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3 LEARNING AND CONDITIONING

The area of psychology concerned with learning and conditioning has produced a rather well-defined body of literature explaining how animals and humans learn. Some of the most famous names in the history of psychology have devoted their entire careers to this research—names that are widely recognized even outside the behavioral sciences, such as Pavlov, Watson, Skinner, and Bandura. Picking a few of the most influential studies from this branch of psychology and from these researchers is no easy task, but the articles selected can be found in nearly every introductory psychology textbook and are representative of the mammoth contributions of these scientists.

For Pavlov, we take a journey back nearly 100 years to review his work with dogs, metronomes, salivation, and the discovery of the conditioned reflex. Second, Watson, known for many contributions, is probably most famous (notorious?), for his torturous experiment with Little Albert, which demonstrated for the first time how emotions are a product of experience. For the third study in this section, we discuss Skinner's famous explanation and demonstration of superstitious behavior in a pigeon and how humans become superstitious in exactly the same way. Finally comes an examination of the well-known "Bobo Doll Study," in which Bandura established that aggressive behaviors could be learned by children through their modeling of adult violence.

IT'S NOT JUST ABOUT SALIVATING DOGS!

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

Have you ever walked into a medical building 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? This 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 song, 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 been conditioned 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 100 years ago in Russia by one of the most familiar names in the history of psychology, Ivan Petrovich Pavlov. 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 (there is even a Rolling Stones song that referred to "salivatin' like Pavlov's dogs"). However, how he came to make his landmark discoveries and the true significance of his work are not so widely understood.

While Pavlov's contribution to psychology was one of the most important ever made, he was not a psychologist at all, but rather a prominent Russian physiologist studying digestive processes. For his research on digestion he was awarded the Nobel Prize for science. But the discoveries that dramatically changed his career and the history of psychology began virtually by accident. It is important to note that in the late 1800s, psychology was a very young science and considered by many to be less than a true science. Therefore, for Pavlov to make such a radical turn from the more solid and respected science of physiology to psychology was a risky career move. He wrote about the dilemma facing a physiologist whose work might involve studying the brain:

> 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 career 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 food or nonfood substances into a dog's mouth and observe the rate and amount of salivation. In order 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 interesting 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. When inedible substances were placed in the dog's mouth (a marble, some sand), saliva was produced (in varying amounts, depending on the substance) to assist the dog in rejecting

the substance. The production of saliva under these conditions was regarded by Pavlov as a reflex; that is, a response that occurs automatically to a specific stimulus without conscious control or 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 fast 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!

So, Pavlov experimented with various stimuli to determine just how "intelligent" these salivary glands were. As the research continued, he began to notice certain 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 digestive 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. While 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 that there must be two kinds of reflexes.

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 when the lights are turned off 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 medical 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 of these examples is salivation, but when the salivation results from hearing footsteps, it is conditioning that prompts it.

The question Pavlov wanted to answer was this: Since conditioned reflexes are not inborn, 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. So, according to Pavlov, the process by which a neutral stimulus becomes a conditioned stimulus could be diagramed 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. 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 and has now returned to its original name of St. Petersburg) with funds donated by "a keen and public-spirited Moscow businessman." 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 this controlled research environment had been established, 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, the odor of vanilla (NS) was presented to the subjects prior to a mild acid solution (similar to lemon juice) being placed in the dog's mouth (the UCS). The acid caused heavy salivation (UCR). After 20 repetitions of the combination, the vanilla alone produced salivation. For a visual test, an object would begin to rotate just prior to the presentation of food. After only five pairings, the rotating object by itself (CS) caused the dogs to salivate (CR).

One additional important finding was that if the neutral stimulus (the vanilla or the rotating object) was presented to the subject *after* the unconditioned stimulus, no conditioning takes place. A demonstration of this was made in Pavlov's lab when the acid solution was placed in the dog's mouth and then, five seconds later, the odor of vanilla presented. After 427 of these pairings, the vanilla did not become a conditioned stimulus.

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 will be 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 were paired with and became associated with unconditioned stimuli for eye blinking (a puff of air into the eye), heart rate increase (a sudden loud noise), and sexual arousal (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 a room that becomes completely dark when the light is switched off to serve as your temporary laboratory. 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 *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) 20 to 30 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

There are two other studies presented in this book that 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 9 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). Moreover, Pavlov's discoveries continue to be used to treat phobias in adults and children alike (e.g., King et al., 2000).

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 will be 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, Garcia, Hawkins, & Rusiniak, 1974). Wolves and coyotes were given pieces of mutton 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 (CR) from the sheep! Based on this and other related research, it is now common practice for ranchers to use this method of classical conditioning to keep wolves and coyotes away from their herds.

A potentially vital area of research involving classical conditioning is in the field of behavioral medicine. There is evidence that the activity of the immune system can be altered by 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 then showed signs of immunosuppression, a weakening of the immune response. Currently research is underway to discover if the reverse is also possible. Laboratory rats have been exposed to the strong odor of camphor and then injected with a drug that enhances the immune response. Early results have shown that the camphor odor alone becomes a conditioned stimulus for increased immune functioning.

If the same strategy is effective for humans, and there is reason to believe it would be, it may be possible one day soon to strengthen your resistance to illness (a conditioned response) by exposing yourself to a nonmedical conditioned stimulus. For example, imagine you feel the beginnings of a cold or the flu, so you slide your special classically conditioned "immune response enhancement music disk" into your CD player. As the music fills the room, your resistance rises as a conditioned response to this stimulus and stops the disease in its tracks.

To demonstrate further the continuing impact of Pavlov's discoveries on today's psychological research, between 1997 and 2000 (since the previous edition of this book) more than 220 scientific articles cited his early book that forms the basis for this discussion. One especially fascinating recent study focused on how Pavlovian principles can be applied to helping people overcome disorders of anxiety, panic, and stress by altering their breathing patterns (Ley, 1999). This study exemplifies a relatively new approach to the treatment of anxiety disorders, called respiratory psychophysiology, in which the body is conditioned to ward off oncoming panic reflexively through changes in breathing with little conscious effort on the individual's part.

CONCLUSION

It is clear from these few examples how extensive Pavlov's influence has been on the field of psychology. There are few scientists who 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.

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Epstein, L., Paluch, R., & Coleman, K. (1996). Differences in salivation to repeated food cues in obese and non-obese women. *Psychosomatic Medicine, 58*(2), 160–164.

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.

King, N., Ollendick, T., Murphy, G., & Muris, P. (2000). Animal phobias in children: Etiology, assessment, and treatment. *Clinical Psychology and Psychotherapy, 7*(1), 11–21.

Ley, R. (1999). The modification of breathing behavior: Pavlovian and operant control in emotion and cognition. *Behavior Modification, 23*(3), 441–479.

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 emotional reactions come from? If you have, you're not alone. The source of emotions has fascinated behavioral scientists throughout psychology's history. Part of the evidence for this fascination can be found in this book; there are four studies included that relate directly to emotional responses (Chapter 5, Harlow, 1958; Chapter 6, Ekman & Friesen, 1971; Chapter 8, Seligman & Meier, 1967; and Chapter 9, Wolpe, 1961). This study by Watson and Raynor on conditioned emotional responses was a strikingly powerful piece of research when it was published more than 70 years 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 their 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 A. Freud in Chapter 8). 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, and specifically emotion, is generated internally through biological and instinctual processes.

In the 1920s, a new movement in psychology known as behaviorism, spearheaded by Pavlov and Watson, began to take hold. The behaviorist 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 in the environment. In other words, we learn our emotional reactions. Watson believed that all human behavior was a product of learning and conditioning, as he proclaimed in his famous statement of 1913:

> 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. (Watson, 1913)

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 somehow generated from within. So Watson set out to demonstrate that emotions could be experimentally conditioned.

THEORETICAL PROPOSITIONS

Watson theorized that if a stimulus that automatically produces a certain emotion in you (such as fear) 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. 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, involving a subject named "Little Albert B."

METHOD AND RESULTS

The subject, Albert B., was recruited for this study at the age of nine months from a hospital where he had been raised, as an orphan, from birth. He was judged by the researchers and the hospital staff to be very healthy, both emotionally and physically. In order to see if Albert was afraid of certain stimuli, he was presented 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 any of them. Since 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 in Albert by exposing him to a loud noise. All

humans, and especially all infants, will exhibit fear reactions to loud, sudden noises. Since no learning is necessary for this response to occur, the loud noise is called an *unconditioned stimulus.* In this study, a steel bar four feet in length was struck with a hammer 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 test was not done until the child was 11 months old. There was hesitation on the part of the researchers 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 will be discussed in conjunction with the overall ethical problems of this study, later in this chapter.)

As the experiment began, the researchers presented Albert with the white rat and the frightening noise at the same time. 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. Well, 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 to 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 five days Albert was tested again. The sequence of presentations on this day are summarized in Table 1.

Another aspect of conditioned emotional responses Watson wanted to explore was whether the learned emotion would transfer from one situation

TABLE 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

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 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 Raynor wanted to make was to see if Albert's newly learned emotional responses would persist over time. Well, Albert had 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 was still 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 psychology, that our behavior stems from unconscious processes, was wrong. This study, with all its methodological flaws and serious breaches of ethical conduct (to be discussed shortly) succeeded to a large extent in convincing a great portion of 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, personal, and human as an emotion was shown to be subject to conditioning, just as a rat in a maze learns to find the food faster and faster on each successive try.

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. These processes are the same as what Watson found with little Albert, although usually more complex.

Watson was quick to point out that his findings could explain human behavior in rather straightforward and simple terms, compared with the psychoanalytic notions of Freud and his followers. As Watson and Raynor 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, he ceased being afraid. Therefore, Watson interpreted thumb-sucking as a conditioned device for blocking fear-producing stimuli.

An additional attack on Freudian thinking made in this article concerned how Freudians in the future, given the opportunity, might analyze Albert's fear of a white fur coat. Watson and Raynor 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." 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 was commonly interpreted.

QUESTIONS AND CRITICISMS

As you have been reading this, you have probably been concerned or even angered over the treatment by the experimenters of this innocent child. This study clearly violates current standards of ethical conduct in research involving humans. It would be highly unlikely that any human-subjects committee at any research institution would approve this study today. Eighty years 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 considerable hesitation in proceeding with the conditioning process, but decided that it was justifiable, since, 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 Raynor contend 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!).

On a related point, several researchers have criticized Watson's assumption that these conditioned fears would persist indefinitely (Harris, 1979). Others claim that Albert was not conditioned as effectively as the authors maintained (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 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). But as he continued to be exposed to the rabbit without anything frightening occurring (such as that loud noise), very likely he slowly became 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 fields, from psychotherapy to advertising. One study, published in a media journal, relied in part on Watson's theories of how emotional responses can be conditioned. Chaudhuri and Buck (1995) examined the psychological effects of advertising in different types of media. These researchers found that print advertising tends to provoke a reasoned, analytic response, whereas electronic advertising (meaning television) creates more of a conditioned emotional response. In other words, when you are watching commercials on TV, you are Little Albert and the TV is the hammer hitting that big metal bar. This finding was strong enough for them to conclude that selection of media (television vs. print) is the most important factor for an advertiser to consider in achieving their desired impact.

As mentioned earlier 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 later in this book). Watson's research has been incorporated into many recent 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 the first section of this book). They claim to have found that a large percentage of the variation in phobias was due to inherited factors. Specifically, the genetic percentages were as follows: agoraphobia (the irrational fear of open, public spaces), 67%; animal phobias, 47%; phobias involving injury or blood, 59%; phobias about specific situations, 46%; and social phobias, 51%. The authors concluded that, while phobias may be molded by an individual's personal environmental experiences, the role of the family in phobias is biological and environmental influences within the family are very weak. 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.

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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.

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

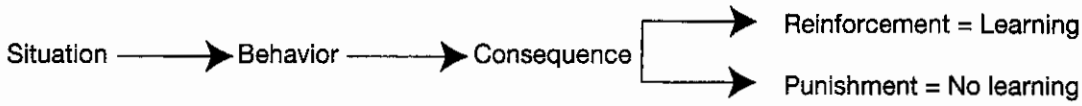
KNOCK WOOD!

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

We will examine one study from a huge body of research carried out by one of the most influential and most widely known psychologists ever, B. F. Skinner. Deciding how to present Skinner and which of his studies to explore was a difficult task. It is clearly impossible to represent adequately in one short article his contributions to the history of psychological research. After all, Skinner is considered by most to be the father of radical behaviorism, is the inventor of the famous (or infamous) *Skinner Box,* and is the author of over a dozen books and more than 70 scientific articles. This article, with the somewhat humorous-sounding title "Superstition in the pigeon," has been selected from all of 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 everything psychological is, essentially, behavioral, including public, or external behavior, and private, or internal, events such as feelings and thoughts. Although he believed that *private* behavior is 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 Michael, 1985, or Schneider & Morris, 1987, for a detailed discussion of the term *radical behaviorism*). So, for Skinner, all behavior, whether internal or external, could be explained by the environmental consequences it produces.

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 and are called punishers. The effects of these relationships between behavior and the environment are called reinforcement and punishment, respectively (Morris, 1997). Reinforcement and punishment are two of the most fundamental processes in what Skinner referred to as operant conditioning and may be diagramed 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 is remove the reinforcement, and the behavior will stop. 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 beggar some food once in a while, extinction will never happen.

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 so easy to identify. Skinner was well known for arguing that if a human behavior was interpreted by others (such as cognitive or humanistic psychologists) to be due to our highly evolved consciousness or intellectual capabilities, it was only because psychologists 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 (thinking, knowing, reasoning). A superstition is a belief in something, and we do not usually attribute such *beliefs* to animals. Well, 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 an 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, change your behavior because of your horoscope? It is probably safe to say that everyone has done something out of superstition 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 that there is a connection between the superstitious behavior and some reinforcing consequence, even though, in reality, there is not. This connection exists because the behavior (such as shaking the dice that certain way) was accidentally reinforced (such as a good roll) once, twice, or several times. Skinner called this *noncontingent* reinforcement, 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.

"And if you think this is some exclusive human activity," Skinner might have said, "I'll make a superstitious pigeon!"

METHOD

In order 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, learn to press the lever for food. Alternately, the experimenter could, if desired, control the food dispenser and reinforce a specific behavior. Later it was 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.

One of these conditioning cages was used in the study discussed here, but with one important change. In order to study superstitious behavior, the food dispenser was rigged to drop food pellets into the tray at intervals of 15 seconds, regardless of what the animal was doing at the time. You can see that this produced noncontingent reinforcement. In other words, the animal received a reward every 15 seconds, no matter what it did.

Subjects in this study were eight pigeons. These birds were fed less than their normal daily amount for several days, so that when tested they would be hungry and therefore highly 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 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 behavior had nothing to do with the pigeon receiving food. Nevertheless, they 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 birds, the interval between the delivery of food pellets was slowly increased to one

minute. When this occurred, the pigeon's movements became more energetic until finally the stepping 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*).

Finally, the new behavior of the birds was 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

Clearly, what Skinner ended up with here was 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. I am sure it is not difficult for you to think of analogies in human behavior, nor was it for 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. As Skinner points out in the case of the pigeons in this study, the food was going to appear no matter what the bird did.

An additional and interesting point made by Skinner in this article was that it is not completely correct to conclude that there is no relationship between the twisting and turning of the bowler and the direction of the ball. What is true is that after the ball has left the bowler's hand, 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, it is a fact that 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 behavior and maintain the superstition.

Finally, 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, 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, for humans, the instances of that accidental reinforcement usually occur at large time intervals, so the superstitious behavior often may persist for a lifetime.

CRITICISMS AND SUBSEQUENT RESEARCH

As mentioned before, Skinner's behaviorist theories and research were always the subject of great and sometimes heated controversy. Other prominent theoretical approaches to human behavior argued that the strict behavioral view was 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 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 a nickel. The correct response was key number 3. However, as in Skinner's study, key number 3 would produce the desired reinforcement 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 hit the third key again and 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 not aware 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, examined new behavioral approaches to understanding the meaning of dreams (see the previous section of this book for

additional discussion of dreaming and dream interpretation). Dixon and Hayes (1999) suggested that through dreaming, people can substitute various stimuli in a given setting and can test various responses to them that in waking life might, or might not, produce the desired consequence. In other words, people may be more superstitious when asleep than when awake!

Another thought-provoking article citing Skinner's 1948 study (Sagvolden et al., 1998) examined the role of reinforcement in attention deficit/hyper activity 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 behaviors that they *believed* were related to the rewards. In other words, they became superstitious in much the same fashion as Skinner's pigeons. In the next phase of the study, the reinforcement was discontinued, which would be expected to cause a decrease and cessation of whatever behaviors had been conditioned (extinction). This is exactly what happened with the non-ADHD boys. 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 ADHD boys 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.

One of Skinner's most famous works, his novel, *Walden Two,* was first published in the same year as his article on pigeon superstition. *Walden Two* was Skinner's personal vision of a utopian society governed by his principles of operant conditioning in which everyone is happy, content, safe, and productive. The extent of Skinner's real-life influences can be illustrated by the fact that in 1967 a community called *Twin Oaks* was established in Virginia and was based on the behavioral concepts embodied in Skinner's novel. *Walden Two* signaled Skinner's willingness to go beyond his laboratory of rats and pigeons and extend his ideas to what might be termed a *behavioral philosophy.* Today, when psychologists write about the larger issues of human behavior in society, *Walden Two* is often cited (see Kimball & Heward, 1993; Malm, 1993).

CONCLUSION

Superstitions are everywhere. You probably have some, and you surely know others who have them. One study of high school and college athletes found that 40% of them engaged in superstitious behavior before or during games (Buhrmann & Zaugg, 1981). 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. Well, that's not exactly true. Obviously there is a 13th floor, but there is no floor that 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 13th floor. Another example is that Americans are so superstitious about $2 bills that the U.S. Treasury has a pile of four million of these bills that people refuse to use!

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.

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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 overabundance of forms, is arguably the greatest social problem facing this country and the world today. Consequently, it is also one of the most heavily researched topics in the history of psychology. Over the years, the behavioral scientists who have been in the forefront of this research have been the social psychologists, whose focus is on 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 goes on. As a result, if you were to consult ten different social psychologists, you would probably get ten 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 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 for aggression, such that violent urges build up in you over time until they demand to be released. Other theories look to situational factors, such as repeated frustration, as the main determinants of aggressive responses. A third view, and one that may be the most widely accepted, is that aggression is learned.

One of the most famous and influential experiments ever conducted in the history of psychology demonstrated how children 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 believe that learning is the primary factor in the development of personality, and that this learning occurs through interactions with other people. 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 (or modeling) the behavior of others.

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 which demonstrated that children readily imitated the behavior of adult models while they were in the presence of the model. One of the things Bandura wanted to address in the new study was whether such imitative learning would generalize to settings in which the model was not with the child.

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 made four predictions:

1. Subjects 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 subjects 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, subjects 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, these methodological steps are presented here.

Subjects

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

Experimental Conditions

Twenty-four children were assigned to the control group, which meant that they would not be exposed to any model. The remaining 48 subjects were first divided into two groups: one exposed to aggressive models and the other exposed to nonaggressive models. These groups were divided again into male and female subjects. Finally, each of these groups were divided so that half of the subjects 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? Bandura guarded against this potential problem by obtaining ratings of each subject'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 the 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 tinker toy set, a mallet, and an inflated Bobo doll 5 feet tall. 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 subjects 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 goodbye to the model, and took the child to another game room.

In the nonaggressive condition, the model simply played quietly with the tinker toys 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 subjects 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 subjects from the various conditions were taken to another room that contained very attractive toys, such as a fire engine, a jet fighter, a complete doll set including wardrobe, a doll carriage, and so on. The researchers believed that in order to test the subjects 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 the subjects to begin playing with the attractive toys, but after a short time told them that the toys in this room were reserved for the other children. The subjects were also told, 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 subject was allowed to play in this room for 20 minutes. During this period, judges behind a one-way mirror rated each child's behavior on several measures of aggression.

Measures of Aggression

A total of eight different responses were measured in the subjects' behavior. In the interest of clarity, only the four most revealing measures will be summarized here. First, all acts that imitated the physical aggression of the model were recorded. These included sitting on Bobo, 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 subjects' repetition of the phrases, "Sock him, Hit him down, Pow," and so on. Third, other mallet aggression (i.e., hitting objects other than the doll with the mallet) were recorded. Fourth, nonimitative aggression was documented by tabulating all subjects' 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 1. If you examine the results carefully, you will discover that three of the four hypotheses presented by Bandura, Ross, and Ross in the introduction were supported.

The children who were exposed to the violent models tended to imitate the exact violent behaviors they observed. There were an average of 38.2 instances of imitative physical aggression for each of the male subjects, and 12.7 for the female subjects who had been exposed to the aggressive models. Additionally, 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 subjects exposed to the nonaggressive models or in the control subjects who were 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. In order for this hypothesis to be supported, the results should show that the subjects in the nonaggressive conditions averaged significantly fewer

TABLE 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)

instances of violence than those in the no-model control group. In Table 1, if you compare the nonaggressive model columns with the control group averages, you'll 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 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 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, while 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.

Finally, boys were significantly more physically aggressive than girls in nearly all the conditions. If all the instances of aggression in Table 1 are tallied, there were 270 violent acts by the boys, compared with 128.3 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 American 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, there have been no fewer than three congressional hearings 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 two 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 control subjects (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 subjects. 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 that 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 much, if not most, of the behaviors that comprise human personality are formed through this modeling process. Second, this research laid the groundwork for hundreds of studies over the past 40 years on the effects on children of viewing violence in person or in the media. (For a summary of Bandura's many contributions to psychology see http://www.ship.edu/~cgboeree/bandura.html, 1998.)

Within the past few years there have been new rounds of congressional hearings on media violence encompassing television and the profound potential effects of 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.

Researchers frequently cite Bandura's study in research about media violence and about modeling. A timely article in a journal devoted to societal influences on children revealed the subjective nature of media violence (Funk et al., 1999). This study focused on the validity of violence rating systems for video and computer games. The authors found that when games were *obviously* violent or nonviolent, people who buy and use the games agreed with the commercial violence ratings. "However," they go on to say, "there is considerable disagreement about notable violent content in games with cartoon-type violence. Recommendations include incorporating consumer perceptions into a comprehensive, content-based informational rating system for all entertainment media" (p. 283). This conclusion is echoed frequently in relation to people's confusion about the number of different rating systems currently in effect for movies, TV shows, video games, music CDs, and so on.

Finally, on a more positive note, Bandura's research on modeled violence was cited in an article that reviewed programs designed to reduce violence in schools (Johnson & Johnson, 1996). These authors reported that when elementary and high school students were trained in conflict-resolution and peer mediation strategies, they were able to facilitate constructive, nonviolent outcomes when conflict arose. Moreover, as other students began to model the behavior of their trained peers, fewer conflicts occurred, the number of conflicts that needed intervention from teachers decreased, and the number of suspensions for violent behavior dropped significantly.

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