

# Chapter I

---

## Roots of Applied Behavior Analysis

---

### Did you know that . . .

- There may be some validity in your mother's claim that "You're just like your father?"
  - Chemicals in your brain may affect your behavior?
  - Pretzels preceded M&Ms as rewards for good behavior?
  - Benjamin Franklin used applied behavior analysis?
- 

### CHAPTER OUTLINE

#### The Usefulness of Explanations

- Biophysical Explanations
- Biochemical Explanations
- The Usefulness of Biophysical and Biochemical Explanations

#### Developmental Explanations

- Psychoanalytic Theory
- A Stage Theory of Cognitive Development
- The Usefulness of Developmental Explanations

#### Cognitive Explanations

- The Usefulness of Cognitive Explanations

#### Behavioral Explanations

- Positive Reinforcement
- Negative Reinforcement

Punishment  
Extinction  
Antecedent Control  
Other Learning Principles  
The Task of the Behaviorist  
The Usefulness of Behavioral Explanations

### Historical Development of Behaviorism

Historical Precedents  
Philosophical and Psychological Antecedents

### Summary

Why do people behave as they do? Why do some people behave in socially approved ways and others in a manner condemned or despised by society? Is it possible to predict what people are likely to do? What can be done to change behavior that is harmful to an individual or destructive to society?

In an effort to answer questions like these, human beings have offered explanations ranging from possession by demons to abnormal quantities of chemicals in the brain. Suggested answers have been debated, written about, attacked, and defended for centuries and continue to be offered today. There are good reasons for continuing to investigate human behavior. Information about the development of certain behaviors in human beings may help parents and teachers find the best way of childrearing or teaching. If we know how people are likely to behave under certain conditions, we can decide whether to provide or avoid such conditions. Those of us who are teachers are particularly concerned with changing behavior; that is, in fact, our job. We want to teach our students to do some things and to stop doing others.

To understand, predict, and change human behavior, we must first understand how human behavior works. We must answer as completely as possible the "why" questions asked above. Therefore, Alexander Pope's dictum that "the proper study of mankind is man" (perhaps rephrased to "the proper study of humanity is people") needs no other revision; it is as true in the 21st century as it was in the 18th.

In this chapter we consider the requirements for meaningful and useful explanations of human behavior. We then describe several interpretations of human behavior that have influenced large numbers of practitioners, including teachers. The discussion traces the historical development of a way to understand and predict human behavior called **applied behavior analysis**.\*

## THE USEFULNESS OF EXPLANATIONS

If a way of explaining behavior is to be useful for the practitioner, it must meet four requirements. First, it should be *inclusive*. It must account for a substantial quantity of behavior. An explanation has limited usefulness if it fails to account for the bulk of human behavior and thus makes prediction and systematic change of behavior impossible. Second, an explanation must be *verifiable*; that is, we should be able to test in some way that it does account for behavior. Third, the explanation should have *predictive utility*. It should provide reliable answers about what people are likely to do under certain circumstances, thereby giving the practitioner the opportunity to change

A useful theory has  
inclusiveness,  
verifiability, predictive  
utility, and parsimony.

\* Words printed in **boldface** in the text are defined in the glossary at the end of the book.

behavior by changing conditions. Fourth, it should be *parsimonious*. A parsimonious explanation is the simplest one that will account for observed phenomena. Parsimony does not guarantee correctness (Mahoney, 1974) because the simplest explanation may not always be the correct one, but it prevents our being so imaginative as to lose touch with the reality of observed data. When the bathroom light fails to operate at 3 a.m., one should check the bulb before calling the electric company to report a blackout. There may be a blackout, but the parsimonious explanation is a burned-out bulb. In examining some of the theories developed to explain human behavior, we shall evaluate each explanation for its inclusiveness, verifiability, predictive utility, and parsimony.

## BIOPHYSICAL EXPLANATIONS

Since physicians of ancient Greece first proposed that human behavior was the result of interactions among four bodily fluids or "humors"—blood, phlegm, yellow bile (choler), and black bile (melancholy)—theorists have searched for explanations for human behavior within the physical structure of the body. Such theories have included those based on genetic or hereditary factors, those that emphasize biochemical influences, and those that suggest aberrant behavior is caused by some damage to the brain. The following anecdote indicates a belief in hereditary influences on behavior.

Some theorists contend  
that human behavior is  
controlled by physical  
influences.



### Professor Grundy Traces the Cause

Having observed an undergraduate student's behavior for some time, Professor Grundy noticed that the student was consistently late for class (when he came at all), invariably unprepared, and frequently inattentive. Because Grundy was certain his dynamic, meaningful lectures were not related to this behavior, he decided to investigate the matter. He paid a visit to the high school attended by the student and located his 10th-grade English teacher, Ms. Marner. "Yes, DeWayne was just like that in high school," said Ms. Marner. "He just didn't get a good background in middle school."

Professor Grundy then went to visit the middle school. "You know," said the guidance counselor, "a lot of our kids are like that. They just don't get the foundation in elementary school." At the elementary school, Professor Grundy talked to the principal. "DeWayne was like that from day one. His home situation was far from ideal. If we don't have support from the home, it's hard to make much progress."

Professor Grundy, sure that he would at last find the answer, went to talk to DeWayne's mother. "I'll tell you," said DeWayne's mother, "he takes after his father's side of the family. They're all just like that."

## Genetic and Hereditary Effects

DeWayne's mother explained his inappropriate behavior by referring to hereditary influences. Could she have been right? The effects of heredity on human behavior, both typical and atypical, have been investigated extensively. There is little question that mental retardation, which results in significant deficits in a wide range of behaviors, is sometimes associated with chromosomal abnormalities or with the inheritance of recessive genes (Patton, Payne, & Beirne-Smith, 1990). Evidence indicates that other behavioral characteristics have some genetic or hereditary basis as well. It is generally accepted that persons with autism have abnormalities in brain development and neurochemistry and that there may be genetic factors related to this disorder (Courchesne, 2004; Freitag, 2007; Prater & Zylstra, 2002). Many emotional and behavior disorders, such as anxiety

disorder, depression schizophrenia, oppositional defiant disorder, and conduct disorder, appear to have some genetic origin (Bassarath, 2001; Burke, Loeber, & Birmaher, 2002). Attention deficit disorder and attention deficit hyperactivity disorder also appear to be genetically related (Larsson, Larsson, & Lichtenstein, 2004), as do some learning disabilities (Raskind, 2001).

In addition, inheritance appears to affect some behavioral characteristics that are not necessarily labeled *deviant* or *atypical*. Thomas and Chess (1977) conducted a study of 136 children whose development was closely monitored for a number of years. The authors identified nine categories of behavior that they labeled *temperament*. The categories included activity level, rhythmicity (regularity), approach or withdrawal, adaptability, intensity of reaction, threshold of responsiveness (sensitivity to stimuli), quality of mood (disposition), distractibility and attention span, and persistence. That these aspects of temperament are observable shortly after birth and remain consistent throughout childhood indicates that they have some constitutional, if not genetic, basis. There is evidence that some clusters of temperamental characteristics may predispose children to be "difficult," but that environmental factors such as childrearing practices have an equal or greater influence on development.

When DeWayne's mother explained her son's behavior to Professor Grundy, her claim that DeWayne takes after his father's family may have involved a degree of truth. It is possible that certain genetic characteristics may increase the probability of certain behavioral characteristics.

### BIOCHEMICAL EXPLANATIONS

Some researchers have suggested that certain behaviors may result from excesses or deficiencies of various substances found in the body. These chemical substances are labeled differently from those hypothesized by the ancient Greeks but are often held responsible for similar disturbances of behavior.

Biochemical abnormalities have been found in some children with serious disturbances of behavior labeled *autism* or *childhood psychosis* (Boullin, Coleman, O'Brien, & Rimland, 1971). Investigation of such factors, however, has established only that biochemical abnormalities exist, not that they cause the disorder.

Other behavior disturbances characterized as hyperactivity, learning disability, or mental retardation have been linked to biophysical factors such as hypoglycemia (Wunderlich, 1977), malnutrition (Cravioto & Delicardie, 1975), and allergic reactions (Feingold, 1975). It is often suggested that biochemical or other physiological factors may, along with other influences, result in damage to the brain or central nervous system.



#### Professor Grundy Learns to Think in Circles

Professor Grundy, as one of his instructional duties, visited student teachers. On his first trip to evaluate Ms. Harper in a primary resource room, he observed that one student, Ralph, wandered continuously about the room. Curious about such behavior, because the other students remained seated, Professor Grundy inquired, "Why is Ralph wandering around the room? Why doesn't he sit down like the others?" Ms. Harper was aghast at such ignorance on the part of a professor.

"Why, Ralph is hyperactive, Professor Grundy. That's why he never stays in his seat."

"Ah," replied the professor. "That's very interesting. How do you know he's hyperactive?"

Some children with disabilities show biochemical abnormalities.

With barely concealed disdain, Ms. Harper hissed, "Professor, I know he's hyperactive because he won't stay in his seat."

After observing the class for a few more minutes, he noticed Ms. Harper and the supervising teacher whispering and casting glances in his direction. Professor Grundy once again attracted Ms. Harper's attention. "What," he inquired politely, "causes Ralph's hyperactivity?"

The disdain was no longer concealed. "Professor," answered Ms. Harper, "hyperactivity is caused by brain damage."

"Indeed," responded the professor, "and you know he has brain damage because . . ."

"Of course I know he has brain damage, Professor. He's hyperactive, isn't he?"

### Brain Damage

The circular reasoning illustrated by Ms. Harper is, unfortunately, not uncommon. Many professionals explain a great deal of students' inappropriate behavior similarly. The notion that certain kinds of behavior result from brain damage has its roots in the work of Goldstein (1939), who studied soldiers having head injuries during World War I. He identified certain behavioral characteristics, including distractibility, perceptual confusion, and hyperactivity. Observing similar characteristics in some children with retardation, some professionals concluded that the children must also be brain injured (Strauss & Werner, 1942; Werner & Strauss, 1940) and that the brain injury was the cause of the behavior. This led to the identification of a hyperkinetic behavior syndrome (Strauss & Lehtinen, 1947), assumed to be the result of brain injury. This syndrome included such characteristics as hyperactivity, distractibility, impulsivity, short attention span, emotional lability (changeability), perceptual problems, and clumsiness. Subsequently, the term *minimal brain dysfunction* was used to describe a disorder assumed to exist in children who, although they had no history of brain injury, behaved similarly to those who did. There is, however, little empirical support for using the possibility of brain injury to account for problem behavior in all children who show such behavioral characteristics. Even when brain damage can be unequivocally shown to exist, there is no proof that it causes any particular behavior or that hyperactivity is a result of that damage for any particular individual (Werry, 1986).

Large numbers of children are presently being defined as "at risk" for the development of academic and social problems because of the effects of both influences before birth (such as parental malnutrition or substance abuse) and environmental factors (Davis & McCaul, 1991). In recent years fetal alcohol syndrome (Batshaw & Conlon, 1997), smoking by expectant mothers (Hetherington & Parke, 1986), illegal drug use by expectant mothers (Shriver & Piersal, 1994), and pediatric AIDS (Diamond & Cohen, 1987) have apparently resulted in increased learning and behavioral problems in children. Although there are clear indications that these factors result in biochemical, central nervous system, and other physiological abnormalities, no specific behavioral deficit or excess is directly attributed to any specific factor (Gelfand, Jenson, & Drew, 1988).

Hyperactivity is not necessarily caused by brain dysfunction.

### THE USEFULNESS OF BIOPHYSICAL AND BIOCHEMICAL EXPLANATIONS

The search for explanations of human behavior based on physiological factors has important implications. As a result of such research, the technology for preventing or lessening some serious problems has been developed. Perhaps the best-known example of such technology is the routine testing of all infants for phenylketonuria (PKU), a hereditary disorder of metabolism. Placing infants with PKU on special diets can prevent the mental retardation formerly associated with this disorder (Berry, 1969). It is possible that future research may explain a good deal more human behavior on a

biological or hereditary basis. Currently, however, only a small part of the vast quantity of human behavior can be explained in this way.

Some biophysical explanations are testable, meeting the second of our four requirements for usefulness. For example, scientists can definitely establish the existence of Down syndrome by observing chromosomes. Some metabolic or biochemical disorders can also be scientifically verified. Verification of such presumed causes of behavior as minimal brain dysfunction, however, is not dependable (Werry, 1986).

Even with evidence of the existence of some physiological disorder, it does not follow that any specific behavior is automatically a result of the disorder. For the teacher, explanations based on presumed physiological disorders have little predictive utility. To say that Rachel cannot walk, talk, or feed herself because she is developmentally delayed as a result of a chromosomal disorder tells us nothing about the conditions under which Rachel might learn to perform these behaviors. Ms. Harper's explanation of Ralph's failure to sit down on the basis of hyperactivity caused by brain damage does not provide any useful information about what might help Ralph learn to stay in his seat. To say that Harold cannot read because he is a child at risk is to put Harold at the greater risk of not learning because we have low expectations for him. Even apparently constitutional differences in temperament are so vulnerable to environmental influences (Thomas & Birch, 1984) that they provide only limited information about how a child is apt to behave under given conditions.

The final criterion, parsimony, is also frequently ignored when physical causes are postulated for student behaviors. Searching for such causes often distracts teachers from simpler, more immediate factors that may be controlling behaviors in the classroom. Perhaps the greatest danger of such explanations is that some teachers may use them as excuses not to teach: Rachel cannot feed herself because she is developmentally delayed, not because I have not taught her. Ralph will not sit down because he is brain damaged, not because I have poor classroom management skills. Irving cannot read because he has dyslexia, not because I have not figured out a way to teach him. Biophysical explanations may also cause teachers to have low expectations for some students. When this happens, teachers might not even try to teach things students are capable of learning. The accompanying chart summarizes the usefulness of biophysical theory.

**The Usefulness of Biophysical Theory**

|                    | Good | Fair | Poor |
|--------------------|------|------|------|
| Inclusiveness      |      |      | ✓    |
| Verifiability      |      | ✓    |      |
| Predictive Utility |      |      | ✓    |
| Parsimony          |      |      | ✓    |

## DEVELOPMENTAL EXPLANATIONS

Observation of human beings confirms that many predictable patterns of development occur. Physical growth proceeds in a fairly consistent manner. Most children start walking, talking, and performing some social behaviors such as smiling in fairly predictable sequences and at generally predictable chronological ages (Gesell & Ilg, 1943). Some theorists have attempted to explain many aspects of human behavior—cognitive, social, emotional, and moral—based on fixed, innate developmental sequences. Their proposed explanations are meant to account for normal as well as “deviant” (other than the accepted or usual) human behavior. The following sections review two of the numerous

developmental theories and examine their usefulness in terms of inclusiveness, verifiability, predictive utility, and parsimony.



### A Freudian by the Garbage Can

Upon returning to the university after observing student teachers, Professor Grundy prepared to return to work on his textbook manuscript, now at least 7 months behind schedule. To his horror, his carefully organized sources, notes, drafts, and revisions were no longer “arranged” on the floor of his office. Worse, his carefully organized sticky notes had been removed from the walls, door, windows, and computer. Professor Grundy ran frantically down the hall, loudly berating the custodial worker who had taken advantage of his absence to remove what he considered “that trash” from the room so that he could vacuum and dust.

As Grundy pawed through the outside garbage can, a colleague offered sympathy. “That’s what happens when an anal-expulsive personality conflicts with an anal-retentive.” Grundy’s regrettably loud and obscene response to this observation drew the additional comment, “Definite signs of regression to the oral-aggressive stage there, Grundy.”



*“Well, well, Professor Grundy, did you lose something or are you just doing ‘research’ on the things you professors throw away?”*

## PSYCHOANALYTIC THEORY

Although many different explanations of human behavior have been described as psychoanalytic, all have their roots in theories of Sigmund Freud (Fine, 1973), who described human behavior in an essentially developmental manner (Kessler, 1966). Freud’s assertion that normal and aberrant human behavior may be understood and explained on the basis of progression through certain crucial stages (Hall, 1954) is perhaps the most commonly accepted and most widely disseminated of his theories. The hypothetical stages include oral (dependent and aggressive), anal (expulsive and retentive), and phallic (when gender awareness occurs). These stages are believed to occur before

the age of 6 and, if mastered, result in emergence into the latency stage, which represents a sort of rest stop until puberty, when the last stage, the genital stage, emerges.

This theory suggests that people who progress through the stages successfully become relatively normal adults. In Freud's view, problems arise when a person fixates (or becomes stuck) at a certain stage or when anxiety causes a regression to a previous stage. People who fixate at or regress to the oral-dependent stage may merely be extremely dependent, or they may seek to solve problems by oral means such as overeating, smoking, or alcohol or drug abuse. A person fixated at the oral-aggressive stage may be sarcastic or verbally abusive. Fixation at the anal-expulsive stage results in messiness and disorganization; at the anal-retentive stage, in compulsive orderliness.

### A STAGE THEORY OF COGNITIVE DEVELOPMENT

Jean Piaget was a biologist and psychologist who proposed a stage theory of human development. Piaget's descriptions of the cognitive and moral development of children have had extensive impact among educators. Like Freud, Piaget theorized that certain forces, biologically determined, contribute to development (Piaget & Inhelder, 1969). The forces suggested by Piaget, however, are those enabling the organism to adapt to the environment—specifically, assimilation, the tendency to adapt the environment to enhance personal functioning, and accommodation, the tendency to change behavior to adapt to the environment. The process of maintaining a balance between these two forces is called equilibration. Equilibration facilitates growth; other factors that also do so are organic maturation, experience, and social interaction. Piaget's stages include sensory-motor (birth to 1 1/2 years), preoperational (1 1/2 to 7 years), concrete operations (7 to 11 years), and formal operations (12 years to adulthood) (Dember & Jenkins, 1970).

### THE USEFULNESS OF DEVELOPMENTAL EXPLANATIONS

Both developmental theories we have discussed are inclusive; they apparently explain a great deal of human behavior, cognitive and affective, normal and atypical. Verifiability, however, is another matter. Although Piagetian theorists have repeatedly demonstrated the existence of academic and preacademic behaviors that appear to be age related in many children (Piaget & Inhelder, 1969), attempts to verify psychoanalytic explanations have not been successful (Achenbach & Lewis, 1971). Considerable resistance to verifying theoretical constructs exists among those who accept the psychoanalytic explanation of human behavior (Schultz, 1969). Although it can be verified that many people act in certain ways at certain ages, this does not prove that the cause of such behavior is an underlying developmental stage or that failure to reach or pass such a stage causes inappropriate or maladaptive behavior. There is little evidence to verify that the order of such stages is invariant or that reaching or passing through earlier stages is necessary for functioning at higher levels. (Phillips & Kelly, 1975). The accompanying chart summarizes the usefulness of developmental theory.

| The Usefulness of Developmental Theory |      |      |      |
|----------------------------------------|------|------|------|
|                                        | Good | Fair | Poor |
| Inclusiveness                          | ✓    |      |      |
| Verifiability                          |      |      | ✓    |
| Predictive Utility                     |      | ✓    |      |
| Parsimony                              |      |      | ✓    |

Some developmental theories can predict what some human beings will do at certain ages. By their nature these theories offer general information about average persons. However, "a prediction about what the average individual will do is of no value in dealing with a particular individual" (Skinner, 1953, p. 19). Developmental theories do not provide information about what conditions predict an individual's behavior in specific circumstances. The practitioner who wishes to change behavior by changing conditions can expect little help from developmental theories. Developmental explanations of behavior are equally inadequate when judged by the criterion of parsimony. To say that a child has temper tantrums because he is fixated at the oral stage of development is seldom the simplest explanation available. Because of their lack of parsimony, developmental explanations may lead the teacher to excuses as unproductive as those prompted by biophysical explanations. Teachers, particularly teachers of students with disabilities, may wait forever for a student to become developmentally ready for each learning task. An explanation that encourages teachers to take students from their current levels to subsequent levels is clearly more useful than a developmental explanation—at least from a practical point of view. We might expect Professor Grundy's developmental colleagues, for example, to explain Grundy's difficulty with the concept of hyperactivity on the basis of his failure to reach the level of formal operational thinking required to deal with hypothetical constructs. Might there be a more parsimonious, more useful explanation of his behavior? Professor Grundy continues to collect theories of behavior in the following episode.



#### Professor Grundy Gains Insight

Having been thoroughly demoralized by his interaction with his student teacher, Professor Grundy decided to pay another surprise visit that afternoon. He was determined to avoid subjecting himself to further ridicule. He did not mention Ralph's hyperactivity but instead concentrated on observing Ms. Harper's teaching. Her lesson plan indicated that she was teaching math, but Professor Grundy was confused by the fact that her group was playing with small wooden blocks of various sizes. Ms. Harper sat at the table with the group but did not interact with the students.

At the conclusion of the lesson, Professor Grundy approached Ms. Harper and asked her why she was not teaching basic addition and subtraction facts as she had planned.

"Professor," stated Ms. Harper, "I conducted my lesson exactly as I had planned. The students were using the blocks to gain insight into the relationship among numbers. Perhaps you are not familiar with the constructivist approach, but everyone knows that true insight is vital to the learning process and that it is impossible to teach children; we can only facilitate their own inner construction of knowledge."

### COGNITIVE EXPLANATIONS

The educational theory espoused (in a somewhat exaggerated form, to be sure) by Ms. Harper is based on an explanation of human behavior and learning that combines elements of developmental theory, especially Piagetian, with a theory first described in Germany in the early part of the 20th century. The first major proponent of this explanation was Max Wertheimer (Hill, 1963), who was interested in people's perception of reality.

Wertheimer suggested it was the relationship among things perceived that was important rather than the things themselves. People, he said, tend to perceive things in an

organized fashion, so that what is seen or heard is different from merely the parts that compose it. He labeled an organized perception of this type a *gestalt*, using a German word for which there is no exact English equivalent but which may be translated as "form," "pattern," or "configuration." English-speaking advocates of this view have retained the word *gestalt*, and we call this explanation Gestalt psychology. Koffka (1935) applied Wertheimer's theories to learning as well as perception. He concluded that learning in human beings is also a process of imposing structure on perceived information. Wertheimer also applied gestalt theory to human problem solving. He studied children's and adults' insights into geometric problems and concluded that meaningful solutions depended on insight and that rote learning—even if it led to correct solutions to problems—was less useful.

Gestalt psychology has had considerable influence on education. The best-known educator to espouse this approach to understanding behavior is Jerome Bruner (1960). What has come to be called the cognitive theory of education places an emphasis on rearranging thought patterns and gaining insight as a basis for learning new academic and social behaviors. The resulting teaching practices are called discovery learning. Learning is explained on the basis of insight, pattern rearrangement, and intuitive leaps. Teachers do not impart knowledge; they merely arrange the environment to facilitate discovery. Motivation is presumed to occur as a result of innate needs that are met when organization is imposed on objects or events in the arrangement. Motivation is thus intrinsic and need not be provided by the teacher. In its latest manifestation, cognitive theory applied to education has been termed *constructivism*. This approach holds that teachers cannot provide knowledge to students; students must construct their own knowledge in their own minds (Brooks, 1990). "Rather than behaviours or skills as the goal of instruction, concept development and deep understanding are the foci" (Fosnot, 1996, p. 10).

Principles derived from Gestalt psychology have also been applied to social behavior, notably in the work of Lewin (1951). His approach has been called *field theory* or *cognitive field theory*. Lewin described human social behavior as based on factors within the person's "life space," the environment as it is perceived by the person and as it affects the person's behavior. He asserted that different people perceive and value environmental objects and events in different ways and that forces exist within people to move them toward or away from these objects or events. Based on a complex procedure for "mapping" or drawing diagrams of people's life spaces, Lewin stated that predictions could be made about what people would do based on the value of the events and the strength of the force. Changing behavior thus depends on changing people's perceptions of their life space and the relationships among the various events and objects in it.

### THE USEFULNESS OF COGNITIVE EXPLANATIONS

Cognitive theory explains a great deal of human behavior. Theorists can account for both intellectual and social behavior. Virtually all behavior can be explained as the result of imposing structure on unstructured environmental events or of perceiving the relative importance of such events. Thus, cognitive theory meets the criterion of inclusiveness.

The theory lacks verifiability, however. Because all the processes that are supposed to take place occur internally, there is no way to confirm their existence. Only the outcome is verifiable—the process is assumed.

The predictive utility of cognitive theory is also extremely limited. In academic areas, the teacher who uses a discovery or constructivist approach has very little control over what students will discover or construct. Most advocates of this approach would insist

Educators who espouse gestalt theory encourage "discovery learning."

that they do not want to predict outcomes of learning. Unfortunately, this unwillingness to control the outcome of the teaching-learning process has led to rather poor results. Educational practices based on a cognitive approach have been less successful than those emphasizing direct instruction (Engelmann & Carnine, 1982).

The predictive utility of cognitive field theory is somewhat greater than that of cognitive theory. If we know enough about the objects and events in a person's life space, the value that she assigns them, and her motivation to approach or avoid them, we may be able to predict behavior. Given all this information, of course, we could almost certainly predict behavior without recourse to theory.

Addressing our final criterion, we must conclude that cognitive theory is not parsimonious. In neither intellectual nor social areas are the explanations necessary to understanding or predicting behavior.

#### The Usefulness of Cognitive Theory

|                    | Good | Fair | Poor |
|--------------------|------|------|------|
| Inclusiveness      | ✓    |      |      |
| Verifiability      |      |      | ✓    |
| Predictive Utility |      |      | ✓    |
| Parsimony          |      |      | ✓    |

Although all the theories described so far provide information about human behavior, none of them meets all four of our criteria. The explanations we have provided are very general, and our conclusions about their usefulness should not be taken as an indication that they have no value. We simply believe they provide insufficient practical guidance for classroom teachers. After the following vignette, we shall describe a behavioral explanation of human behavior that we believe most nearly reaches the criteria of inclusiveness, verifiability, predictive utility, and parsimony.



#### Professor Grundy Takes Action

Professor Grundy had an absolutely rotten day. A number of the students in his 8 a.m. class—including, of course, DeWayne—had come in late, disrupting his lecture. He had been ridiculed by a student teacher; his precious manuscript had been retrieved from the dumpster in a sadly wrinkled and malodorous condition; his colleague had made repeated references to "anal-expulsive" and "oral-aggressive" tendencies during the day in spite of Grundy's protests.

After arriving at home and pouring himself a large drink for medicinal purposes, Grundy decided something must be done. He made several detailed plans and retired for the evening, confident he was on the right track. The next morning he arose, enthusiastically determined, in spite of a slight headache, to put his plans into action.

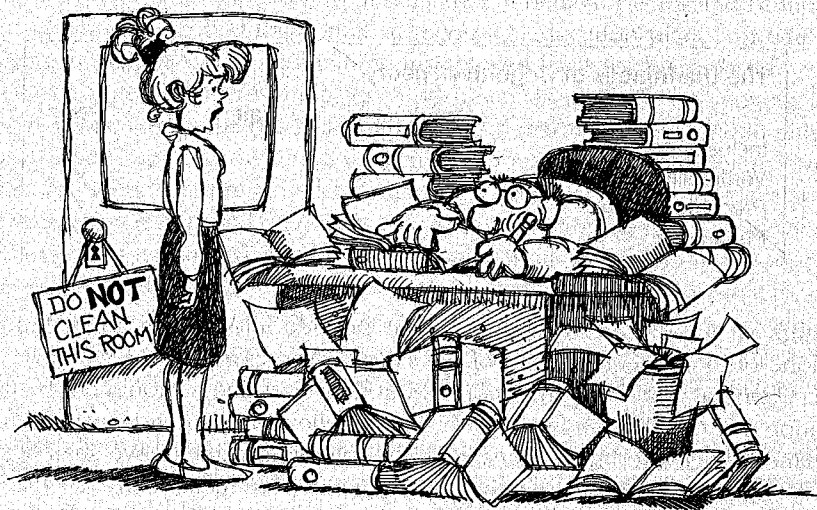
His first step was to arrive at his 8 a.m. class 5 minutes early—somewhat of a novelty because he usually arrived several minutes late. He spent the extra 5 minutes chatting affably with students and clarifying points from the previous day's lecture when asked to do so. At 8:00 sharp, he presented each of the five students present with an "on-time slip" worth 2 points on the next exam.

After the morning lecture, Professor Grundy proceeded to his office, where he affixed to the door a large sign reading "PLEASE DO NOT CLEAN THIS OFFICE TODAY!" He then

opened the window, wondering just what the biology department had deposited in the dumpster to cause so strong a smell. He spent an hour reorganizing his notes.

Next, Grundy once again visited Ms. Harper, this time suggesting that she would receive an unsatisfactory grade for student teaching unless she learned to control Ralph's behavior and to teach basic math facts. Her habitual expression of disdain changed to one of rapt attention. Professor Grundy had observed that Ralph, because he was too "hyperactive" to remain in his seat, spent the time while other students worked wandering from toy to toy in the free-time area of the classroom. He suggested that Ms. Harper allow Ralph to play with the toys only after remaining in his seat for a specified length of time: very short periods at first, gradually increasing in length. Grundy further suggested the student teacher make flash cards of basic addition and subtraction facts, allowing the students to play with the colored blocks after they had learned several combinations.

*"The librarian sent me over to pick up one of your 48 overdue books... if you're... uh... done with it."*



Returning happily to his office, the professor encountered his psychoanalytically oriented colleague, who once again jocularly repeated his insights into Grundy's character. Ignoring the comments, the professor began an animated conversation with the departmental office associate, praising the rapidity with which she was helping him reorganize his manuscript. She assured him it had first priority, because she couldn't wait to be rid of the stinking pages.

Within a short time, Professor Grundy felt that he had things under control. Most of the students enrolled in his 8 a.m. class were present and on time every morning, even though Grundy had begun to give "on-time slips" only occasionally. Ms. Harper had stopped sneering and started teaching. Ralph's wandering had decreased dramatically, and the math group had learned to add and subtract. Grundy continued to ignore his colleague's comments, which gradually ceased when no response was forthcoming, and his notes and drafts were rapidly being transformed into a freshly processed manuscript. The only negative outcome was a sharp note from campus security stating that the condition of his office constituted a fire hazard and that it must be cleaned immediately.

## BEHAVIORAL EXPLANATIONS

In the preceding vignette, Professor Grundy emerged as the behaviorist that he is. To solve some of his problems, he used techniques derived from yet another explanation of human behavior. The behavioral explanation states that human behavior, both adaptive and maladaptive, is learned. Learning occurs as a result of the consequences

of behavior. To put it very simply, behavior that is followed by pleasant consequences tends to be repeated and thus learned. Behavior that is followed by unpleasant consequences tends not to be repeated and thus not learned. By assuming that his students, including DeWayne, came to class late, that the custodian cleaned, that the student teacher ridiculed, that Ralph wandered, and that his psychoanalytic colleague teased because they had learned to do so, Professor Grundy was able to teach them to do other things instead. In doing so, he applied several learning principles underlying the behaviorists' view of human behavior. The following sections introduce these principles, each of which will be discussed in detail in later chapters.

## POSITIVE REINFORCEMENT

**Positive reinforcement** describes a functional relation between two environmental events: a **behavior** (any observable action) and a **consequence** (a result of that action). Positive reinforcement is demonstrated when a behavior is followed by a consequence that increases the behavior's rate of occurrence.

Many human behaviors are learned as a result of positive reinforcement. Parents who praise their children for putting away toys may teach the children to be neat; parents who give their children candy to make them stop screaming in the grocery store may teach the children to scream. The cleaning behavior of Professor Grundy's custodian undoubtedly was learned and maintained through positive reinforcement, as was the wit of Grundy's psychoanalytic colleague. Grundy used positive reinforcement (on-time tickets, conversation, and time with toys) to increase his students' rate of coming to class on time and the amount of time Ralph stayed in his seat.

## NEGATIVE REINFORCEMENT

**Negative reinforcement** describes a relationship among events in which the rate of a behavior's occurrence increases when some (usually aversive or unpleasant) environmental condition is removed or reduced in intensity. Human beings learn many behaviors when acting in a certain way results in the termination of unpleasantness. Professor Grundy, for example, learned that opening windows results in the reduction of unpleasant odors in closed rooms. Similarly, the office associate reorganized his manuscript rapidly because when she finished, she could throw away the smelly papers.

## PUNISHMENT

The word **punishment** also describes a relationship: a behavior is followed by a consequence that decreases the behavior's future rate of occurrence. An event is described as a **punisher** only if the rate of occurrence of the preceding behavior decreases. Behaviorists use the word *punishment* as a technical term to describe a specific relationship; confusion may arise because the same word is used in a nontechnical sense to describe unpleasant things done to people in an effort to change their behavior. To the behaviorist, punishment occurs only when the preceding behavior decreases. In the technical sense of the term, something is not necessarily punishment merely because someone perceives the consequent event as unpleasant. A behaviorist can never say, "I punished him, but it didn't change his behavior," as do many parents and teachers. It is punishment only if the functional relation can be established. People could say that Professor Grundy's verbal threat to Ms. Harper, for example, was apparently a punisher: her ridiculing comments to him stopped. Of course, we wish he had used a more positive approach.

*Chapter 7 describes reinforcement in detail.*

*Chapter 8 describes punishment and extinction in detail.*

## EXTINCTION

When a previously reinforced behavior is no longer reinforced, its rate of occurrence decreases. This relationship is described as **extinction**. Recall from our vignette that when Grundy no longer reacted to his colleague's ridicule, the behavior stopped. For a behaviorist, all learning principles are defined on the basis of what actually happens, not what we think is happening. Grundy may have thought he was punishing his colleague by yelling or otherwise expressing his annoyance. In reality, the rate of the behavior increased when Grundy reacted in this way; the real relationship was that of positive reinforcement. The behavior stopped when the positive reinforcer was withdrawn.

## ANTECEDENT CONTROL

*Stimulus control is the focus of Chapter 9.*

Requirements that a functional assessment or analysis be performed for students with disabilities before changes in placement can be made (see Chapter 6 for a detailed discussion) have greatly increased interest in antecedent control. Teachers and researchers have come to rely much more frequently on examination of antecedent events and conditions, those occurring before the behavior, to determine what might be setting the stage for appropriate or challenging behaviors. There is also increased emphasis on manipulating antecedent conditions or events to manage behavior.

An antecedent that occurs immediately before a behavior is called a discriminative stimulus and is said to "occasion" (to set the occasion for) a behavior. There is a functional relation, called **stimulus control**, between behavior and an **antecedent stimulus** rather than behavior and its consequences. Consequences must have been present during the development of the relation, but the antecedent condition or event now serves as a signal or cue for the behavior. In our vignette, the custodian's adherence to posted notices had apparently been reinforced in the past, so Professor Grundy's sign was effective even in the absence of a reinforcer or a punisher.

Recently, researchers have been investigating more distant varieties of antecedent events and conditions (Smith & Iwata, 1997). Often referred to as **setting events** or *establishing operations*,\* these conditions or events may occur simultaneously with a discriminative stimulus or hours or even days before (Horner, Vaughn, Day, & Ard, 1996). They may occur in the same setting or in a completely different one. They influence behavior by temporarily changing the value or effectiveness of reinforcers. The simplest kinds of setting events to describe are deprivation and satiation. A student who has just come in from the playground, sweating buckets from playing a hard game of kickball, is likely to be more responsive to a soft drink as a potential reinforcer than one who has just consumed a soda in the air-conditioned cafeteria. Setting events, however, can be much more complex. Kazdin (2000) described three types of setting events: social, physiological, and environmental. Bailey, Wolery, and Sugai (1988) subdivided environmental setting events into instructional dimensions, physical dimensions, social dimensions, and environmental changes. These varieties of conditions and events may include variables as diverse as a noisy or uncomfortably warm classroom (environmental), the presence of a disliked staff member or peer (social), or a headache (physiological).

Bailey et al. (1988) included considerations about instructional materials that may not be age appropriate or gender appropriate. It may be that no reinforcer will (or indeed

\* Some authors (Michael, 2000) use the term *establishing operations*; others (Kazdin, 2000) use *setting events*. Some use the terms interchangeably; others differentiate between them. Kennedy and Meyer (1998) suggest that the terms describe similar concepts from different theoretical perspectives. Until the confusion about terminology (sometimes within a single edited text) is cleared up (Horner & Harvey, 2000), we prefer to use the term *setting events*.

should) induce a teenage boy to touch, much less read, a colorfully illustrated book about the little mermaid. We believe that issues of students' ethnic or cultural heritage can also serve as setting events. Students are much more motivated to interact with materials that portray people like themselves (Gay, 2002). Attention to cultural diversity may enable teachers to provide reinforcers that are more meaningful and powerful and to avoid strategies that are ineffective or offensive. Strategies such as personalized contextual instruction (Voltz, 2003) that embed instruction into contexts of interest to students in a given setting (Voltz, 1999) may enhance the value of reinforcers. The following anecdote describes a classroom using this approach.

### Music Hath Charms

Ms. Garcia, a general education teacher, Mr. Walden, a special education teacher, and Ms. Nguyen, a paraprofessional, share the responsibility for an inclusive primary class of 25 students that they privately agree "gives new meaning to the term diversity." Their students range in age from 7 to 9. They have 14 boys and 11 girls: 12 African-American students, 8 Hispanic students, and 4 Asian students. They have 7 children with learning disabilities, 4 children with behavior disorders, and 2 children who are intellectually gifted. And they have Yuri, a boy from Russia who has autism. What the children have in common is eligibility for free or reduced-price lunch and the fact that all of their teachers believe every one of them is capable of great things.

Things had been going well; the teachers used the standard curriculum and a combination of group and individual teaching. They used a simple point system with the class as a whole (the students could earn tangibles and activities for completing work and behaving appropriately) and implemented more complex positive behavior support plans with some children with more challenging behaviors. The students were making good academic progress but, as Mr. Walden stated at a meeting one afternoon, "Nobody seems real excited about school except us." The three teachers decided to implement an integrated unit approach that Ms. Garcia had learned about in a class she was taking at the local university and researched on the Internet and at the university library. The next morning Ms. Garcia explained the plan to the students, asking them to think about what they would like to study. The students seemed to think the teachers must be kidding and made several suggestions ranging from sports to dinosaurs, but most of the interest appeared to center around music. "Rap!" shouted several students. "Salsa!" suggested others. "All right," agreed Ms. Garcia, as Ms. Nguyen and Mr. Walden moved around praising students who were attending, "Let's make a list of what we already know about music and then a list of things we would like to know. Ms. Nguyen, would you help Yuri put the sticky notes with our ideas on the board?"

After almost an hour they had a good list to start out with and the teachers were startled to see that it was almost lunchtime. They were even more startled to realize that no one had given the students points all morning and that verbal praise and pats on the back had been enough.

## OTHER LEARNING PRINCIPLES

In addition to these major learning principles, Professor Grundy illustrated the use of several other influences on human behavior described by behaviorists. These influences include **modeling** and **shaping**. Modeling is the demonstration of behavior. The professor had been modeling inappropriate behavior—coming to class late—and his students had apparently been imitating that behavior. People learn many behaviors, both appropriate and inappropriate, by imitating a model. Infants learn to talk by imitating their caregivers; adults can learn to operate complex machinery by watching a demonstration. Bandura (1977) developed a social-learning theory that describes the power of observation in facilitating learning.

Shaping uses the reinforcement of successive approximations to a desired behavior to teach new behavior. Grundy suggested that Ms. Harper use shaping to teach Ralph to stay in his seat. She was initially to reinforce sitting behavior when it occurred for short periods of time and gradually increase the sitting time required for Ralph to earn the reinforcer.

Many behaviors are taught by shaping. Parents may praise a young child effusively the first time she dresses herself, even if her blouse is on inside out and her shorts are on backward. Later she may earn a compliment only if her outfit is perfectly coordinated.

### THE TASK OF THE BEHAVIORIST

*If you can see it, hear it, feel it, or smell it, it's observable. If you can count it or measure it, it's quantifiable.*

Behaviorists explain the development of both typical and atypical human behavior in terms of the principles just described. An important aspect of this approach is its emphasis on behavior. To qualify as a behavior, something must be *observable* and *quantifiable* (Baer, Wolf, & Risley, 1968). We must be able to see (or sometimes hear, feel, or even smell) the behavior. To make such direct observation meaningful, some way of measuring the behavior in quantitative terms (How much? How long? How often?) must be established. Behaviorists cannot reliably state that any of the relations described as learning principles exist unless these criteria are met.

Skinner (1953) suggested that behaviorists are less concerned with explaining behavior than with describing it. The emphasis, he states, is on which environmental factors increase, decrease, or maintain the rate of occurrence of specific behaviors. It is important to note that behaviorists do not deny the existence of physiological problems that may contribute to some behavioral problems. Nor do most behaviorists deny the effects of heredity (Mahoney, 1974) or even developmental stages (Ferster, Culbertson, & Boren, 1975). Their primary emphasis, however, is on present environmental conditions maintaining behavior and on establishing and verifying functional relations between such conditions and behavior.

### THE USEFULNESS OF BEHAVIORAL EXPLANATIONS

One of the most common criticisms of the behavioral approach is that it leaves much of human behavior unexplained. Emphasis on observable behavior has led many to assume that behavioral principles cannot account for any but simple motor responses. However, Skinner (1953, 1957, 1971) applied basic learning principles to explain a wide variety of complex human behavior, including verbal behavior and sociological, economic, political, and religious beliefs.

The fact that behavioral principles have not accounted for all aspects of human behavior should not lead to the assumption that they cannot. In the years since Skinner first identified the principles of behavior that developed into the discipline of applied behavior analysis, many aspects have been accounted for. Many phenomena have yet to be explained. "In the meantime—which may last forever—the best strategy is to isolate variables that influence important behavior and manipulate those variables to make life better" (Poling & Byrne, 1996, p. 79). Because behaviorists refuse to theorize about what they have not observed, explanation must await verification. Behaviorists are ready temporarily to sacrifice some degree of inclusiveness for verifiability.

Verifiability is the essence of the behavioral explanation. Other theorists posit a theory and attempt to verify it through experimental investigation. Behaviorists, on the other hand, investigate before formulating what may be described as generalizations rather than theories. That adult attention serves as a positive reinforcer for most children (Baer & Wolf, 1968; Harris, Johnston, Kelley, & Wolf, 1964) is an example of such a generalization. This statement was made only after repeated observations established a functional relation between children's behavior and adult attention. The accompanying chart summarizes the usefulness of behavioral theory.

The focus of the behavioral approach is changing behavior. Predictive utility is an essential part of any behavioral explanation. Functional relations are established and

### The Usefulness of Behavioral Theory

|                    | Good | Fair | Poor |
|--------------------|------|------|------|
| Inclusiveness      |      | ✓    |      |
| Verifiability      | ✓    |      |      |
| Predictive Utility | ✓    |      |      |
| Parsimony          | ✓    |      |      |

generalizations are made precisely so that they can be used to change maladaptive or inappropriate behavior and increase appropriate behavior. Behaviorists are reinforced by changing behavior, not by discussing it. Unless it is possible to use generalizations to predict what people will do under certain conditions, behaviorists see little point in making the statements. An enormous body of evidence exists, representing the application of learning principles to human behavior. Such data make possible the prediction of behavior under a wide variety of conditions.

Behavioral explanations are parsimonious, satisfying our fourth criterion for usefulness. Describing behavior solely in terms of observable, verifiable, functional relations avoids the use of "explanatory fictions." Such fictions are defined only in terms of their effects, resulting in the circular reasoning we discussed earlier. Rather than invoking "hyperactivity"—an example of an explanatory fiction—to explain Ralph's out-of-seat behavior, Professor Grundy chose a behavioral approach to look at what happened before and after Ralph left his seat. In this way, behaviorism avoids explanations distant from observed behavior and its relationship to the environment. It is unacceptable to explain out-of-seat behavior by labeling the cause as hyperactivity or to explain messiness as fixation at or regression to the anal-expulsive stage of behavior. Neither explanation adds anything useful to our information about the problem.

Haughton and Ayllon (1965) offered one example of the fluency with which many professionals are willing to invoke unparsimonious explanations of behavior. The authors were working with a hospitalized mental patient whose behavior for many years had been limited to sitting and smoking cigarettes. After a period during which smoking was limited, the patient was given cigarettes only when standing up and holding a broom. The patient began carrying the broom most of the time. Two psychiatrists were asked to observe and evaluate the patient's behavior. Both offered lengthy and complex explanations, suggesting that the broom served a function similar to that of a young child's "blankie" or that it represented an infant she wished she had, or the scepter of an omnipotent queen. When staff members stopped giving cigarettes to the woman while she was carrying the broom, she stopped carrying the broom. Although we stated earlier that the parsimonious explanation may not always be correct, in this case it was. Even when the development of unusual behavior is not as easy to trace as in this example, the assumption that such behaviors are being maintained by current environmental conditions and that the behavior may be changed by changing the environment is not merely parsimonious, it is supremely optimistic. The teacher who concentrates on discovering and changing the environmental conditions maintaining students' inappropriate or maladaptive behavior does not give up on them because they have cultural differences, retardation, brain damage, emotional disturbance, hyperactivity, or are at risk, or developmentally unready to learn; she teaches them. If students' behavior is described in terms of behavioral excesses (too much moving around) or deficits (too little reading), as suggested by Gelfand and Hartmann (1975) and Hersen and Bellack (1977), rather than

*"Explanatory fictions"  
explain nothing.  
Behaviorists explain  
behavior on the basis of  
observation, not  
imagination.*

in terms of explanatory fictions, the teacher can go about the business of teaching—decreasing behavioral excesses and overcoming behavioral deficits.

## HISTORICAL DEVELOPMENT OF BEHAVIORISM

Behaviorism as a science has roots in philosophical and psychological traditions originating several centuries ago. The learning principles described earlier certainly existed before being formally defined. People's behavior has been influenced since the beginning of civilization. In the following section, we will examine several historical descriptions of how people have used the relation between behavior and its consequences. Then we will trace the development of behaviorism as a formal way of explaining, predicting, and changing human behavior.

### HISTORICAL PRECEDENTS

The arrangement of environmental conditions in order to influence behavior is by no means a recent invention. It is said that the ancient Romans put eels in the bottom of wine cups to decrease excessive drinking. Crossman (1975, p.348) provided an historical example of the use of positive reinforcement.

There is a fascinating history behind the pretzel. About 610 an imaginative Alpine monk formed the ends of dough, left over from the baking of bread, into baked strips folded into a looped twist so as to represent the folded arms of children in prayer. The tasty treat was offered to the children as they learned their prayers and thereby came to be called "pretiola"—Latin for "little reward." [From the back of a Country Club Foods pretzel bag, Salt Lake City.]

Educators used behavioral principles long before the principles were formally identified.

Several innovative educators developed elaborate programs of reward and punishment to manage their students' behavior. In the early 19th century, Lancaster (Kaestle, 1973) instituted a system in Great Britain that was later also used in the United States. Students earned tickets that could be exchanged for prizes or money. They lost tickets when they misbehaved.

Benjamin Franklin demonstrated that adults' behavior could also be changed, using a rather different positive reinforcer (Skinner, 1969). When a ship's chaplain complained that few sailors attended prayers, Franklin suggested that the chaplain take charge of serving the sailors' daily ration of rum and deal it out only after the prayers. Attendance improved remarkably.

Behavioral principles operate whether anyone is consciously using them.

Parents and teachers have likewise applied the principles of learning in their efforts to teach children. "Clean up your plate and then you can have dessert," says the parent hoping for positive reinforcement. "When you finish your arithmetic, you may play a game," promises the teacher. Parents and teachers, whether they are aware of it or not, also use punishment: the child who runs into the street is spanked; the student who finishes his assignment quickly is given more work to do. All of us have heard "Just ignore him and he'll stop. He's only doing it for attention." If he does stop, we have an example of extinction. Of course, many parents and teachers extinguish appropriate behavior as well, paying no attention to children who are behaving nicely. Negative reinforcement is demonstrated in many homes every day: "You don't play outside until that room is clean." Teachers also use negative reinforcement when they require students, for example, to finish assignments before going to lunch or to recess. Kindergarten teachers who ask their charges to use their "inside voices" are trying to establish stimulus control. Whenever teachers show their students how to do something, they are modeling.

It becomes apparent that a person does not need to know the names of the relationships involved to use them. Indeed, applying behavioral learning principles sounds a lot

like common sense. If it is so simple, why must students take courses and read books? Why have such quantities of material been written and so much research conducted?

The answer is that it is inefficient to fail to arrange environmental conditions so that functional relations are established, or to allow such relations to be randomly established, or to assume that such relations have been established based only on common sense. This inefficiency has resulted in high levels of maladaptive behavior in schools and sometimes frighteningly low levels of academic and preacademic learning. It is our aim in writing this book to help teachers become applied behavior analysts. The derivation and definition of the term *applied behavior analysis* will be discussed in the remaining sections of this chapter.

### PHILOSOPHICAL AND PSYCHOLOGICAL ANTECEDENTS

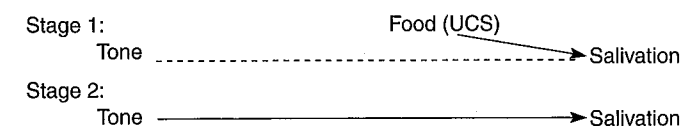
The roots of the behavioral viewpoint are firmly planted in a 19th-century philosophical movement known as *positivism*, which in its turn evolved from the 17th-century writings of Francis Bacon (Smith, 1992). Positivism's earliest proponent, Auguste Comte, emphasized that the only valid knowledge was that which was objectively observable.

A second important contribution came from animal psychology, influenced by the work of Charles Darwin (Boring, 1950), which emphasized the continuity between animal and human behavior and thus suggested that something about human beings could be learned through the careful observation of other animals. Animal psychology focused on the adaptation of physical structures in the body to the environment. This focus led to consideration of mental processes in the same light and to a psychological movement known as *functionalism*.

Functionalism was a third important influence on the development of a behavioral approach to explaining human behavior. William James, whose work was a precursor of behaviorism (Boring, 1950), noted that Dewey and James Angell were also influential in turning the emphasis in American psychology from an introspective, theorizing model to one emphasizing a practical, observational approach.

### Respondent Conditioning

Most people are aware of the work of Ivan Pavlov, who observed that when a tone was sounded as dogs were fed, the dogs began to salivate when they heard the tone even when food was not present. (Anyone who feeds dogs can observe a similar phenomenon when the dogs arrive drooling when they hear the food pans being taken from the dishwasher.) Pavlov's precise observation and measurement have served as a model for experimental research to this day. His classic experiment involved pairing food powder (which elicits salivation, an automatic reflex) with a tone that would normally have no effect on dogs' salivation. The presentation of the tone preceded the presentation of the food powder; after repeated pairings, salivation occurred when only the tone was presented (Hill, 1970). The food powder was labeled the *unconditioned stimulus* (UCS); the tone, the *conditioned stimulus* (CS). Salivation is an unconditioned response to food powder and a conditioned response to the tone. The relationship may be represented as shown in the accompanying diagram. The process of pairing stimuli so that an unconditioned stimulus elicits a response is known as *Pavlovian, classical, or respondent conditioning*.



### Associationism

Another influential experimenter whose research paralleled that of Pavlov was Edward Thorndike. Thorndike studied cats rather than dogs, and his primary interest was discovering associations between situations and responses (Thorndike, 1931). He formulated two laws that profoundly influenced the subsequent development of behavioral science. The Law of Effect (Thorndike, 1905) states that "any act which in a given situation produces satisfaction becomes associated with that situation, so that when the situation recurs the act is more likely than before to recur also" (p. 203). Second is the Law of Exercise, which states that a response made in a particular situation becomes associated with the situation. The relationship of the Law of Effect with the principle of positive reinforcement is obvious. The Law of Exercise is similarly related to the stimulus control principle discussed earlier.

### Behaviorism

The term *behaviorism* was first used by John Watson (1914, 1919, 1925). Watson advocated the complete abolition of any datum in psychology that did not result from direct observation. He considered such concepts as mind, instinct, thought, and emotion both useless and superfluous. He denied the existence of instinct in human beings and reduced thought to subvocal speech, emotion to bodily responses. A Watsonian behaviorist of our acquaintance once responded to a question by saying, "I've changed my mind (you should excuse the expression)." The true Watsonian does not acknowledge the existence of any such entity as "mind."

Watson and Raynor (1920) conditioned a startle response in a baby, Albert, by pairing a white rat (CS) with a loud noise (UCS). Watson contended that all "emotional" responses such as fear were conditioned in similar ways. In an interestingly related procedure, Jones (1924) desensitized a 3-year-old child who showed a fear response to white rabbits and other white furry objects by pairing the child's favorite foods with the rabbit. This procedure was unfortunately not carried out with Albert, who moved away before his conditioned fear could be eliminated. Albert may still be scared of white rats, which may have created a number of problems in his life, including preventing his employment as a behavioral psychologist. Watson later suggested that Albert might eventually seek Freudian therapy to overcome his strange fears and that his problems might be attributed to an unresolved Oedipal complex (Pierce & Eppling, 1999).

### Operant Conditioning

The learning principles described at the beginning of this section are those suggested by proponents of an *operant conditioning* model for explaining, predicting, and changing human behavior. The best known operant conditioner was B. F. Skinner (1904–1988), who first distinguished operant from respondent conditioning.

Respondent conditioning, you will recall, deals with behaviors elicited by stimuli that precede them. Most such behaviors are reflexive; that is, they are not under voluntary control. Operant conditioning (sometimes called *instrumental conditioning*), on the other hand, deals with behaviors usually considered voluntary rather than reflexive. Operant conditioners are concerned primarily with the consequences of behavior and the establishment of functional relations between behavior and consequences. The behavioral view described earlier is that of operant conditioning, which will be the emphasis of the entire text.

Skinner's early work was with animals, primarily white rats. In this, he followed in the tradition of earlier behaviorists, to whom this particular animal was so important that one researcher (Tolman, 1932) dedicated a major book to *Mus norvegicus albinus*, a strain of white rats. Bertrand Russell, the philosopher, is said to have suggested

If we were all Watsonians, we couldn't say, "She hurt my feelings," "My mind wandered," or "Use your imagination."

Operant behaviors are emitted voluntarily; respondent behaviors are elicited by stimuli.

facetiously that the different emphases in European (primarily gestalt, introspective, and theorizing) and American (primarily behavioral, active, and observational) studies may have resulted from differences in the breeds of rats available. Whereas European rats sat around quietly waiting for insight, American rats were active go-getters, scurrying around their cages and providing lots of behaviors for psychologists to observe.

Skinner also worked with pigeons. He explained (1963) that, while in the military during World War II, he was assigned to a building whose windowsills were frequented by these birds. Because there was very little to do, he and his colleagues began to train the pigeons to perform various behaviors. This subsequently developed into a rather elaborate, successful, although ultimately abandoned before fully operational, project to train pigeons to deliver guided missiles to enemy vessels. The pigeons, of course, were limited to one delivery. Although "Project Pigeon" was a source of personal and professional frustration to Skinner, it is credited with moving his interest firmly and finally from the laboratory into applied settings (Capshe, 1993).

Early application of operant conditioning techniques to human beings was directed toward establishing that the principles governing animal behavior also govern human behavior. The use of these principles to change human behavior—usually called *behavior modification*—did not really emerge in nonlaboratory settings until the 1960s. One of the authors remembers being told in an experimental psychology course in 1961 that there was some indication operant conditioning could be applied to simple human behavior. As an example, the instructor laughingly described college students' conditioning their professor to lecture from one side of the room simply by looking interested only when he stood on that side. The instructor insisted that it would not be possible to modify his behavior in this way, because he was aware of the technique. He was wrong; he was backed into one corner of the room by the end of the next lecture.

At that time, however—in spite of Skinner's (1953) theoretical application of operant conditioning techniques to complex human behavior and pioneer studies such as those of Ayllon and Michael (1959) and Birnbrauer, Bijou, Wolf, and Kidder (1965)—few people anticipated the enormous impact that the use of such principles would have on American psychology and education and on other disciplines, including economics (Kagel & Winkler, 1972). The application of behavior modification in real-life settings had become so prevalent by 1968 that a new journal, the *Journal of Applied Behavior Analysis*, was founded to publish the results of research. In Volume 1, Number 1, of the journal, Baer, Wolf, and Risley (1968) defined applied behavior analysis as the "process of applying sometimes tentative principles of behavior to the improvement of specific behaviors, and simultaneously evaluating whether or not any changes noted are indeed attributed to the process of application" (p. 91).

Baer and his colleagues (1968) suggested that for research to qualify as applied behavior analysis, it must change socially important behavior, chosen because it needs change, not because its study is convenient to the researcher. It must deal with observable and quantifiable behavior, objectively defined or defined in terms of examples, and clear evidence of a functional relation between the behavior to be changed and the experimenter's intervention must exist. In a more recent retrospective analysis of the progress of applied behavior analysis since 1968, the same authors (Baer, Wolf, & Risley, 1987) suggested that in spite of considerable opposition and in light of many failures of the procedures in real settings, applied behavior analysts should persevere. They stated, "current theory has worked far too well to be abandoned in the face of what are more parsimoniously seen as technological rather than theoretical failures" (p. 325). In other words, we still cannot always make what we know ought to work actually work, but that is a problem of implementation, not an indication of the inadequacy of applied behavior analysis as a discipline. Johnston (1996) suggested that a greater

Applied behavior analysis must deal with socially important, observable behaviors. Relationships between behaviors and interventions must be verified.

separation of applied research from service delivery might provide more controlled conditions for research and thus enable more progress.

Applied behavior analysis is more rigorously defined than behavior modification. In our earlier vignette, Professor Grundy apparently succeeded in modifying behavior, but he failed to meet the criterion of analysis—he had no way of knowing for sure whether his techniques changed behavior or whether the change was mere coincidence. Keeping data about behavior change (or the lack of it) is a fundamental tenet of applied behavior analysis. It is required for many procedures necessary for students with disabilities, including functional analysis of behavior, discussed in Chapter 6, and Responsiveness to Intervention (RTI) (Bradley, Danielson, & Doolittle, 2007) used as part of the identification for students with learning disabilities. This book is designed to help teachers become applied behavior analysts, effective modifiers of behavior, and efficient analyzers of the principles of learning involved in all aspects of their students' performance.

Teachers who learn and practice the principles of applied behavior analysis can help their students master functional and academic skills in a systematic and efficient manner and can document their students' progress for parents and other professionals. They can manage behavior positively so that their focus remains on learning. They can teach students to get along with peers and adults and to make good choices. By providing learning environments that are safe, joyful, and successful, they can make enormous differences in students' lives.

### SUMMARY

We described a number of approaches to explaining human behavior. We evaluated these approaches in terms of their inclusiveness, verifiability, predictive utility, and parsimony. We also described an explanation of human behavior that appears to us to be the most useful—the behavioral explanation.

In tracing the history of the behavioral approach to human behavior, we emphasized the development of a science of applied behavior analysis. We discussed the necessity for concentrating on socially useful studies of human behavior and on careful observation of the establishment of functional relations. We also provided a rationale for learning and using the principles of applied behavior analysis and some examples of their use in various educational settings.

### KEY TERMS

|                           |                     |                |
|---------------------------|---------------------|----------------|
| applied behavior analysis | punishment          | setting events |
| positive reinforcement    | punisher            | modeling       |
| behavior                  | extinction          | shaping        |
| consequence               | stimulus control    |                |
|                           | antecedent stimulus |                |

## Chapter 2

# Preparing Behavioral Objectives

### Did you know that . . .

- If a composer orchestrates without the melody in mind, the Dixie Chicks could sound like Santana?
- There are reasons for writing behavioral objectives besides satisfying legal or administrative requirements?
- Aggression is in the eye of the beholder?
- Even professors write behavioral objectives?
- Ninety percent may not be a passing grade?
- Accuracy is not always enough?

### CHAPTER OUTLINE

#### Definition and Purpose

Pinpointing Behavior

#### Educational Goals

Establishing Goals

#### Components of a Behavioral Objective

Identify the Learner

Identify the Target Behavior

Identify the Conditions of Intervention

Identify Criteria for Acceptable Performance