudden darkness. Now, with the lights on, watch your eyes closely in the mirror and ring the bell. You will see your pupils dilate slightly even though there is no change in light! The bell has become the conditioned stimulus and pupil dilation the conditioned response.

RELATED RESEARCH AND RECENT APPLICATIONS

Two other studies presented in this book rest directly on Pavlov's theory of classical conditioning. In the next article, John B. Watson conditioned 11-month-old Little Albert to fear a white rat (and other furry things) by employing the same principles Pavlov used to condition salivation in dogs. By doing so, Watson demonstrated how emotions, such as fear, are formed. Later, Joseph Wolpe (see Chapter IX on psychotherapy) developed a therapeutic technique for treating intense fears (phobias) by applying the concepts of classical conditioning. His work was based on the idea that the association between the conditioned stimulus and the unconditioned stimulus must be broken in order to reduce the fearful response.

This line of research on classical conditioning and phobias continues to the present. For example, studies have found that children whose parents have phobias may develop the same phobias to objects such as snakes and spiders through "vicarious" conditioning from mom and dad without any direct exposure to the feared object (Fredrikson, Annas, & Wik, 1997). The countless applications of Pavlov's theory in the psychological and medical literature are far too numerous to summarize in any detail here. Instead, a few additional examples of the more notable findings are discussed.

A common problem that plagues ranchers around the world is that of predatory animals, usually wolves and coyotes, killing and eating their livestock. In the early 1970s, studies were conducted that attempted to apply Pavlovian conditioning techniques to solve the problem of the killing of sheep by coyotes and wolves without the need for killing the predators (see Gustafson et al., 1974). Wolves and coyotes were given pieces of mutton (meat from sheep) containing small amounts of lithium chloride (UCS), a chemical that if ingested, makes an animal sick. When the animals ate the meat, they became dizzy, with severe nausea and vomiting (UCR). After recovering, these same hungry predators were placed in a pen with live sheep. The wolves and coyotes began to attack the sheep (CS), but as soon as they smelled their prey, they stopped and stayed as far away from the sheep as possible. When the gate to the pen was opened, the wolves and coyotes actually ran away from the sheep! Based on this and other related research, ranchers commonly use this method of classical conditioning to keep wolves and coyotes away from their herds.

Another potentially vital area of research involving classical conditioning is in the field of behavioral medicine. Studies have suggested that the activity of the immune system can be altered using Pavlovian principles. Ader and Cohen (1985) gave mice water flavored with saccharine (mice love this water). They then paired the saccharine water with an injection of a drug that weakened the immune system of the mice. Later, when these conditioned mice were given the saccharine water but no injection, they showed signs of immunosuppression, a weakening of the immune response. Research is underway (primarily within a psychology subfield called *psychoneuroimmunology*) to study if the reverse is also possible, if immune *enhancing* responses may be classically conditioned. Overall, research is demonstrating that classical conditioning may indeed hold promise for increasing the effectiveness of immune system responses in humans (Miller & Cohen, 2001). Just imagine: in the future, you may be able to strengthen your resistance to illness by exposing yourself to a *nonmedical* conditioned stimulus. For example, imagine you feel the beginnings of a cold or the flu, so you tune into your special classically conditioned "immune response enhancement music" on your iPod. As the music fills your ears, your resistance rises as a conditioned response to this stimulus and stops the disease in its tracks.

As a demonstration of the continuing impact of Pavlov's discoveries on today's psychological research, consider the following. Since 2000, more than a thousand scientific articles have cited Pavlov's work that forms the basis for this discussion. One especially fascinating recent study demonstrated how your psychological state at the time of conditioning and extinction may play a part in the treatment of classically conditioned irrational fears, called phobias (Mystkowski et al., 2003). Researchers used desensitization techniques to treat participants who were terrified of spiders. Some received the treatment after ingesting caffeine, while others ingested a placebo. A week later, all participants were retested—some receiving caffeine and others a placebo. Those who were given the placebo during treatment, but received real caffeine at the follow-up, *and* those who had received real caffeine during treatment, but received a placebo at the follow-up, experienced a relapse of the fear response. In other words, changing the characteristics of a stimulus situation lessens the effect of extinction. However, those who were in the same drug condition, either caffeine or placebo, at treatment *and* follow-up, continued to experience a lowered fear response to spiders. This finding implies that if a classically conditioned behavior is successfully placed on extinction, the response may return, if the conditioned stimulus is encountered in a new and different situation.

CONCLUSION

These examples demonstrate how extensive Pavlov's influence has been on many scientific and research disciplines. For psychology in particular, few scientists have had as much impact in any single discipline. Classical conditioning is one of the fundamental theories on which modern psychology rests. Without Pavlov's contributions, behavioral scientists still might have uncovered most of these principles over the decades. It is unlikely, however, that such a cohesive, elegant, and well-articulated theory of the conditioned reflex would ever have existed if Pavlov had not made the decision to risk his career and venture into the untested, uncharted, and highly questionable science of nineteenth-century psychology.

Ader, R., & Cohen, N. (1985). CNS-immune system interactions: Conditioning phenomena. *Behavioral and Brain Sciences, 8,* 379–394.
Fredrikson, M., Annas, P., & Wik, G. (1997). Parental history, aversive exposure, and the development of snake and spider phobias in women. *Behavior Research and Therapy, 35*(1), 23–28.
Gustafson, C. R., Garcia, J., Hawkins, W., & Rusiniak, K. (1974). Coyote predation control by aversive conditioning. *Science, 184,* 581–583.
Miller, G., & Cohen, S. (2001). Psychological interventions and the immune system: A meta-analytic review and critique. *Health Psychology, 20,* 47–63.
Mystkowski, J., Mineka, S., Vernon, L., & Zinbarg, R. (2003). Changes in caffeine states enhance return of fear in spider phobia. *Journal of Consulting and Clinical Psychology, 71,* 243–250.

Reading 10: LITTLE EMOTIONAL ALBERT

Watson, J. B., & Rayner, R. (1920). Conditioned emotional responses. *Journal of Experimental Psychology, 3,* 1–14.

Have you ever wondered where your emotions come from? If you have, you're not alone. The source of our emotions has fascinated behavioral scientists throughout psychology's history. Part of the evidence for this fascination can be found in this book; four studies are included that relate directly to emotional responses (Chapter V, Harlow, 1958; Chapter VI, Ekman & Friesen, 1971; Chapter VIII, Seligman & Meier, 1967; and Chapter IX, Wolpe, 1961). This study by Watson and Rayner on conditioned emotional responses was a strikingly powerful piece of research when it was published nearly a century ago, and it continues to exert influence today. You would be hard pressed to pick up a textbook on general psychology or on learning and behavior without finding a summary of the study's findings.

The historical importance of this study is not solely due to the research findings but also to the new psychological territory it pioneered. If we could be transported back to the turn of the century and get a feel for the state of psychology at the time, we would find it nearly completely dominated by the work of Sigmund Freud (see the reading on Anna Freud in Chapter VIII). Freud's psychoanalytic view of human behavior was based on the idea that we are motivated by unconscious instincts and repressed conflicts from early childhood. In simplified Freudian terms, behavior, thoughts, and emotions are generated internally through biological and instinctual processes.

In the 1920s, a new movement in psychology known as behaviorism, spearheaded by Pavlov (as discussed in the previous study) and Watson, began to take hold. The behaviorists' viewpoint was radically opposed to the psychoanalytic school and proposed that behavior is generated *outside* the person through various environmental or situational stimuli. Therefore, Watson theorized, emotional responses exist in us because we have been conditioned to respond emotionally to certain stimuli that we encounter. In other words, we *learn* our emotional reactions. Watson (1913) believed that all human behavior was a product of learning and conditioning, as he proclaimed in his famous statement:

> Give me a dozen healthy infants, well-formed, and my own special world to bring them up in, and I'll guarantee to take any one at random and train him to become any type of specialist I might select—doctor, lawyer, artist, merchant-chief, and, yes, beggarman and thief.

This was, for its time, an extremely revolutionary view. Most psychologists, as well as public opinion in general, were not ready to accept these new ideas. This was especially true for emotional reactions, which seemed to be generated from within the person. Watson set out to demonstrate that specific emotions could be conditioned without regard for any internal forces.

THEORETICAL PROPOSITIONS

Watson theorized that if a stimulus automatically produces a certain emotion in you (such as fear) and that stimulus is repeatedly experienced at the same moment as something else, such as a rat, the rat will become associated in your brain with the fear. In other words, you will eventually become conditioned to be afraid of the rat (this view reflects Pavlov's theory of classical conditioning). He maintained that we are not born to fear rats but that such fears are learned through conditioning. This formed the theoretical basis for his most famous experiment, which involved a participant named "Little Albert."

METHOD AND RESULTS

The participant, Albert B., was recruited for this study at the age of 9 months from a hospital where he had been raised as an orphan from birth. The researchers and the hospital staff judged him to be very healthy, both emotionally and physically. To see if Albert was naturally afraid of certain stimuli, the researchers presented him with a white rat, a rabbit, a monkey, a dog, masks with and without hair, and white cotton wool. Albert's reactions to these stimuli were closely observed. Albert was interested in the various animals and objects and would reach for them and sometimes touch them, but he never showed the slightest fear of them. Because they produced no fear, these are referred to as *neutral stimuli.*

The next phase of the experiment involved determining if a fear reaction could be produced by exposing Albert to a loud noise. This was not difficult, because all humans, and especially infants, will exhibit fear reactions to loud, sudden noises. Because no learning is necessary for this response to occur, the loud noise is called an *unconditioned stimulus.* In this study, a steel bar 4 feet in length was struck with a hammer just behind Albert. This noise startled and frightened him and made him cry.

Now the stage was set for testing the idea that the emotion of fear could be conditioned in Albert. The actual conditioning tests were not done until the child was 11 months old. The researchers were hesitant to create fear reactions in a child experimentally, but they made the decision to proceed based on what was, in retrospect, questionable ethical reasoning. (This is discussed in conjunction with the overall ethical problems of this study, elsewhere in this review.)

As the experiment began, the researchers presented Albert with the white rat. At first, Albert was interested in the rat and reached out to touch it. As he did this, the metal bar was struck, which startled and frightened Albert. This process was repeated three times. One week later, the same procedure was followed. After a total of seven pairings of the noise and the rat, the rat was presented to Albert alone, without the noise. As you've probably guessed by now, Albert reacted with extreme fear to the rat. He began to cry, turned away, rolled over on one side away from the rat, and began to crawl away so fast that the researchers had to rush to catch him before he crawled off the edge of the table! A fear response had been conditioned to an object that had not been feared only one week earlier.

The researchers then wanted to determine if this learned fear would transfer to other objects. In psychological terms, this transfer is referred to as *generalization*. If Albert showed fear of other similar objects, then the learned behavior is said to have generalized. The next week, Albert was tested again and was still found to be afraid of the rat. Then, to test for generalization, an object similar to the rat (a white rabbit) was presented to Albert. In the author's words:

> Negative responses began at once. He leaned as far away from the animal as possible, whimpered, then burst into tears. When the rabbit was placed in contact with him, he buried his face in the mattress, then got up on all fours and crawled away, crying as he went. (p. 6)

Remember, Albert was not afraid of the rabbit prior to conditioning, and had not been conditioned to fear the rabbit specifically.

Little Albert was presented over the course of this day of testing with a dog, a white fur coat, a package of cotton, and Watson's own head of gray hair. He reacted to all of these items with fear. One of the most well-known tests of generalization that made this research as infamous as it is famous occurred when Watson presented Albert with a Santa Claus mask. The reaction? Yes . . . fear! After another 5 days Albert was tested again. The sequence of presentations on this day are summarized in Table 10-1.

Another aspect of conditioned emotional responses Watson wanted to explore was whether the learned emotion would transfer from one situation to another. If Albert's fear responses to these various animals and objects occurred only in the experimental setting and nowhere else, the significance of the findings would be greatly reduced. To test this, later on the day outlined in Table 10–1, Albert was taken to an entirely different room with brighter lighting and more people present. In this new setting, Albert's reactions to the rat and rabbit were still clearly fearful, although somewhat less intense.

The final test that Watson and Rayner wanted to make was to see if Albert's newly learned emotional responses would persist over time. Albert had

TABLE 10-1 Sequence of Stimulus Presentations to Albert on Fourth Day of Testing

STIMULUS PRESENTED	REACTION OBSERVED
1. Blocks	Played with blocks as usual
2. Rat	Fearful withdrawal (no crying)
3. Rat + Noise	Fear and crying
4. Rat	Fear and crying
5. Rat	Fear, crying, and crawling away
6. Rabbit	Fear, but less strong reaction than on former presentations
7. Blocks	Played as usual
8. Rabbit	Same as 6
9. Rabbit	Same as 6
10. Rabbit	Some fear, but also wanted to touch rabbit
11. Dog	Fearful avoidance
12. Dog + Noise	Fear and crawling away
13. Blocks	Normal play

been adopted and was scheduled to leave the hospital in the near future. Therefore, all testing was discontinued for a period of 31 days. At the end of this time, he was once again presented with the Santa Claus mask, the white fur coat, the rat, the rabbit, and the dog. After a month, Albert remained very afraid of all these objects.

Watson and his colleagues had planned to attempt to *recondition* Little Albert and eliminate these fearful reactions. However, Albert left the hospital on the day these last tests were made, and, as far as anyone knows, no reconditioning ever took place.

DISCUSSION AND SIGNIFICANCE OF FINDINGS

Watson had two fundamental goals in this study and in all his work: (a) to demonstrate that all human behavior stems from learning and conditioning and (b) to demonstrate that the Freudian conception of human nature, that our behavior stems from unconscious processes, was wrong. This study, with all its methodological flaws and serious breaches of ethical conduct, succeeded to a large extent in convincing many in the psychological community that emotional behavior could be conditioned through simple stimulus-response techniques. This finding helped, in turn, to launch one of the major schools of thought in psychology: behaviorism. Here, something as complex and personal as an emotion was shown to be subject to conditioning, just as Pavlov demonstrated that dogs learn to salivate at the sound of a metronome.

A logical extension of this is that other emotions, such as anger, joy, sadness, surprise, or disgust, may be learned in the same manner. In other words, the reason you are sad when you hear that old song, nervous when you have a job interview or a public speaking engagement, happy when spring arrives, or afraid when you hear a dental drill is that you have developed an association in your brain between these stimuli and specific emotions through conditioning.

Other more extreme emotional responses, such as phobias and sexual fetishes, may also develop through similar sequences of conditioning.

Watson was quick to point out that his findings could explain human behavior in rather straightforward and simple terms, compared with the complexities of the psychoanalytic notions of Freud and his followers. As Watson and Rayner explained in their article, a Freudian would explain thumb sucking as an expression of the original pleasure-seeking instinct. Albert, however, would suck his thumb whenever he felt afraid. As soon as his thumb entered his mouth, his fear lessened. Therefore, Watson interpreted thumb sucking as a conditioned device for blocking fear-producing stimuli.

An additional questioning of Freudian thinking in this article concerned how Freudians in Albert's future, given the opportunity, might analyze Albert's fear of a white fur coat. Watson and Rayner claimed that Freudian analysts "will probably tease from him the recital of a dream which, upon their analysis, will show that Albert at three years of age attempted to play with the pubic hair of the mother and was scolded violently for it" (p. 14). Their main point was that they had demonstrated with Little Albert that emotional disturbances in adults cannot always be attributed to sexual traumas in childhood, as the Freudian view maintained.

QUESTIONS AND CRITICISMS

As you have been reading this, you have probably been concerned or even angered over the experimenter's treatment of this innocent child. This study clearly violated current standards of ethical conduct in research involving humans. It would be highly unlikely that any institutional review board at any research institution would approve this study today. A century ago, however, such ethical standards did not formally exist, and it is not unusual to find reports in the early psychological literature of what now appear to be questionable research methods. It must be pointed out that Watson and his colleagues were not sadistic or cruel people and that they were engaged in a new, unexplored area of research. They acknowledged their considerable hesitation in proceeding with the conditioning process but decided that it was justifiable, because, in their opinion, some such fears would arise anyway when Albert left the sheltered hospital environment. Even so, is it ever appropriate to frighten a child to this extent, regardless of the importance of the potential discovery? Today nearly all behavioral scientists would agree that it is not.

Another important point regarding the ethics of this study was the fact that Albert was allowed to leave the research setting and was never reconditioned to remove his fears. Watson and Rayner contended in their article that such emotional conditioning may persist over a person's lifetime. If they were correct on this point, it is extremely difficult, from an ethical perspective, to justify allowing someone to grow into adulthood fearful of all these objects (and who knows how many others!).

Several researchers have criticized Watson's assumption that these conditioned fears would persist indefinitely (e.g., Harris, 1979). Others claim that

Albert was not conditioned as effectively as the authors maintained (e.g., Samelson, 1980). It has frequently been demonstrated that behaviors acquired through conditioning can be lost because of other experiences or simply because of the passage of time. Imagine, for example, that when Albert turned age five, he was given a pet white rabbit for a birthday present. At first, he might have been afraid of it (no doubt baffling his adoptive parents). As he continued to be exposed to the rabbit without anything frightening occurring (such as that loud noise), he would probably slowly become less and less afraid until the rabbit no longer caused a fear response. This is a well-established process in learning psychology called *extinction,* and it happens routinely as part of the constant learning and unlearning, conditioning and unconditioning processes we experience throughout our lives.

RECENT APPLICATIONS

Watson's 1920 article continues to be cited in research in a wide range of applications, including theories of effective parenting and psychotherapy. One study, examined the facial expressions of emotion in infants (Sullivan & Lewis, 2003). We know that facial expressions corresponding to specific emotions are consistent among all adults and across cultures (see the reading on Ekman's research in Chapter VI). This study, however, extended this research to how such expressions develop in infants and what the various expressions mean at very young ages. A greater understanding of infants' facial expressions might be of great help in adults' efforts to communicate with and care for babies. The authors noted that their goal in their research was "to provide practitioners with basic information to help them and the parents they serve become better able to recognize the expressive signals of the infants and young children in their care" (p. 120). These authors' use of Watson's findings offers us a degree of comfort in that his questionable research tactics with Little Albert, may, in the final analysis, allow us to develop greater sensitivity and perception into the feelings and needs of infants.

As mentioned previously in this discussion, one emotion, fear, in its extreme form, can produce serious negative consequences known as *phobias.* Many psychologists believe that phobias are conditioned much like Little Albert's fear of furry animals (see the discussion of Wolpe's research on the treatment of phobias in Chapter IX: Psychotherapy). Watson's research has been incorporated into many studies about the origins and treatments of phobias. One such article discussed phobias from the nature–nurture perspective and found some remarkable results. Watson's approach, of course, is rooted completely in the environmental or nurture side of the argument, and most people would view phobias as learned.

However, a study by Kendler, Karkowski, and Prescott (1999) provided compelling evidence that the development of phobias may include a substantial genetic component. The researchers studied phobias and unreasonable fears in more than 1,700 female twins (see the discussion of Bouchard's twin research in Chapter I). They claim to have found that a large percentage of the variation in phobias was due to *inherited* factors. The authors concluded that, although phobias may be molded by an individual's personal experiences, the role of a person's family in the development of phobias is primarily genetic, not environmental. Imagine: *Born to be phobic!* This view flies directly in the face of Watson's theory and should provide plenty of fuel for the ongoing nature–nurture debate in psychology and throughout the behavioral sciences.

Harris, B. (1979). What ever happened to Little Albert? *American Psychologist, 34,* 151–160.

Kendler, K., Karkowski, L., & Prescott, C. (1999). Fears and phobias: reliability and heritability. *Psychological Medicine, 29*(3), 539–553.

Samelson, F. (1980). Watson's Little Albert, Cyril Burt's twins, and the need for a critical science. *American Psychologist, 35,* 619–625.

Sullivan, M., & Lewis, M. (2003). Emotional expressions of young infants and children: A practitioner's primer. *Infants and Young Children, 16,* 120–142.

Watson, J. B. (1913). Psychology as the behaviorist views it. *Psychological Review, 20,* 158–177.

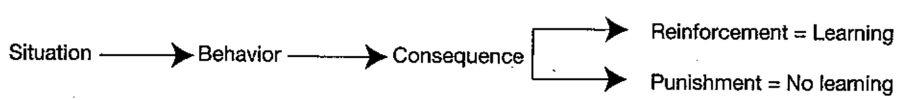
Reading 11: KNOCK WOOD!

Skinner, B. F. (1948). Superstition in the pigeon. *Journal of Experimental Psychology, 38,* 168–172.

In this reading, we examine one study from a *huge* body of research carried out by one of the most influential and most widely known figures in the history of psychology: B. F. Skinner (1904–1990). Deciding how to present Skinner and which of his multitude of studies to explore is a difficult task. It is impossible to represent adequately in one short article Skinner's contributions to the history of psychology. After all, Skinner is considered by most to be the father of radical behaviorism, he was the inventor of the famous (or infamous) Skinner Box, and he was the author of over 20 books and many hundreds of scientific articles. This article, with the funny-sounding title "Superstition in the Pigeon," has been selected from all his work because it allows for a clear discussion of Skinner's basic theories, provides an interesting example of his approach to studying behavior, and offers a "Skinnerian" explanation of a behavior with which we are all familiar: superstition.

Skinner is referred to as a *radical behaviorist* because he believed that all behaviors—including public, or external behavior, as well as private, or internal, events such as feelings and thoughts—are ultimately learned and controlled by the relationships between the situation that immediately precedes the behavior and the consequences that directly follow it. Although he believed that private behaviors are difficult to study, he acknowledged that we all have our own subjective experience of these behaviors. He did not, however, view internal events, such as thoughts and emotions, as causes of behavior but rather as part of the mix of environment and behavior that he was seeking to explain (see Schneider & Morris, 1987, for a detailed discussion of the term *radical behaviorism*).

To put Skinner's theory in very basic terms: In any given situation, your behavior is likely to be followed by consequences. Some of these consequences, such as praise, receiving money, or the satisfaction of solving a problem, will make the behavior more likely to be repeated in future, similar situations. These consequences are called reinforcers. Other consequences, such as injuring yourself or feeling embarrassed, will tend to make the behavior less likely to be repeated in similar situations. These consequences are called punishers. The effects of these relationships between behavior and the environment are called reinforcement and punishment respectively (Edward K. Morris, personal communication, September 1987). Reinforcement and punishment are two of the most fundamental processes in what Skinner referred to as operant conditioning and may be diagrammed as follows:



Within this conceptualization, Skinner also was able to explain how learned behaviors decrease and sometimes disappear entirely. When a behavior has been reinforced and the reinforcement is then withdrawn, the likelihood of the behavior reoccurring will slowly decrease until the behavior is effectively suppressed. This process of behavior suppression is called *extinction.*

If you think about it, these ideas are not new to you. The process we use to train our pets follows these same rules. You tell a dog to sit, it sits, and you reward it with a treat. After a while the dog will sit when told to, even without an immediate reward. You have applied the principles of operant conditioning. This is a very powerful form of learning and is effective with all animals, even old dogs learning new tricks and, yes, even cats! Also, if you want a pet to stop doing something, all you have to do for the behavior to stop is remove the reinforcement. For example, if your dog is begging at the dinner table, there is a reason for that (regardless of what you may think, dogs are not born to beg at the table). You have conditioned this behavior in your dog through reinforcement. If you want to *put that behavior on extinction,* the reinforcement must be totally discontinued. Eventually, the dog will stop begging. By the way, if one member of the family cheats during extinction and secretly gives the canine beggar some food once in a while, extinction will never happen, but the dog will spend much more of its begging energy near that person's chair.

Beyond these fundamentals of learning, Skinner maintained that all human behavior is created and maintained in precisely the same way. It's just that with humans, the exact behaviors and consequences are not always easy to identify. Skinner was well known for arguing that if a human behavior was interpreted by other theoretical approaches to be due to our highly evolved consciousness or intellectual capabilities, it was only because those theorists had been unable to pinpoint the reinforcers that had created and were maintaining the behavior. If this feels like a rather extreme position to you, remember that Skinner's position was called *radical behaviorism* and was always surrounded by controversy.

Skinner often met skepticism and defended his views by demonstrating experimentally that behaviors considered to be the sole property of humans could be learned by "lowly creatures" such as pigeons or rats. One of these demonstrations involved the contention by others that superstitious behavior is uniquely human. The argument was that superstition requires human *cognitive* activity (i.e., thinking, knowing, reasoning). A superstition is a belief in something, and we do not usually attribute such beliefs to animals. Skinner said in essence that superstitious behavior could be explained as easily as any other action by using the principles of operant conditioning. He performed this experiment to prove it.

THEORETICAL PROPOSITIONS

Think back to a time when you have behaved superstitiously. Did you knock on wood, avoid walking under a ladder, avoid stepping on cracks, carry a lucky coin or other charm, shake the dice a certain way in a board game, or change your behavior because of your horoscope? It is probably safe to say that everyone has done something superstitious at some time, even if some of them might not want to admit it. Skinner said that the reason people do this is that they believe or presume a connection exists between the superstitious behavior in a certain setting and a reinforcing consequence, even though, in reality, it does not. This connection exists because the behavior (such as shaking the dice that certain way) was accidentally reinforced (by something rewarding, such as a good roll) once, twice, or several times. Skinner called this *noncontingent* reinforcement—that is, a reward that is not contingent on any particular behavior. You *believe* that there is a *causal* relationship between the behavior and the reward, when no such relationship exists. "If you think this is some exclusive human activity," Skinner might have said, "I'll create a superstitious pigeon!"

METHOD

To understand the method used in this experiment, a brief description of what has become known as the Skinner Box is necessary. The principle behind the Skinner Box (or *conditioning chamber,* as Skinner called it) is really quite simple. It consists of a cage or box that is empty except for a dish or tray into which food may be dispensed. This allows a researcher to have control over when the animal receives reinforcement, such as pellets of food. The early conditioning boxes also contained a lever which, if pressed, would cause some food to be dispensed. If a rat (rats were used in Skinner's earliest work) was placed in one of these boxes, it would eventually, through trial and error, and reinforcement, learn to press the lever for food. Alternatively, the experimenter could, if desired, take control of the food dispenser and reinforce a specific behavior. Later, Skinner and others found that pigeons also made ideal subjects in conditioning experiments, and conditioning chambers were designed with disks to be pecked instead of bars to be pressed.

These conditioning cages were used in the study discussed here, but with one important change. To study superstitious behavior, the food dispensers were rigged to drop food pellets into the tray at intervals of 15 seconds, *regardless* of what the animal was doing at the time. The reward was not contingent on any particular behavior. This was noncontingent reinforcement: the animal received a reward every 15 seconds, no matter what it did.

Subjects in this study were 8 pigeons. These birds were fed less than their normal daily amount for several days so that when tested they would be hungry and therefore motivated to perform behaviors for food (this increased the power of the reinforcement). Each pigeon was placed into the experimental cage for a few minutes each day and just left there to do whatever a pigeon does. During this time, reinforcement was being delivered automatically every 15 seconds. After several days of conditioning in this way, two independent observers recorded the birds' behavior in the cage.

RESULTS

As Skinner reports:

> In six out of eight cases the resulting responses were so clearly defined that two observers could agree perfectly in counting instances. One bird was conditioned to turn counterclockwise about the cage, making two or three turns between reinforcements. Another repeatedly thrust its head into one of the upper corners of the cage. A third developed a tossing response as if placing its head beneath an invisible bar and lifting it repeatedly. Two birds developed a pendulum motion of the head and body in which the head was extended forward and swung from right to left with a sharp movement followed by a somewhat slower return. The body generally followed the movement and a few steps might be taken when it was extensive. Another bird was conditioned to make incomplete pecking or brushing movements directed toward but not touching the floor. (p. 168)

None of these behaviors had been observed in the birds prior to the conditioning procedure. The new behaviors had no real effect on the delivery of food. Nevertheless, the pigeons behaved as if a certain action would produce the food—that is, they became superstitious.

Skinner next wanted to see what would happen if the time interval between reinforcements was extended. With one of the head-bobbing and hopping birds, the interval between each delivery of food pellets was slowly increased to 1 minute. When this occurred, the pigeon's movements became more energetic until finally the bobbing and hopping became so pronounced that it appeared the bird was performing a kind of dance during the minute between reinforcement (such as a *pigeon food dance*).

The birds' new behavior was then put on extinction. This meant that the reinforcement in the test cage was discontinued. When this happened, the superstitious behaviors gradually decreased until they disappeared altogether. However, in the case of the *hopping* pigeon with a reinforcement interval that had been increased to a minute, over 10,000 responses were recorded before extinction occurred!

DISCUSSION

In this study, Skinner ended up with six superstitious pigeons. However, he explains his findings more carefully and modestly: "The experiment might be said to demonstrate a sort of superstition. The bird behaves as if there were a causal relation between its behavior and the presentation of food, although such a relation is lacking" (p. 171).

The next step would be to apply these findings to humans. You can probably think of analogies in human behavior, and so did Skinner. He described "the bowler who has released a ball down the alley but continues to behave as if he were controlling it by twisting and turning his arm and shoulder as another case in point" (p. 171). You know, rationally, that behaviors such as these don't really have any effect on a bowling ball that is already halfway down the alley. However, due to past conditioning, you believe your antics may help, but the ball, in reality, will go wherever it is going to go regardless of your behavior after it has been released. As Skinner put it, the "bowler's behavior has no effect on the ball, but the behavior of the ball has an effect on the bowler" (p. 171). In other words, on some occasions, the ball might happen to move in the direction of the bowler's body movements. That movement of the ball, coupled with the consequence of a strike or a spare, is enough to accidentally reinforce the twisting and turning behavior and maintain the superstition. How different is that from Skinner's pigeons? Not very.

The reason that superstitions are so resistant to extinction was demonstrated by the pigeon that hopped 10,000 times before giving up the behavior. When any behavior is only reinforced once in a while in a given situation (called *partial reinforcement*), it becomes very difficult to extinguish. This is because the expectation stays high that the superstitious behavior *might* work to produce the reinforcing consequences. You can imagine that if the connection was present every time and then disappeared, the behavior would stop quickly. However, in real life, the instances of accidental reinforcement usually occur sporadically, so the superstitious behavior often may persist for a lifetime.

CRITICISMS AND SUBSEQUENT RESEARCH

Skinner's behaviorist theories and research have always been the subject of great and sometimes heated controversy. Other prominent theoretical approaches to human behavior have argued that the strict behavioral view is unable to account for many of the psychological processes that are fundamental to humans. Carl Rogers, the founder of the *humanistic* school of psychology, and well known for his debates with Skinner, summed up this criticism:

> In this world of inner meanings, humanistic psychology can investigate issues which are meaningless for the behaviorist: purposes, goals, values, choice, perceptions of self, perceptions of others, the personal constructs with which we build our world . . . the whole phenomenal world of the individual with its connective tissue of meaning. Not one aspect of this world is open to the strict behaviorist. Yet that these elements have significance for man's behavior seems certainly true. (Rogers, 1964, p. 119)

Behaviorists would argue in turn that all of these human characteristics are open to behavioral analysis. The key to this analysis is a proper interpretation of the behaviors and consequences that constitute them. (See Skinner, 1974, for a complete discussion of these issues.)

On the specific issue of superstitions, however, there appears to be less controversy and a rather wide acceptance of the learning processes involved in their formation. An experiment performed by Bruner and Revuski (1961) demonstrated how easily superstitious behavior develops in humans. Four high school students each sat in front of four telegraph keys. They were told that each time they pressed the correct key, a bell would sound, a red light would flash, and they would earn 5 cents (worth about 50 cents today). The correct response was key number 3. However, as in Skinner's study, key number 3 would produce the desired reinforcement (the nickel) only after a delay interval of 10 seconds. During this interval, the students would try other keys in various combinations. Then, at some point following the delay, they would receive the reinforcement. The results were the same for all the students. After a while, they had each developed a pattern of key responses (such as 1, 2, 4, 3, 1, 2, 4, 3) that they repeated over and over between each reinforcement. Pressing the 3 key was the only reinforced behavior; the other presses in the sequence were completely superstitious. Not only did they behave superstitiously, but all the students believed that the other key presses were necessary to "set up" the reinforced key. They were completely unaware of their superstitious behavior.

RECENT APPLICATIONS

Skinner, as one of psychology's most influential figures, still has a far-reaching substantive impact on scientific literature in many fields. His 1948 article on superstitious behavior is cited in numerous studies every year. One of these studies, for example, compared two types of reinforcement in the development of superstitious behavior (Aeschleman, Rosen, & Williams, 2003). Positive reinforcement occurs when you receive something desirable as a consequence (such as money, food, or praise). Negative reinforcement, which is often confused with punishment, rewards you by *eliminating* something *undesirable* (such as not having to do homework or avoiding pain). The study found that greater levels of superstitious behavior (perceived control over noncontingent events) developed under conditions of negative reinforcement than under positive reinforcement. In the authors' words: "These findings . . . suggest that, relative to positive reinforcement, negative reinforcement operations may provide a more fertile condition for the development and maintenance of superstitious behaviors" (p. 37). In other words, the study suggested that you are more likely to employ superstitious tactics to prevent bad outcomes than to create good outcomes.

Another thought-provoking article citing Skinner's 1948 study (Sagvolden et al., 1998) examined the role of reinforcement in attention deficit/hyperactivity disorder (ADHD). The researchers asked boys with and without a diagnosis of ADHD to participate in a game in which they would receive rewards of coins or small toys. Although the reinforcement was delivered at fixed 30-second intervals (noncontingent reinforcement), all the boys developed superstitious behaviors that they *believed* were related to the rewards. In the next phase of the study, the reinforcement was discontinued. You would expect this to cause a decrease and cessation of whatever behaviors had been conditioned (extinction). This is exactly what happened with the boys without ADHD. But the boys with ADHD, after a brief pause, became more active and began engaging impulsively in bursts of responses at an even faster pace, *as if* the reinforcement had been reestablished. The authors suggested that this overactivity and impulsiveness implied that the boys with ADHD possessed significantly less ability to cope with delays of reinforcement than did the comparison group of boys. Findings such as these are important additions to our understanding and our ability to treat ADHD effectively.

CONCLUSION

Superstitions are everywhere. You probably have some, and you surely know others who have them. Some superstitions are such a part of a culture that they produce society-wide effects. You may be aware that most high-rise buildings do not have a 13th floor. But that's not exactly true. Obviously, a 13th floor exists, but no floor is *labeled* "13." This is probably not because architects and builders are an overly superstitious bunch, but rather it is due to the difficulty of renting or selling space on the "unlucky" thirteenth floor. Another example is that Americans are so superstitious about the two-dollar bill that the U.S. Treasury prints fewer two-dollar notes than any other denomination (less than 1%).

Are superstitions psychologically unhealthy? Most psychologists believe that even though superstitious behaviors, by definition, do not produce the consequences that you think they do, they can serve useful functions. Often such behaviors can produce a feeling of strength and control when a person is facing a difficult situation. It is interesting to note that people who are employed in dangerous occupations tend to have more superstitions than others. This feeling of increased power and control that is sometimes created by superstitious behavior can lead to reduced anxiety, greater confidence and assurance, and improved performance.

Aeschleman, S., Rosen, C., & Williams, M. (2003). The effect of non-contingent negative and positive reinforcement operations on the acquisition of superstitious behaviors. *Behavioural Processes, 61,* 37–45.
Bruner, A., & Revuski, S. (1961). Collateral behavior in humans. *Journal of the Experimental Analysis of Behavior, 4,* 349–350.
Rogers, C. R. (1964). Toward a science of the person. In F. W. Wann (Ed.), *Behaviorism and phenomenology: Contrasting bases for modern psychology.* Chicago: Phoenix Books.
Sagvolden, T., Aase, H., Zeiner, P., & Berger, D. (1998). Altered reinforcement mechanisms in attention-deficit/hyperactivity disorder. *Behavioral Brain Research, 94*(1), 61–71.
Schneider, S., & Morris, E. (1987). The history of the term *radical behaviorism:* From Watson to Skinner. *Behavior Analyst, 10*(1), 27–39.
Skinner, B. F. (1974). *About behaviorism.* New York: Knopf.

Reading 12: SEE AGGRESSION . . . DO AGGRESSION!

Bandura, A., Ross, D., & Ross, S. A. (1961). Transmission of aggression through imitation of aggressive models. *Journal of Abnormal and Social Psychology, 63,* 575–582.

Aggression, in its abundance of forms, is arguably the greatest social problem facing this country and the world today. It is also one of the most researched topics in the history of psychology. Over the years, the behavioral scientists who have been in the forefront of this research have been social psychologists, whose focus is on all types of human interaction. One goal of social psychologists has been to define aggression. This may, at first glance, seem like a relatively easy goal, but such a definition turns out to be rather elusive. For example, which of the following behaviors would you define as aggression: a boxing match? a cat killing a mouse? a soldier shooting an enemy? setting rat traps in your basement? a bullfight? The list of behaviors that may or may not be included in a definition of aggression is endless. As a result, if you were to consult 10 different social psychologists, you would probably hear 10 different definitions of aggression.

Many researchers have gone beyond trying to agree on a definition to the more important process of examining the sources of human aggression. The question they often pose is this: Why do people engage in acts of aggression? Throughout the history of psychology, many theoretical approaches have been proposed to explain the causes of aggression. Some of these contend that you are biologically preprogrammed to be aggressive because aggression in certain circumstances has been an evolutionary survival mechanism. Other theories look to situational factors, such as repeated frustration or specific types of provocation, as the determinants of aggressive responses. A third view, and the one this study suggests, is that aggression is learned.

One of the most famous and influential experiments ever conducted in the history of psychology demonstrated how children may *learn* to be aggressive. This study, by Albert Bandura and his associates Dorothea Ross and Sheila Ross, was carried out in 1961 at Stanford University. Bandura is considered to be one of the founders of a school of psychological thought called *social learning theory.* Social learning theorists propose that human interaction is the primary factor in the development of human personality. For example, as you are growing up, important people, such as your parents and teachers, reinforce certain behaviors and ignore or punish others. Even beyond direct rewards and punishments, however, Bandura believed that behavior can be shaped in important ways through simply observing and imitating the behavior of others—that is, through modeling.

As you can see from the title of this chapter's study, Bandura, Ross, and Ross were able to demonstrate this modeling effect for acts of aggression. This research has come to be known throughout the field of psychology as "the Bobo doll study," for reasons that will become clear shortly. The article began with a reference to earlier research findings demonstrating that children readily observed and imitated the behavior of adult models. One of the issues Bandura wanted to examine in this study was whether such imitative learning would generalize to settings in which the child was separated from the model after observing the model's behavior.

THEORETICAL PROPOSITIONS

The researchers proposed to expose children to adult models who behaved in either aggressive or nonaggressive ways. The children would then be tested in a new situation without the model present to determine to what extent they would imitate the acts of aggression they had observed in the adult. Based on this experimental manipulation, Bandura and his associates offered four predictions:

1. Children who observed adult models performing acts of aggression would imitate the adult and engage in similar aggressive behaviors, even if the model was no longer present. Furthermore, this behavior would differ significantly from those children who observed nonaggressive models or no models at all.
2. Children who were exposed to the nonaggressive models would not only be less aggressive than those who observed the aggression but also significantly less aggressive than a control group of children who were exposed to no model at all. In other words, the nonaggressive models would have an aggression-inhibiting effect.
3. Because children tend to identify with parents and other adults of their same sex, participants would "imitate the behavior of the same-sex model to a greater degree than a model of the opposite sex." (p. 575)
4. "Since aggression is a highly masculine-typed behavior in society, boys should be more predisposed than girls toward imitating aggression, the difference being most marked for subjects exposed to the male model." (p. 575)

METHOD

This article outlined the methods used in the experiment with great organization and clarity. Although somewhat summarized and simplified here, these methodological steps were as follows.

Participants

The researchers enlisted the help of the director and head teacher of the Stanford University Nursery School in order to obtain participants for their study. A total of 36 boys and 36 girls, ranging in age from 3 years to almost 6 years, participated in the study. The average age of the children was 4 years and 4 months.

Experimental Conditions

The control group, consisting of 24 children, would not be exposed to any model. The remaining 48 children were first divided into two groups: one exposed to aggressive models and the other exposed to nonaggressive models. These groups were divided again into males and females. Each of these groups was further divided so that half of the children were exposed to same-sex models and half to opposite-sex models. This created a total of eight experimental groups and one control group. A question you might be asking yourself is this: What if the children in some of the groups are already more aggressive than others? Due to the small number of participants in each group, Bandura guarded against this potential problem by obtaining ratings of each child's level of aggressiveness. The children were rated by an experimenter and a teacher (both of whom knew the children well) on their levels of physical aggression, verbal aggression, and aggression toward objects. These ratings allowed the researchers to match all the groups in terms of average aggression level.

The Experimental Procedure

Each child was exposed individually to the various experimental procedures. First, the experimenter brought the child to the playroom. On the way, they encountered the adult model who was invited by the experimenter to come and *join in the game.* The child was seated in one corner of the playroom at a table containing highly interesting activities. There were potato prints (this was 1961, so for those of you who have grown up in our high-tech age, a potato print is a potato cut in half and carved so that, like a rubber stamp, it will reproduce geometric shapes when inked on a stamp pad) and stickers of brightly colored animals and flowers that could be pasted onto a poster. Next, the adult model was taken to a table in a different corner containing a Tinkertoy set, a mallet, and an inflated 5-foot-tall Bobo doll (one of those large, inflatable clowns, weighted at the bottom so it pops back up when punched or kicked.). The experimenter explained that these toys were for the model to play with and then left the room.

For both the aggressive and nonaggressive conditions, the model began assembling the tinker toys. However, in the aggressive condition, after a minute the model attacked the Bobo doll with violence. For all the children in the aggressive condition, the sequence of aggressive acts performed by the model was identical:

> The model laid Bobo on its side, sat on it, and punched it repeatedly in the nose. The model then raised the Bobo doll, picked up the mallet, and struck the doll on the head. Following the mallet aggression, the model tossed the doll up in

> the air aggressively, and kicked it about the room. This sequence of physically aggressive acts was repeated three times, interspersed with verbally aggressive responses such as, "Sock him in the nose..., Hit him down..., Throw him in the air . . . , Kick him . . . , Pow . . . , " and two non-aggressive comments, "He keeps coming back for more" and "He sure is a tough fella." (p. 576)

All this took about 10 minutes, after which the experimenter came back into the room, said good-bye to the model, and took the child to another game room.

In the nonaggressive condition, the model simply played quietly with the Tinkertoys for the 10-minute period and completely ignored the Bobo doll. Bandura and his collaborators were careful to ensure that all experimental factors were identical for all the groups except for the factors being studied: the aggressive versus nonaggressive model and the sex of the model.

Arousal of Anger or Frustration

Following the 10-minute play period, all children from the various conditions were taken to another room that contained very attractive toys, such as a fire engine; a jet fighter; and a complete doll set including wardrobe, doll carriage, and so on. The researchers believed that in order to test for aggressive responses, the children should be somewhat angered or frustrated, which would make such behaviors more likely to occur. To accomplish this, they allowed them to begin playing with the attractive toys, but after a short time told them that the toys in this room were reserved for other children. They also told the children, however, that they could play with some other toys in the next room.

Test for Imitation of Aggression

The final experimental room was filled with both aggressive and nonaggressive toys. Aggressive toys included a Bobo doll (of course), a mallet, two dart guns, and a tether ball with a face painted on it. The nonaggressive toys included a tea set, crayons and paper, a ball, two dolls, cars and trucks, and plastic farm animals. Each child was allowed to play in this room for 20 minutes. During this period, judges behind a one-way mirror rated the child's behavior on several measures of aggression.

Measures of Aggression

A total of eight different responses were measured in the children's behavior. In the interest of clarity, only the four most revealing measures are summarized here. First, all acts that imitated the physical aggression of the model were recorded. These included sitting on the Bobo doll, punching it in the nose, hitting it with the mallet, kicking it, and throwing it into the air. Second, imitation of the models' verbal aggression was measured by counting the children's repetition of the phrases "Sock him," "Hit him down," "Pow," and so on. Third, other mallet aggression (e.g., hitting objects other than the doll with the mallet) were recorded. Fourth, nonimitative aggression was documented by tabulating all the children's acts of physical and verbal aggression that had not been performed by the adult model.

RESULTS

The findings from these observations are summarized in Table 12-1. If you examine the results carefully, you will discover that three of the four hypotheses presented by Bandura, Ross, and Ross were supported.

The children who were exposed to the violent models tended to imitate the exact violent behaviors they observed. On average were 38.2 instances of imitative physical aggression for each of the boys, as well as 12.7 for the girls who had been exposed to the aggressive models. In addition, the models' verbally aggressive behaviors were imitated an average of 17 times by the boys and 15.7 times by the girls. These specific acts of physical and verbal aggression were virtually never observed in the participants exposed to the nonaggressive models or in the control group that was not exposed to any model.

As you will recall, Bandura and his associates predicted that nonaggressive models would have a violence-inhibiting effect on the children. For this hypothesis to be supported, the results should show that the children in the nonaggressive conditions averaged significantly fewer instances of violence than those in the no-model control group. In Table 12-1, if you compare the nonaggressive model columns with the control group averages, you will see that the findings were mixed. For example, boys and girls who observed the nonaggressive male exhibited far less nonimitative mallet aggression than controls, but boys who observed the nonaggressive female aggressed more with the mallet than did the boys in the control group. As the authors readily admit, these results were so

TABLE 12-1 Average Number of Aggressive Responses from Children in Various Treatment Conditions

	TYPE OF MODEL				
TYPE OF AGGRESSION	AGGRESSIVE MALE	NON-AGGRESSIVE MALE	AGGRESSIVE FEMALE	NON-AGGRESSIVE FEMALE	CONTROL GROUP
Imitative Physical Aggression					
Boys	25.8	1.5	12.4	0.2	1.2
Girls	7.2	0.0	5.5	2.5	2.0
Imitative Verbal Aggression					
Boys	12.7	0.0	4.3	1.1	1.7
Girls	2.0	0.0	13.7	0.3	0.7
Mallet Aggression					
Boys	28.8	6.7	15.5	18.7	13.5
Girls	18.7	0.5	17.2	0.5	13.1
Nonimitative Aggression					
Boys	36.7	22.3	16.2	26.1	24.6
Girls	8.4	1.4	21.3	7.2	6.1

(Adapted from p. 579)

inconsistent in relation to the aggression-inhibiting effect of nonaggressive models that they were inconclusive.

The predicted gender differences, however, were strongly supported by the data in Table 12-1. Clearly, boys' violent behavior was influenced more by the aggressive male model than by the aggressive female model. The average total number of aggressive behaviors by boys was 104 when they had observed a male aggressive model, compared with 48.4 when a female model had been observed. Girls, on the other hand, although their scores were less consistent, averaged 57.7 violent behaviors in the aggressive female model condition, compared with 36.3 when they observed the male model. The authors point out that in same-sex aggressive conditions, girls were more likely to imitate verbal aggression, while boys were more inclined to imitate physical violence.

Boys were significantly more physically aggressive than girls in nearly all the conditions. If all the instances of aggression in Table 12-1 are tallied, the boys committed 270 violent acts, compared with 128 committed by the girls.

DISCUSSION

Bandura, Ross, and Ross claimed that they had demonstrated how specific behaviors—in this case, violent ones—could be learned through the process of observation and imitation without any reinforcement provided to either the models or the observers. They concluded that children's observation of adults engaging in these behaviors sends a message to the child that this form of violence is permissible, thus weakening the child's inhibitions against aggression. The consequence of this observed violence, they contended, is an increased probability that a child will respond to future frustrations with aggressive behavior.

The researchers also addressed the issue of why the influence of the male aggressive model on the boys was so much stronger than the female aggressive model was on the girls. They explained that in our culture, as in most, aggression is seen as more typical of males than females. In other words, it is a masculine-typed behavior. So, a man's modeling of aggression carried with it the weight of social acceptability and was, therefore, more powerful in its ability to influence the observer.

SUBSEQUENT RESEARCH

At the time this experiment was conducted, the researchers probably had no idea how influential it would become. By the early 1960s, television had grown into a powerful force in U.S. culture and consumers were becoming concerned about the effect of televised violence on children. This has been and continues to be hotly debated. In the past 30 years, no fewer than three congressional hearings have been held on the subject of television violence, and the work of Bandura and other psychologists has been included in these investigations.

These same three researchers conducted a follow-up study 2 years later that was intended to examine the power of aggressive models who are on film, or who are not even real people. Using a similar experimental method involving aggression toward a Bobo doll, Bandura, Ross, and Ross designed an experiment to compare the influence of a live adult model with the same model on film and to a cartoon version of the same aggressive modeling. The results demonstrated that the live adult model had a stronger influence than the filmed adult, who, in turn, was more influential than the cartoon. However, all three forms of aggressive models produced significantly more violent behaviors in the children than was observed in children exposed to nonaggressive models or controls (Bandura, Ross, & Ross, 1963).

On an optimistic note, Bandura found in a later study that the effect of modeled violence could be altered under certain conditions. You will recall that in his original study, no rewards were given for aggression to either the models or the children. But what do you suppose would happen if the model behaved violently and was then either reinforced or punished for the behavior while the child was observing? Bandura (1965) tested this idea and found that children imitated the violence more when they saw it rewarded but significantly less when the model was punished for aggressive behavior.

Critics of Bandura's research on aggression have pointed out that aggressing toward an inflated doll is not the same as attacking another person, and children know the difference. Building on the foundation laid by Bandura and his colleagues, other researchers have examined the effect of modeled violence on real aggression. In a study using Bandura's Bobo doll method (Hanratty, O'Neil, & Sulzer, 1972), children observed a violent adult model and were then exposed to high levels of frustration. When this occurred, they often aggressed against a live person (dressed like a clown), whether that person was the source of the frustration or not.

RECENT APPLICATIONS

Bandura's research discussed in this chapter made at least two fundamental contributions to psychology. First, it demonstrated dramatically how children can acquire new behaviors simply by observing adults, even when the adults are not physically present. Social learning theorists believe that many, if not most, of the behaviors that comprise human personality are formed through this modeling process. Second, this research formed the foundation for hundreds of studies over the past 45 years on the effects on children of viewing violence in person or in the media. (For a summary of Bandura's life and contributions to psychology, see Pajares, 2004). Less than a decade ago, the U.S. Congress held new hearings on media violence focusing on the potential negative effects of children's exposure to violence on TV, movies, video games, computer games, and the Internet. Broadcasters and multimedia developers, feeling increased pressure to respond to public and legislative attacks, are working to reduce media violence or put in place parental advisory rating systems warning of particularly violent content.

Perhaps of even greater concern is scientific evidence demonstrating that the effects of violent media on children may continue into adulthood (e.g., Huesmann et al., 2003). One study found "that childhood exposure to media violence predicts young adult aggressive behavior for both males and females. Identification with aggressive TV characters and perceived realism of TV violence also predict later aggression. These relations persist even when the effects of socioeconomic status, intellectual ability, and a variety of parenting factors are controlled" (p. 201).

CONCLUSION

As children acquire easier access to quickly expanding media formats, concerns over the effects of violence embedded in these media are increasing as well. Blocking children's access to all violent media is probably an impossible task, but research is increasing on strategies for preventing media violence from translating into real-life aggression among children. These efforts have been stepped up considerably in the wake of deadly shootings by students at schools throughout the United States, and they are likely to continue on many research fronts for the foreseeable future. Recently, the California legislature passed a law banning the sale of "ultra-violent" video games to children under the age of 18 without parental permission and imposing a fine of $1,000 on retailers who fail to adhere to the law. What is "ultra-violent," you ask? According to the law, it is defined "as depicting serious injury to human beings in a manner that is especially heinous, atrocious or cruel" (Going after video game violence, 2006). If you find such a definition overly subjective, you would not be alone. The video game industry is suing to overturn this law as unconstitutional, and you can bet that Bandura's research will be part of that battle.

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