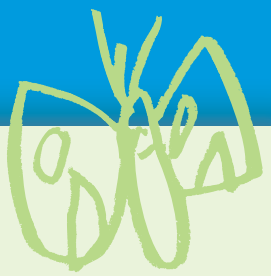
CHAPTER TWO

A Child's World: How We Discover It



There is one thing even more vital to science than intelligent methods; and that is,the sincere desire to find out the truth, whatever it may be.

—Charles Sanders Peirce, *Collected Papers,* vol. 5

Did You *Know* . . .

* Theories are never "set in stone"; they are always open to change as a result of new findings?
* Children shape their world as it shapes them?
* Cross-cultural research enables us to determine which aspects of development are universal and which are culturally influenced?
* An experiment is the *most definitive* way to demonstrate that one event causes another?
* The results of laboratory experiments may be less applicable to real life than experiments carried out in a home, school, or public setting?

These are just a few of the interesting and important topics we will cover in this chapter. Here, we present an overview both of major theories of human development and of research methods used to study it. In the first part of the chapter, we explore major issues and theoretical perspectives that underlie much research in child development. In the remainder of the chapter, we look at how researchers gather and assess information so that, as you read further in this book, you will be better able to judge whether research findings and conclusions rest on solid ground. After you have studied this chapter, you should be able to answer each of the Guidepost questions that follow.

Guideposts for Study

1. What purposes do theories serve, and what are two basic issues on which developmental theorists differ?
2. What are five theoretical perspectives on child development, and what are some theories that are representative of each?
3. How do developmental scientists study children, and what are the advantages and disadvantages of each research method?
4. What ethical problems may arise in research on children?

Guidepost 1

What purposes do theories serve, and what are two basic issues on which developmental theorists differ?

Basic Theoretical Issues

When Ahmed graduated from high school with honors in math and science, his father, an award-winning engineer, beamed. "The apple doesn't fall far from the tree," he said.

Statements like that one, which abound in everyday life, are informal, or intuitive, theories about why children develop as they do. Scientists have formal theories about human development. Like laypeople's informal theories, scientific theories are not dry, abstract, or esoteric. They deal with the substance of real life.

theory Coherent set of logically related concepts that seeks to organize, explain, and predict data.

A scientific **theory** is a set of logically related concepts or statements that seeks to describe and explain development and to predict what kinds of behavior might occur under certain conditions. Theories organize and explain *data,* the information gathered by research. As painstaking research adds, bit by bit, to the body of knowledge, theoretical concepts, such as the idea of an "identity crisis," help us make sense of, and see connections between, isolated pieces of data.

hypotheses Possible explanations for phenomena, used to predict the outcome of research.

Theory and research are interwoven strands in the seamless fabric of scientific study. Theories inspire further research and predict its results. They do this by generating **hypotheses,** tentative explanations or predictions that can be tested by further research. Research can indicate whether a theory is accurate in its predictions but cannot conclusively show a theory to be true. Theories can be disproved, but never proved. Theories change to incorporate new findings. Sometimes research supports a hypothesis and the theory on which it was based. At other times, scientists must modify their theories to account for unexpected data. Research findings often suggest additional hypotheses to be examined and provide direction for dealing with practical issues.

A theory is based on certain assumptions, which may or may not turn out to be true. For example, Charles Darwin's theory of evolution, which preceded modern cell biology, assumed that all life forms evolved from a single ancestor—an assumption that has been challenged by newer evolutionary research (Liu, 2006; Woese, 1998). Alternatively, despite the fact that Gregor Mendel's seminal work on particulate genetics had not yet been discovered by the scientific community, Darwin's theory required an explanation of how traits in their entirety could be passed on to offspring. At the time he developed his theory, no such explanation existed. Darwin assumed it must exist, and this aspect of his work was later supported.

Developmental science cannot be completely objective. Theories and research about human behavior are products of very human individuals, whose inquiries and interpretations are inevitably influenced by their own values and experience. In striving for greater objectivity, researchers must scrutinize how they and their colleagues conduct their work, the assumptions on which it is based, and how they arrive at their conclusions.

Throughout this book, we examine many, often conflicting, theories. In assessing them, it is important to keep in mind that they reflect the outlooks of the human beings who originated them. The way theorists explain development depends in part on their assumptions about two basic issues: (1) whether children are active or reactive in their own development, and (2) whether development is continuous or occurs in stages. A third

issue, whether development is more influenced by heredity or by environment, was introduced in Chapter 1 and is discussed more fully in Chapter 3.

Issue 1: Is Development Active or Reactive?

Are children active in their own development? This controversy goes back to the 18th century. The English philosopher John Locke held that a young child is a *tabula rasa*—a "blank slate"—on which society "writes." How the child developed—in either positive or negative ways—depended entirely upon experiences. In contrast, the French philosopher Jean Jacques Rousseau believed that children are born "noble savages" who develop according to their own positive natural tendencies if not corrupted by society. We now know that both views are too simplistic. Children have their own internal drives and needs that influence development, but children also are social animals who cannot develop optimally in isolation.

Mechanistic Model

The debate over Locke's and Rousseau's philosophies led to two contrasting models, or images, of development: mechanistic and organismic. Locke's view was the forerunner of the **mechanistic model.** In this model, people are like machines that react to environmental input (Pepper, 1942, 1961). A machine is the sum of its parts. To understand it, we can break it down into its smallest components and then reassemble it.

mechanistic model Model that views human development as a series of predictable responses to stimuli.

Machines do not operate of their own volition; they react automatically and passively to physical forces or inputs. Fill a car with gas, turn the ignition key, press the accelerator, and the vehicle will move. In the mechanistic view, human behavior is much the same: it results from the operation of biological parts in response to external or internal stimuli. If we know enough about how the human "machine" is put together and about the forces acting on it, we can predict what the person will do.

Mechanistic research seeks to identify the factors that make people behave as they do. For example, in seeking to explain why some high school students drink too much alcohol, a mechanistic theorist might look for environmental influences, such as advertising and whether the student's friends are heavy drinkers.

Organismic Model

Rousseau was the precursor of the **organismic model.** This model sees children as active, growing organisms that set their own development in motion (Pepper, 1942, 1961). They initiate events; they do not just react. Thus, the driving force for change is internal. Environmental influences do not *cause* development, though they can speed or slow it. Because human behavior is viewed as an organic whole, it cannot be predicted by breaking it down into simple responses to environmental stimulation. The meaning of a family relationship, for example, goes beyond what can be learned from studying its individual members and their day-to-day interactions. An organismic theorist, in studying why some high school students drink too much, would be likely to look at what kinds of situations they choose to participate in, and with whom. Do they choose friends who prefer to party or to study?

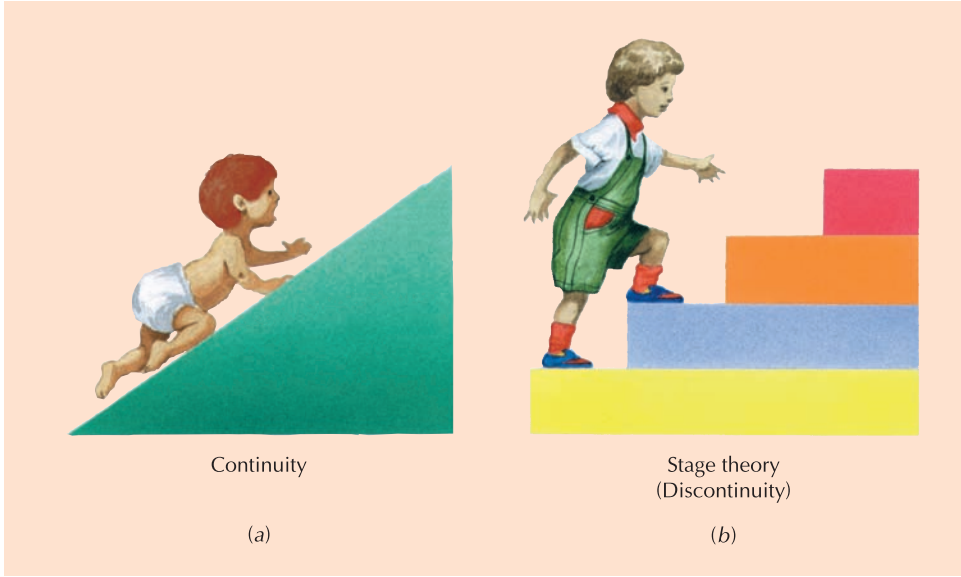
organismic model Model that views human development as internally initiated by an active organism, and as occurring in a sequence of qualitatively different stages.

For organicists, development has an underlying, orderly structure, though it may not be obvious from moment to moment. As a fertilized egg cell develops into an embryo and then into a fetus, it goes through a series of qualitative changes not overtly predictable from what came before. Swellings on the head become eyes, ears, mouth, and nose. The brain begins to coordinate breathing, digestion, and elimination. Sex organs form. Similarly, organicists describe development after birth as a progressive sequence of stages, moving toward full maturation.

Issue 2: Is Development Continuous or Discontinuous?

The mechanistic and organismic models also differ on the second issue: Is development *continuous,* that is, gradual and incremental, or *discontinuous,* that is, abrupt or uneven?

Figure 2-1
A major difference among developmental theories is (*a*) whether it proceeds continuously, as learning theorists and information-processing theorists propose, or (*b*) whether development occurs in distinct stages, as Freud, Erikson, and Piaget maintained.



quantitative change Change in number or amount, such as in height, weight, or size of vocabulary.

qualitative change Change in kind, structure, or organization, such as the change from nonverbal to verbal communication.

Checkpoint

Can you . . .

- ✔ Explain the relationships among theories, hypotheses, and research?
- ✔ Discuss two issues regarding child development?
- ✔ Contrast the mechanistic and organismic models?
- ✔ Compare quantitative and qualitative change and give an example of each?

Guidepost 2

What are five theoretical perspectives on child development, and what are some theories that are representative of each?

Mechanistic theorists see development as continuous, like walking or crawling up a ramp (Figure 2-1a). Development, in mechanistic models, is always governed by the same processes, allowing prediction of earlier behaviors from later ones.

Mechanistic theorists deal with **quantitative change**—changes in number or amount, such as in height, weight, size of vocabulary, or frequency of communication. A baby who gains 3 pounds in his first 3 months of life experiences a quantitative change. Quantitative researchers may measure how much or how quickly a child can remember, rather than what memory is or how it operates. Quantitative changes are largely continuous and unidirectional. Children grow in one direction—up.

Organismic theorists emphasize **qualitative change**—changes in kind, structure, or organization. Qualitative change is discontinuous; it is marked by the emergence of new phenomena that cannot be anticipated easily on the basis of earlier functioning. The change from a nonverbal child to one who understands words and can communicate verbally is a qualitative change.

Organismic theorists see development as occurring in a series of distinct stages, like stair steps (Figure 2-1b). At each stage, children cope with different types of problems and develop different abilities. Each stage builds on the previous one and prepares the way for the next. Organicists see this unfolding structure of development as universal: everyone goes through the same stages in the same order, though the precise timing varies.

Theoretical Perspectives

Theories generally fall within these broad perspectives, each of which focuses on different aspects of development. These perspectives influence the questions researchers ask, the methods they use, and the ways they interpret data. Therefore, to evaluate and interpret research, it is important to recognize the theoretical perspective on which it is based.

Five major perspectives underlie much influential theory and research on child development: (1) psychoanalytic, which focuses on unconscious emotions and drives; (2) learning, which studies observable behavior; (3) cognitive, which analyzes thought processes; (4) contextual, which emphasizes the impact of the historical, social, and cultural context; and (5) evolutionary/sociobiological, which considers evolutionary and biological underpinnings of behavior. Following is a general overview of the basic propositions, methods, and causal emphasis of each of these perspectives and some leading theorists within each perspective. These are summarized in Table 2-1 on page 28–29 and will be referred to throughout this book.

Perspective 1: Psychoanalytic

Sigmund Freud (1856–1939), a Viennese physician, originated the **psychoanalytic perspective,** which views development as shaped by unconscious forces that motivate human behavior. *Psychoanalysis,* the therapeutic approach Freud developed, seeks to give patients insight into unconscious emotional conflicts by asking them questions designed to summon up long-buried memories. Following is a summary of Freud's theory of psychosexual development. Other theorists and practitioners, including Erik H. Erikson, whom we discuss next, have expanded and modified Freud's theory.

psychoanalytic perspective View of human development as being shaped by unconscious forces.

Sigmund Freud: Psychosexual Development

The Viennese physician Sigmund Freud developed an influential but controversial theory of childhood emotional development.

Freud (1953, 1964a, 1964b) believed that people are born with biological drives that must be redirected to make it possible to live in society. He proposed three hypothetical parts of the personality: the id, the ego, and the superego. Newborns are governed by the *id,* which operates under the pleasure principle—the drive to seek immediate satisfaction of needs and desires. When gratification is delayed, as it is when infants have to wait to be fed, they begin to see themselves as separate from the outside world. The *ego,* which represents reason, develops gradually during the first year or so of life and operates under the reality principle. The ego's aim is to find realistic ways to gratify the id that are acceptable to the superego, which develops at about age 5 or 6. The *superego* includes the conscience and incorporates socially approved "shoulds" and "should nots" into the child's own value system. The superego is highly demanding; if its standards are not met, a child may feel guilty and anxious. The ego mediates between the impulses of the id and the demands of the superego.

Freud proposed that personality forms through unconscious childhood conflicts between the inborn urges of the id and the requirements of civilized life. These conflicts occur in an unvarying sequence of five maturation-based stages of **psychosexual development** (Table 2-2, page 30), in which sensual pleasure shifts from one body zone to another—from the mouth to the anus and then to the genitals. At each stage, the behavior that is the chief source of gratification (or frustration) changes—from feeding to elimination and eventually to sexual activity.

psychosexual development In Freudian theory, an unvarying sequence of stages of personality development during infancy, childhood, and adolescence, in which gratification shifts from the mouth to the anus and then to the genitals.

Freud considered the first three stages—those of the first few years of life—to be crucial for personality development. According to Freud, if children receive too little or too much gratification in any of these stages, they are at risk of *fixation*—an arrest in development that can show up in adult personality. For example, babies whose needs are not met during the *oral stage,* when feeding is the main source of sensual pleasure, may grow up to become nail-biters or smokers or to develop "bitingly" critical personalities. A person who, as a toddler, had too-strict toilet training may be fixated at the *anal stage,* when the chief source of pleasure was moving the bowels. Such a person may be obsessively clean, rigidly tied to schedules and routines, or defiantly messy.

According to Freud, a key event in psychosexual development occurs in the *phallic stage* of early childhood. Boys develop sexual attachment to their mothers, and girls to their fathers, and they have aggressive urges toward the same-sex parent, whom they regard as a rival. Freud called these developments the *Oedipus* and *Electra complexes.* Girls, according to Freud, experience *penis envy,* the repressed wish to possess a penis and the power it stands for.

Children eventually resolve their anxiety over these feelings by identifying with the same-sex parent and move into the *latency stage* of middle childhood, a period of relative emotional calm and intellectual and social exploration. They redirect their sexual energies into other pursuits, such as schoolwork, relationships, and hobbies.

The *genital stage,* the final one, lasts throughout adulthood. The sexual urges repressed during latency now resurface to flow in socially approved channels, which Freud defined as heterosexual relations with persons outside the family of origin.

Freud's theory made historic contributions and inspired a whole generation of followers, some of whom took psychoanalytic theory in new directions. Some of Freud's ideas, such as his notions of the Oedipus crisis and penis envy, now are widely considered obsolete. Others, such as the concepts of the id and superego, cannot be scientifically

Table 2-1 Five Perspectives on Human Development

Perspective	Important Theories	Basic Propositions
Psychoanalytic	Freud's psychosexual theory Erikson's psychosocial theory	Behavior is controlled by powerful unconscious urges. Personality is influenced by society and develops through a series of crises.
Learning	Behaviorism, or traditional learning theory (Paviov, Skinner, Watson)	People are responders; the environment controls behavior.
	Social learning (social cognitive) theory (Bandura)	Children learn in a social context by observing and imitating models. Children are active contributors to learning.
Cognitive	Piaget's cognitive-stage theory	Qualitative changes in thought occur between infancy and adolescence. Children are active initiators of development.
	Vygotsky's sociocultural theory	Social interaction is central to cognitive development.
	Information-processing theory	Human beings are processors of symbols.
Contextual	Bronfenbrenner's bioecological theory	Development occurs through interaction between a developing person and five surrounding, interlocking contextual systems of influences, from microsystem to chronosystem.
Evolutionary/ sociobiological	Bowlby's attachment theory	Human beings have the adaptive mechanisms to survive; critical or sensitive periods are stressed; evolutionary and biological bases for behavior and predisposition toward learning are important.

tested. Although Freud opened our eyes to the importance of early sexual urges, many psychoanalysts today reject his narrow emphasis on sexual and aggressive drives to the exclusion of other motives. Although the specific components of his theory generally have not been supported in research, several of his central themes have nonetheless "stood the test of time" (Westen, 1998, p. 334). Freud made us aware of the importance of unconscious thoughts, feelings, and motivations; the role of childhood experiences in forming personality; the ambivalence of emotional responses, especially responses to parents; the role of mental representations of the self and others in the establishment of intimate relationships; and the path of normal development from an immature, dependent state to a mature, interdependent one. In all these ways, Freud left an indelible mark on psychoanalysis and developmental psychology (Westen, 1998).

We need to remember that Freud's theory grew out of his place in history and in society. Freud based his theories about normal development not on a population of average children but on a clientele of upper-middle-class adults, mostly women, in therapy. His concentration on the influences of sexual urges and early experience did not take into account other, and later, influences on personality—including the influences of society and culture, which many heirs to the Freudian tradition, such as Erik Erikson, stress.

The psychoanalyst Erik H. Erikson departed from Freudian theory in emphasizing societal, rather than chiefly biological, influences on personality.

Erik Erikson: Psychosocial Development

Erik Erikson (1902–1994), a German-born psychoanalyst who originally was part of Freud's circle in Vienna, modified and extended Freudian theory by emphasizing the influence of society on the developing personality. Erikson was a pioneer in the life-span perspective. Whereas Freud maintained that early childhood experiences permanently shape personality, Erikson contended that ego development is lifelong.

Erikson's (1950, 1982; Erikson, Erikson, & Kivnick, 1986) theory of **psychosocial development** covers eight stages across the life span (see Table 2-2); we discuss the first five of these stages in the appropriate chapters. Each stage involves what Erikson originally called a "crisis" in personality—a major psychosocial theme that is particularly important at that time but will remain an issue to some degree throughout the rest of life.* These issues, which emerge according to a maturational timetable, must be satisfactorily resolved for healthy ego development.

psychosocial development In Erikson's eight-stage theory, the socially and culturally influenced process of development of the ego, or self.

*Erikson later dropped the term "crisis" and referred instead to conflicting or competing tendencies.

Technique Used	Stage-Oriented	Causal Emphasis	Active or Reactive Individual
Clinical observation	Yes	Innate factors modified by experience	Reactive
Clinical observation	Yes	Interaction of innate and experiential factors	Active
Rigorous scientific (experimental) procedures	No	Experience	Reactive
Rigorous scientific (experimental) procedures	No	Experience modified by innate factors	Active and reactive
Flexible interviews; meticulous observation	Yes	Interaction of innate and experiential factors	Active
Cross-cultural research; observation of child interacting with more competent person	No	Experience	Active
Laboratory research; technological monitoring of physiologic responses	No	Interaction of innate and experiential factors	Active
Naturalistic observation and analysis	No	Interaction of innate and experiential factors	Active
Naturalistic and laboratory observation	No	Interaction of innate and experiential factors	Active and reactive (theorists vary)

Each stage requires the balancing of a positive trait and a corresponding negative one. Although the positive quality should predominate, some degree of the negative is needed as well for optimal development. The critical theme of infancy, for example, is *basic trust versus basic mistrust.* People need to trust the world and the people in it, but they also need to learn some mistrust to protect themselves from danger. The successful outcome of each stage is the development of a particular "virtue" or strength—in this first stage, the virtue of *hope*. The resolution of later crises or conflicts depends upon the resolution reached in previous stages. In other words, successful resolution of one crisis put the child in a particularly good position to address the next crisis, a process the occurred iteratively across the life span.

Erikson's theory is important because of its emphasis on social and cultural influences and on development beyond adolescence. He is perhaps most widely known for his concept of the *identity crisis* (see Chapter 17), which has generated considerable research and public discussion.

Checkpoint

Can you . . .

- ✔ Identify the chief focus of the psychoanalytic perspective?
- ✔ Name Freud's five stages of development and three parts of the personality?
- ✔ Tell how Erikson's theory differs from Freud's and list its eight stages?

Perspective 2: Learning

The **learning perspective** maintains that development results from *learning,* a long-lasting change in behavior based on experience or adaptation to the environment. Learning theorists are concerned with discovering the objective laws that govern changes in observable behavior. They see development as continuous (not in stages) and emphasize quantitative change.

learning perspective View of human development that holds that changes in behavior result from experience.

Learning theorists have helped to make the study of human development more scientific by focusing on observable, quantifiable behaviors. Their terms are defined precisely, and their theories can be tested in the laboratory. Two important learning theories are *behaviorism* and *social learning (social cognitive) theory.*

Learning Theory 1: Behaviorism

Behaviorism is a mechanistic theory, which describes observed behavior as a predictable response to experience. Although biology sets limits on what people do, behaviorists view the environment as much more influential. They hold that human beings at all ages learn about the world the same way other organisms do: by reacting to conditions, or aspects of their environment, that they find pleasing, painful, or threatening. Moreover, they argue that learning occurs throughout the lifespan. The processes governing the way you learn

behaviorism Learning theory that emphasizes the predictable role of environment in causing observable behavior.

Table 2-2 Development Stages according to Various Theories

Psychosexual Stages (Freud)	Psychosocial Stages (Erikson)	Cognitive Stages (Piaget)
Oral *(birth to 12–18 months)*. Baby's chief source of pleasure involves mouth-oriented activities (sucking and feeding).	***Basic trust versus mistrust*** *(birth to 12–18 months).* Baby develops sense of whether world is a good and safe place. Virtue: hope.	***Sensorimotor*** *(birth to 2 years).* Infant gradually becomes able to organize activities in relation to the environment through sensory and motor activity.
Anal *(12–18 months to 3 years).* Child derives sensual gratification from withholding and expelling feces. Zone of gratification is anal region, and toilet training is important activity.	***Autonomy versus shame and doubt*** *(12–18 months to 3 years).* Child develops a balance of independence and self-sufficiency over shame and doubt. Virtue: will.	***Preoperational*** *(2 to 7 years).* Child develops a representational system and uses symbols to represent people, places, and events. Language and imaginative play are important manifestations of this stage. Thinking is still not logical.
Phallic *(3 to 6 years).* Child becomes attached to parent of the other sex and later identifies with same-sex parent. Supergo develops. Zone of gratification shifts to genital region.	***Initiative versus guilt*** *(3 to 6 years).* Child develops initiative when trying out new activities and is not overwhelmed by guilt. Virtue: purpose.	
Latency (6 years to puberty). Time of relative calm between more turbulent states.	***Industry versus inferiority*** *(6 years to puberty).* Child must learn skills of the culture or face feelings of incompetence. Virtue: skill.	***Concrete operations*** *(7 to 11 years).* Child can solve problems logically if they are focused on the here and now but cannot think abstractly.
Genital *(puberty through adulthood).* Reemergence of sexual impulses of phallic stage, channeled into mature adult sexuality.	***Identity versus identity confusion*** *(puberty to young adulthood).* Adolescent must determine sense of self ("Who am I?") or experience confusion about roles. Virtue: fidelity.	***Formal operations*** *(11 years through adulthood).* Person can think abstractly, deal with hypothetical situations, and think about possibilities.
	Intimacy versus isolation *(young adulthood).* Person seeks to make commitments to others; if unsuccessful, may suffer from isolation and self-absorption. Virtue: love.	
	Generativity versus stagnation *(middle adulthood).* Mature adult is concerned with establishing and guiding the next generation or else feels personal impoverishment. Virtue: care.	
	Integrity versus despair *(late adulthood)*. Elderly person achieves acceptance of own life, allowing acceptance of death, or else despairs over inability to relive life. Virtue: wisdom.	

Note: All ages are approximate.

to walk are very similar to those governing the emergence of language. Behavioral research focuses on *associative learning,* in which a mental link is formed between two events. Two kinds of associative learning are *classical conditioning* and *operant conditioning.*

Classical Conditioning While studying the role of saliva in dogs' digestive processes, Russian physiologist Ivan Pavlov (1849–1936) stumbled upon a phenomenon he labeled "psychic reflexes." Pavlov's dogs were presented with meat powder and then had their saliva collected. He noticed that his dogs began to salivate when they saw their handlers or when they heard clicking noises produced by the device that distributed the meat powder, before the meat powder was even presented. Pavlov tried pairing the meat powder with various stimuli such as the ringing of a bell and the dogs learned to salivate at the sound of a bell. These experiments were the foundation for **classical conditioning,** in which a response (salivation) to a stimulus (the bell) is elicited after repeated association with a stimulus that normally elicits the response (food).

classical conditioning Learning based on association of a stimulus that does not ordinarily elicit a particular response with another stimulus that does elicit the response.

The American behaviorist John B. Watson (1878–1958) applied stimulus-response theories to children, claiming that he could mold any infant in any way he chose. His writings influenced a generation of parents to apply principles of learning theory to child raising. In one of the earliest and most famous demonstrations of classical conditioning

in human beings, he taught an 11-month-old baby known as "Little Albert" to fear a furry white rat (Watson & Rayner, 1920).

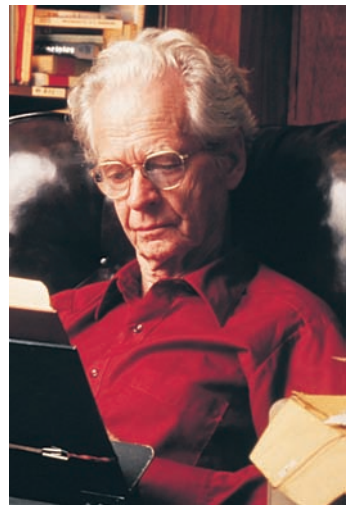
In this study, Albert was exposed to a loud noise when he started to stroke the rat. The noise frightened him, and he began to cry. After repeated pairings of the rat with the loud noise, Albert whimpered with fear when he saw the rat. Moreover, Albert also started showing fear responses to white rabbits and cats, and the beards of elderly men. Although the study had methodological flaws and would be considered highly unethical today, it did suggest that a baby could be conditioned to fear something he or she had not been afraid of before.

Classical conditioning occurs throughout life. Food preferences may be a result of conditioned learning. Fear responses to objects like a car or a dog may be the result of an accident or a bad experience.

Operant Conditioning Angel lies in his crib. When he starts to babble ("ma-ma-ma"), his mother smiles and repeats the syllables. Angel learns that his behavior (babbling) can produce a desirable consequence (loving attention from a parent), and so he learns to keep babbling to attract his mother's attention. An originally accidental behavior (babbling) has become a conditioned response.

operant conditioning Learning based on association of behavior with its consequences.

This type of learning is called **operant conditioning** because the individual learns from the consequences of "operating" on the environment. Unlike classical conditioning, operant conditioning involves voluntary behavior, such as Angel's babbling and involves the consequences rather than the predictors of behavior.



The American psychologist B. F. Skinner formulated the principles of operant conditioning.

The American psychologist B. F. Skinner (1904–1990), who formulated the principles of operant conditioning, worked primarily with rats and pigeons, but Skinner (1938) maintained that these principles apply to human beings as well. He found that an organism will tend to repeat a response that has been reinforced by desirable consequences and will suppress a response that has been punished. Thus, **reinforcement** is the process by which a behavior is strengthened, increasing the likelihood that the behavior will be repeated. In Angel's case, his mother's attention reinforces his babbling. **Punishment** is the process by which a behavior is weakened, *decreasing* the likelihood of repetition. If Angel's mother frowned when he babbled, he would be less likely to babble again. Whether a consequence is reinforcing or punishing depends on the person. What is reinforcing for one person may be punishing for another. For a child who likes being alone, being sent to his or her room could be reinforcing rather than punishing.

reinforcement In operant conditioning, a process that increases the likelihood that a behavior will be repeated.

punishment In operant conditioning, a process that decreases the likelihood that a behavior will be repeated.

Reinforcement is most effective when it immediately follows a behavior. If a response is no longer reinforced, it will eventually be *extinguished,* that is, return to its original (baseline) level. If, after a while, no one repeats Angel's babbling, he may babble less often than if his babbles still brought reinforcement.

Behavior modification, or behavior therapy, is a form of operant conditioning used to eliminate undesirable behavior, such as temper tantrums, or to instill desirable behavior, such as putting away toys after play. For example, every time a child puts toys away, she or he gets a reward, such as praise or a treat or new toy. Behavior modification is particularly effective among children with special needs, such as those with mental or emotional disabilities. However, Skinnerian psychology is limited in application because it does not adequately address individual differences, cultural and social influences, or other aspects of human development that can be attributed to a combination of factors—not solely learned associations.

Learning Theory 2: Social Learning (Social Cognitive) Theory

social learning theory Theory that behaviors also are learned by observing and imitating models. Also called *social cognitive theory.*

The American psychologist Albert Bandura (b. 1925) developed many of the principles of **social learning theory.** Whereas behaviorists see the environment, acting on the child, as the chief impetus for development, Bandura (1977, 1989; Bandura & Walters, 1963) suggests that the impetus for development is bidirectional. Bandura called this concept **reciprocal determinism**—the child acts on the world as the world acts on the child.

reciprocal determinism Bandura's term for bidirectional forces that affect development.

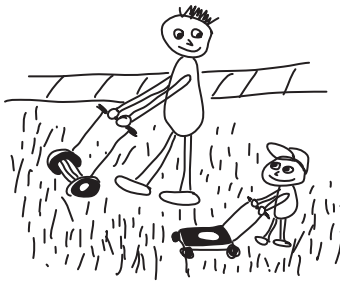


Figure 2-2
According to social learning theory, children learn by imitating the behavior of adult models—such as Dad mowing the lawn.

observational learning Learning through watching the behavior of others.

self-efficacy Sense of one's capability to master challenges and achieve goals.

Classic social learning theory maintains that people learn appropriate social behavior chiefly by observing and imitating models—that is, by watching other people, such as parents, teachers, or sports heroes and learning both about what potential behaviors might be, as well as learning about the likely consequences of such behaviors. This process is called **observational learning,** or *modeling* (Figure 2-2). People tend to choose models who are prestigious, who control resources, or who are rewarded for what they do—in other words, whose behavior is perceived as valued in their culture. Imitation of models is the most important element in how children learn a language, deal with aggression, develop a moral sense, and learn gender-appropriate behaviors. Observational learning can occur even if a person does not imitate the observed behavior.

Bandura's (1989) updated version of social learning theory is *social cognitive theory.* The change of name reflects a greater emphasis on cognitive processes as central to development. Cognitive processes are at work as people observe models, learn "chunks" of behavior, and mentally put the chunks together into complex new behavior patterns. Rita, for example, imitates the toes-out walk of her dance teacher but models her dance steps after those of Carmen, a slightly more advanced student. Even so, she develops her own style of dancing by putting her observations together into a new pattern.

Through feedback on their behavior, children gradually form standards for judging their own actions and become more selective in choosing models who exemplify those standards. They also begin to develop a sense of **self-efficacy,** the confidence that they have what it takes to succeed.

Checkpoint

Can you . . .

- ✔ Identify the chief concerns, strengths, and weaknesses of the learning perspective?
- ✔ Tell how classical conditioning and operant conditioning differ?
- ✔ Contrast reinforcement and punishment?
- ✔ Compare behaviorism and social learning (or social cognitive) theory?

Perspective 3: Cognitive

The **cognitive perspective** focuses on thought processes and the behavior that reflects those processes. This perspective encompasses both organismic and mechanistically influenced theories. It includes Piaget's cognitive-stage theory and Vygotsky's sociocultural theory of cognitive development. It also includes the information-processing approach and neo-Piagetian theories, which combine elements of information-processing and Piagetian theory.

cognitive perspective Perspective that looks at the development of mental processes such as thinking.

cognitive-stage theory Piaget's theory that children's cognitive development advances in a series of four stages involving qualitatively distinct types of mental operations.

Jean Piaget's Cognitive-Stage Theory

Our understanding of how children think owes a great deal to the work of the Swiss theoretician Jean Piaget (1896–1980). Piaget's **cognitive-stage theory** was the forerunner of today's "cognitive revolution" with its emphasis on mental processes. Piaget, a biologist and philosopher by training, viewed development organismically, as the product of children's efforts to understand and act on their world.

As a young man studying in Paris, Piaget set out to standardize the tests Alfred Binet had developed to assess the intelligence of French schoolchildren. Although his original role was to develop norms for the age at which children could pass particular tasks, Piaget instead became intrigued by the children's wrong answers, finding in them clues to their thought processes. He realized that children showed specific types of logical errors depending on their age.

Piaget's *clinical method* combined observation with flexible questioning. To find out how children think, Piaget followed up their wrong answers with more questions, and then designed tasks to test his tentative conclusions. In this way he discovered that a typical 4-year-old believes that pennies or flowers are more numerous when arranged in a line than when heaped or piled up. From his observations of his own and other children, Piaget created a comprehensive theory of cognitive development.

Piaget suggested that cognitive development begins with an inborn ability to adapt to the environment and is initially based on motor activities such as reflexes. By rooting for a nipple, feeling a pebble, or exploring the boundaries of a room, young children develop a more accurate understanding of their surroundings and greater competence in dealing with them. This cognitive growth occurs through three interrelated processes: organization, adaptation, and equilibration.

Organization is the tendency to create categories, such as birds, by observing the characteristics that individual members of a category, such as sparrows and cardinals, have in common. According to Piaget, people create increasingly complex cognitive structures called **schemes,** ways of organizing information about the world that govern the way the child thinks and behaves in a particular situation. As children acquire more information, their schemes become more complex. Take sucking, for example. A newborn infant has a simple scheme for sucking but soon develops varied schemes for how to suck at the breast, a bottle, or a thumb. The infant may have to open her mouth wider, or turn her head to the side, or suck with varying strength.

Adaptation is Piaget's term for how children handle new information in light of what they already know. Adaptation occurs through two complementary processes: (1) **assimilation,** taking in new information and incorporating it into existing cognitive structures; and (2) **accommodation,** adjusting one's cognitive structures to fit the new information.

Equilibration—a constant striving for a stable balance, or equilibrium—dictates the shift from assimilation to accommodation. When children cannot handle new experiences within their existing cognitive structures, they experience an uncomfortable state of disequilibrium. For example, a child knows what birds are and sees a plane for the first time. The child labels the plane a "bird" (assimilation). Over time the child notes differences between planes and birds, which makes her somewhat uneasy (disequilibrium) and motivates her to change her understanding (accommodation) and provide a new label for the plane. She then is at equilibrium. By organizing new mental and behavioral patterns that integrate the new experience, the child restores equilibrium. Thus, assimilation and accommodation work together to produce equilibrium. Throughout life, the quest for equilibrium is the driving force behind cognitive growth.

The Swiss psychologist Jean Piaget studied children's cognitive development by observing and talking with his own youngsters and others.

organization Piaget's term for the creation of categories or systems of knowledge.

schemes Piaget's term for organized patterns of thought and behavior used in particular situations.

adaptation Piaget's term for adjustment to new information about the environment.

assimilation Piaget's term for incorporation of new information into an existing cognitive structure.

accommodation Piaget's term for changes in a cognitive structure to include new information.

equilibration Piaget's term for the tendency to seek a stable balance among cognitive elements; achieved through a balance between assimilation and accommodation.

Piaget described cognitive development as occurring in four qualitatively different stages (listed in Table 2-2 and discussed in detail in later chapters), which represent universal patterns of development. At each stage a child's mind develops a new way of operating. From infancy through adolescence, mental operations evolve from learning based on simple sensory and motor activity to logical, abstract thought.

Piaget's observations have yielded much information and some surprising insights. Piaget has shown us that children's minds are not miniature adult minds. Knowing how children think makes it easier for parents and teachers to understand and teach them. Piaget's theory has provided rough benchmarks for what to expect of children at various ages and has helped educators design curricula appropriate to varying levels of development.

Yet Piaget may have seriously underestimated the abilities of infants and young children. Some contemporary psychologists question his distinct stages, pointing instead to evidence that cognitive development is more gradual and continuous (Courage & Howe, 2002). Research beginning in the late 1960s has challenged Piaget's idea that thinking develops in a single, universal progression of stages leading to formal thought. Instead, children's cognitive processes seem closely tied to specific content (what they are thinking *about*) as well as to the context of a problem and the kinds of information and thought a culture considers important (Case & Okamoto, 1996). We explore further critiques of Piaget's work in the chapters that follow.

Lev Vygotsky's Sociocultural Theory

The Russian psychologist Lev Semenovich Vygotsky (1896–1934) focused on the social and cultural processes that guide children's cognitive development. Vygotsky's (1978) **sociocultural theory,** like Piaget's theory, stresses children's active engagement with

sociocultural theory Vygotsky's theory of how contextual factors affect children's development.

According to the Russian psychologist Lev Semenovich Vygotsky, children learn through social interaction.

zone of proximal development (ZPD) Vygotsky's term for the difference between what a child can do alone and what the child can do with help.

scaffolding Temporary support to help a child master a task.

their environment; but, whereas Piaget described the solo mind taking in and interpreting information about the world, Vygotsky saw cognitive growth as a *collaborative* process. Children, said Vygotsky, learn through social interaction. There is no such thing as development without context, and there are as many ways to develop as there are different cultures and different experiences. Children acquire cognitive skills as part of their induction into a way of life. Shared activities help children internalize their society's modes of thinking and behaving and make those folkways their own. Vygotsky placed special emphasis on *language*—not merely as an expression of knowledge and thought but as an essential tool for learning and thinking about the world.

According to Vygotsky, adults or more advanced peers must help direct and organize a child's learning before the child can master and internalize it. This guidance is most effective in helping children cross the **zone of proximal development (ZPD),** the gap between what they are already able to do and what they could achieve with assistance from another person (*proximal* means "nearby"). Children in the ZPD for a particular task can almost, but not quite, perform the task on their own, and it is within this psychological space that most learning occurs. Responsibility for directing and monitoring learning gradually shifts from the adult to the child—much as, when an adult teaches a child to float, the adult first supports the child in the water and then lets go gradually as the child's body relaxes into a horizontal position.

Some followers of Vygotsky (Wood, 1980; Wood, Bruner, & Ross, 1976) have applied the metaphor of scaffolds—the temporary platforms on which construction workers stand—to this way of teaching. **Scaffolding** is the temporary support that parents, teachers, or others give a child in doing a task until the child can do it alone. For example, when a child is learning to float, a parent or teacher supports a child's back, first with a hand, then with only a finger, until the child can float without support.

Vygotsky's theory has important implications for education and for cognitive testing. Tests that focus on a child's potential for learning provide a valuable alternative to standard intelligence tests that assess what the child has already learned, and many children may benefit from the sort of expert guidance Vygotsky prescribes.

Checkpoint

Can you . . .

- ✔ Contrast Piaget's assumptions and methods with those of classical learning theory?
- ✔ List three interrelated principles that bring about cognitive growth, according to Piaget, and give an example of each?
- ✔ Explain how Vygotsky's theory differs from Piaget's and define the concepts of ZPD and scaffolding?

The Information-Processing Approach

information-processing approach Approach to the study of cognitive development by observing and analyzing the mental processes involved in perceiving and handling information.

The **information-processing approach** seeks to explain cognitive development by analyzing the processes involved in making sense of incoming information and performing tasks effectively: such processes as attention, memory, planning strategies, decision making, and goal setting. The information-processing approach is not a single theory but a framework that undergirds a wide range of theories and research.

Some information-processing theorists compare the brain to a computer: there are certain inputs (such as sensory impressions) and certain outputs (such as behaviors). Information-processing theorists are interested in what happens in the middle. How does the brain use sensations and perceptions, say, of an unfamiliar word, to recognize that word again? Why does the same input sometimes result in different outputs? In large part, information-processing researchers use observational data to *infer* what goes on between a stimulus and a response. For example, they may ask a person to recall a list of words and then observe any difference in performance if the person repeats the list over and over before being asked to recall the words. Through such studies, some information-processing researchers have developed *computational models* or flowcharts that analyze the specific steps people go through in gathering, storing, retrieving, and using information.

Information-processing theorists, like Piaget, see people as active thinkers about their world. Unlike Piaget, they generally do *not* propose stages of development. Instead, they view development as continuous. They note age-related increases in the speed, complexity, and efficiency of mental processing and in the amount and variety of material that can be stored in memory. Brain imaging research, discussed later in this chapter, supports important aspects of information-processing models, such as the existence of separate physical structures to handle conscious and unconscious memory (Schacter, 1999; Yingling, 2001).

The information-processing approach has practical applications. It enables researchers to estimate an infant's later intelligence from the efficiency of sensory perception and

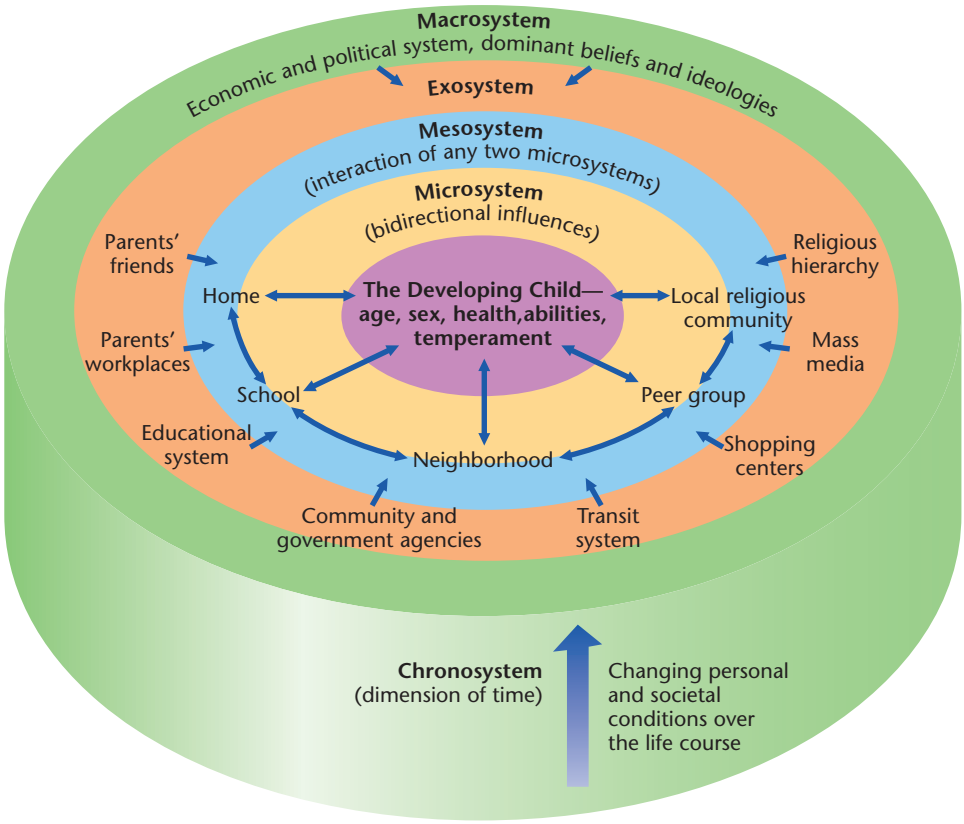


Figure 2-3

Bronfenbrenner's bioecological theory. Concentric circles show five levels of environmental influence on the individual, from the most intimate environment (the microsystem) to the broadest (the chronosytem)—all within the perpendicular dimension of time.

processing. It enables parents and teachers to help children learn by making them more aware of their own mental processes and of strategies to enhance them. Psychologists often use information-processing models to test, diagnose, and treat learning problems.

Neo-Piagetian Theories

Since the 1980s, in response to criticisms of Piaget's theory, some developmental psychologists have sought to integrate elements of his theory with the information-processing approach. Instead of describing a single, general system of increasingly logical mental operations, these neo-Piagetians focus on *specific* concepts, strategies, and skills, such as number concepts and comparisons of "more" and "less." They suggest that children develop cognitively by becoming more efficient at processing information. Because of this emphasis on efficiency of processing, the neo-Piagetian approach helps account for individual differences in cognitive ability and for uneven development in various domains.

Checkpoint

Can you . . .

- ✔ Describe what information-processing researchers do?
- ✔ Explain how neo-Piagetian theory differs from the Piagetian approach?

Perspective 4: Contextual

According to the **contextual perspective,** development can be understood only in its social context. Contextualists see the individual, not as a separate entity interacting with the environment but as an inseparable part of it. (Vygotsky's sociocultural theory, which we discussed as part of the cognitive perspective, also can be classified as contextual.)

The American psychologist Urie Bronfenbrenner's (1917–2005) **bioecological theory** (1979, 1986, 1994; Bronfenbrenner & Morris, 1998) identifies five levels of environmental influence, ranging from very intimate to very broad: microsystem, mesosystem, exosystem, macrosystem, and chronosystem (Figure 2-3). To understand the complexity of influences on development, we must see a child within the context of these multiple environments.

contextual perspective View of child development that sees the individual as inseparable from the social context.

bioecological theory Bronfenbrenner's approach to understanding processes and contexts of child development that identifies five levels of environmental influence.

microsystem Bronfenbrenner's term for a setting in which a child interacts with others on an everyday, face-to-face basis.

mesosystem Bronfenbrenner's term for linkages between two or more microsystems.

exosystem Bronfenbrenner's term for linkages between two or more settings, one of which does not contain the child.

macrosystem Bronfenbrenner's term for a society's overall cultural patterns, including values, customs, and social systems.

chronosystem Bronfenbrenner's term for effects of time on other developmental systems.

A **microsystem** is the everyday environment of home, school, or neighborhood, including face-to-face relationships with parents, friends, classmates, teachers, or neighbors. How, for example, does a new baby affect the parents' lives? How do their feelings and attitudes affect the baby?

The **mesosystem** is the interlocking of various microsystems. It may include linkages between home and school (such as parent-teacher conferences) or between the family and the peer group (such as relationships that develop among families of children in a neighborhood play group). For example, a parent's bad day at work might affect interactions with a child later that evening in a negative way. Despite never having actually gone to the workplace, the child is still affected by it.

The **exosystem** consists of linkages between a microsystem and outside systems or institutions that affect a person indirectly. How does a community's educational system affect children's career aspirations? Does television programming that encourages prosocial behavior make children more helpful?

The **macrosystem** consists of overarching cultural patterns, such as dominant beliefs, ideologies, and economic and political systems. How is a child's development affected by living in a capitalist or socialist society?

Finally, the **chronosystem** adds the dimension of time: change or constancy in the child and the environment. This can include changes in family composition, place of residence, or parents' employment, as well as larger events such as wars, ideology, political system, and economic cycles.

According to Bronfenbrenner, a person is not merely an outcome of development but a shaper of it. People affect their own development through their biological and psychological characteristics, talents and skills, disabilities, and temperament.

By looking at systems that affect individuals in and beyond the family, this bioecological approach helps us to see the variety of influences on development. The contextual perspective also reminds us that findings about the development of children in one culture or one group within a culture (such as white, middle-class Americans) may not apply equally to children in other societies or cultural groups.

Checkpoint

Can you . . .

- ✔ State the chief assumptions of the contextual perspective?
- ✔ Name and differentiate Bronfenbrenner's five systems of contextual influence?

Perspective 5: Evolutionary/Sociobiological

evolutionary/sociobiological perspective View of human development that focuses on evolutionary and biological bases of social behavior.

The **evolutionary/sociobiological perspective** originally proposed by E. O. Wilson (1975) focuses on evolutionary and biological bases of behavior. Influenced by Darwin's theory of evolution, it draws on findings of anthropology, ecology, genetics, ethology, and evolutionary psychology to explain the adaptive, or survival, value of behavior for an individual or species.

According to Darwin, species have developed through the related processes of *survival of the fittest* and *natural selection.* Individuals with heritable traits *fitted* (better adapted) to their environments survive and reproduce more than those that are less fitted (less adapted). Thus, through differential reproduction success, individuals with more adaptive characteristics pass on their traits to future generations at higher levels than individuals that are less adaptively fit. In this way, adaptive characteristics are selected to be passed on, and the less adapted ones die out.

Evolved mechanisms are behaviors that developed to solve problems in adapting to an earlier environment. For example, aversion to certain foods during the first trimester of pregnancy, when the fetus is most vulnerable, may originally have evolved to protect the fetus from toxic substances. Such evolved mechanisms may survive even though they no longer serve a useful purpose (Bjorklund & Pellegrini, 2000, 2002), or they may evolve further in response to changing environmental conditions. Although most evolved mechanisms are tailored to a specific problem, others, such as human intelligence, are viewed as having evolved to help people face a wide range of problems (MacDonald, 1998).

ethology Study of distinctive adaptive behaviors of species of animals that have evolved to increase survival of the species.

Ethology is the study of the distinctive adaptive behaviors of animal species. Ethologists suggest that for each species certain innate behaviors, such as squirrels' burying of nuts in the fall and spiders' spinning of webs, have evolved to increase the odds of survival. Another example, studied by Konrad Lorenz, is newborn ducklings' instinct to follow their mother (refer to Chapter 1). By observing animals, usually in their natural

surroundings and often comparing across different species, ethologists seek to identify which behaviors are universal and which are specific to a particular species or are modified by culture. The British psychologist John Bowlby (1969) applied ethological principles to aspects of human development, in part drawing upon his knowledge of proximity-seeking behavior (staying close to the mother) in animals of different species in the formation of his ideas about attachment in humans. He viewed infants' attachment to a caregiver as a mechanism that evolved to protect them from predators. (Attachment is discussed more fully in Chapter 8.)

Evolutionary psychology applies Darwinian principles to human behavior. According to this theory, people unconsciously strive, not only for personal survival but also to perpetuate their genetic legacy. They do so by seeking to maximize their chances of having offspring who will survive to reproduce, hence, passing down their characteristics and genes. However, an evolutionary perspective does not reduce human behavior entirely to the effects of genes seeking to reproduce themselves. It also places great weight on the environment to which a person must adapt and the flexibility of the human mind. A *developmental systems approach* views human development as the outcome of a dynamic process of bidirectional interaction between person and environment (Bjorklund & Pellegrini, 2000; Lickliter & Honeycutt, 2003; Nelson, 2005). An example, discussed in Chapter 6, is Esther Thelen's theory and research on how infants learn to walk.

Evolutionary developmental psychologists apply evolutionary principles to child development. They study such topics as parenting strategies, attachment, gender differences in play, and peer relations, and they identify characteristics that help children of various ages adapt, or adjust, to the circumstances in which they find themselves. Box 2-1 discusses an apparent irony: the adaptive value of immature behavior.

evolutionary psychology
Application of Darwinian principles of natural selection and survival of the fittest to human psychology.

Checkpoint

Can you . . .

- ✔ Identify the chief focus of the evolutionary/sociobiological perspective, and explain how Darwin's theory of evolution underlies this perspective?
- ✔ Tell what kinds of topics ethologists and evolutionary psychologists study?

A Shifting Balance

No one theory of development is universally accepted, and no one theoretical perspective explains all facets of development. As the study of child development has evolved, the mechanistic and organismic models have shifted in influence. Most of the early pioneers in the field, including Freud, Erikson, and Piaget, favored organismic, or stage, approaches. The mechanistic view gained support during the 1960s with the popularity of learning theories.

Today much attention is focused on the biological and evolutionary bases of behavior. Instead of looking for broad stages, developmental scientists seek to discover what specific kinds of behavior show continuity and what processes are involved in each. Rather than abrupt changes, a close examination of Piaget's stages of cognitive development, for example, reveals gradual, sometimes imperceptible advances that add up to a qualitative shift. Similarly, most infants do not learn to walk overnight, but rather by a series of tentative movements that gradually become more self-assured. Even when observable behavior seems to change suddenly, the biological or neurological processes that underlie that behavioral change may be continuous (Courage & Howe, 2002). To some extent, the interpretation of advances as quantitative or qualitative depends on the size of the lens being used to investigate them.

Instead of debating active versus reactive development, investigators often find that influences are *bidirectional:* people change their world even as it changes them. A baby girl born with a cheerful disposition is likely to get positive responses from adults, which strengthens her trust that her smiles will be rewarded and motivates her to smile more. A teacher who offers constructive criticism and emotional support to his students is likely to elicit greater efforts to achieve. Improved student performance, in turn, is likely to encourage him to keep using this teaching style.

Developmental theories grow out of, and are tested by, research. Although most researchers draw from a variety of theoretical perspectives, research questions and methods often reflect a researcher's particular theoretical orientation. For example, in trying to understand how a child develops a sense of right and wrong, a behaviorist would examine the way the parents respond to the child's behavior: what kinds of behavior they punish or praise. A social learning theorist would focus on imitation of moral examples,

What's your view

- Which theoretical perspective would be most useful for (a) a mother trying to teach her child to say "please," (b) a teacher interested in stimulating critical thinking, and (c) a researcher studying siblings' imitation of one another?

Box 2-1 *The Adaptive Value of Immaturity*

In comparison with other animals and even with other primates, human beings take a long time to grow up. Chimpanzees reach reproductive maturity in about 8 years, rhesus monkeys in about 4 years, and lemurs in only 2 years or so. Human beings, in contrast, do not reach full growth and physical maturity until the early teenage years and, at least in modern industrialized societies, typically reach cognitive and psychosocial maturity even later. During much of that time, they remain largely dependent on their parents or other caregivers.

From the point of view of evolutionary theory, this prolonged period of immaturity may be essential to survival and well-being. Human beings are social animals, and a long, protective childhood may serve as essential preparation for the social problem-solving skills needed in adulthood. Human communities and cultures are highly complex, and there is much to learn in order to know the ropes. Thus childhood may be an evolved mechanism that allows for the development of social competency.

Human intelligence, too, may be an evolved characteristic. The fossil record indicates that during the past 4 million years the human brain has tripled in volume. At the same time, its period of development has nearly doubled. The human brain, despite its rapid prenatal growth, is much less fully developed at birth than the brains of other primates; if the human fetus's brain attained full size before birth, its head would be too big to go through the birth canal and women's hips are as wide as they can be to still support upright walking. Instead, the human brain continues to grow in size and complexity throughout childhood, eventually far surpassing the brains of our simian cousins in the capacities for language and thought. The human brain's slower development gives it greater *plasticity,* or flexibility, as not all connections are hardwired at an early age. One theorist has called this plasticity "the human species's greatest adaptive advantage" (Bjorklund, 1997, p. 157).

The extended period of immaturity and dependency during infancy and childhood allows children to spend much of their time in play; and, as Piaget maintained, it is largely through play that cognitive development occurs. Play also enables children to develop motor skills and experiment with social roles. It is a vehicle for creative imagination and intellectual curiosity, the hallmarks of the human spirit. Rather than being a distraction used to burn off energy before getting to the real business of learning, it is within play that many of our most important fundamental skills and abilities are developed.

Some aspects of immaturity serve immediate adaptive purposes. For example, some primitive reflexes, such as rooting for the nipple, which are protective for newborns, disappear when no longer needed. Research on animals suggests that the immaturity of early sensory and motor functioning may protect infants from overstimulation. By limiting the amount of information they have to deal with, it may help them focus on experiences essential to survival, such as feeding and attachment to the mother. Later, infants' limited memory capacity may simplify the processing of linguistic sounds and facilitate early language learning.

Limitations on the way young children think also may have adaptive value. For example, young children are unrealistic in assessing their abilities, believing they can do more than they actually can. This immature self-judgment, by reducing fear of failure, may encourage children to try new things.

All in all, evolutionary theory and research suggest that immaturity is not necessarily equivalent to deficiency and that some attributes of infancy and childhood have persisted because they are appropriate to the tasks of a particular time of life.

Source: Bjorklund, 1997; Bjorklund & Pellegrini, 2000, 2002; Flinn & Ward, 2005.

What's your view ?

Can you think of additional examples of the adaptive value of immaturity? Can you think of ways in which immaturity may *not* be adaptive?

possibly in stories or in movies. An information-processing researcher might do a task analysis to identify the steps a child goes through in determining the range of moral options available and then in deciding which option to pursue.

With the vital connection between theory and research in mind, let's look at the methods developmental researchers use.

Guidepost 3

How do developmental scientists study children, and what are the advantages and disadvantages of each research method?

Research Methods

Researchers in child development work within two methodological traditions: quantitative and qualitative. Each of these traditions has different goals and different ways of seeing and interpreting reality and uses different means of collecting and analyzing data.

Quantitative and Qualitative Research

Quantitative research deals with objectively measurable, numerical data; it generally answers the questions "how much?" or "how many?" Quantitative researchers might study, for example, how much fear or anxiety children feel before surgery, as measured by standardized tests or physiological changes, or what proportion of children undergoing

quantitative research Research that deals with objectively measurable data.

surgery show strong fear or anxiety. **Qualitative research** focuses on the how and why of behavior; it involves nonnumerical (verbal or pictorial) descriptions of participants' subjective understandings, feelings, or beliefs about their experiences. Qualitative researchers might study, for example, how children describe their emotions before surgery (Morse & Field, 1995) or, as in the anthropologist Margaret Mead's research, how girls in the South Sea islands talk about their experience of puberty and why their subjective experience differs from that of girls in Western cultures. Qualitative research also can reveal how subjective experience influences behavior. In an evaluation of the effectiveness of Early Head Start programs for infants and toddlers, qualitative research with staff members revealed that their beliefs about the processes through which their programs affected the children's development played a part in the measured outcomes (Love et al., 2002).

qualitative research Research that involves the interpretation of nonnumerical data, such as subjective experiences, feelings, or beliefs.

Quantitative research on child development is based on the **scientific method,** which has traditionally characterized most scientific inquiry. Its usual steps are

1. *identification of a problem* to be studied, often on the basis of a theory or of previous research;
2. *formulation of hypotheses* to be tested by research;
3. *collection of data;*
4. *statistical analysis of the data* to determine whether they support the hypothesis;
5. *formation of tentative conclusions;* and
6. *dissemination of findings* so that other observers can check, learn from, analyze, repeat, and build on the results.

scientific method System of established principles and processes of scientific inquiry, which includes identifying a problem to be studied, formulating a hypothesis to be tested by research, collecting data, analyzing the data, forming tentative conclusions, and disseminating findings.

In contrast with quantitative research, qualitative research is more flexible and informal and less structured and systematic. Instead of generating hypotheses from previous research, as quantitative researchers often do, qualitative investigators might gather and examine large amounts of data to see what hypotheses may emerge.

The selection of quantitative or qualitative methods may depend on the purpose of the study, how much is already known about the topic, and the researcher's theoretical orientation. Quantitative research often is done in controlled laboratory settings; qualitative research typically is conducted in everyday settings, such as the home or school. Quantitative investigators seek to remain detached from study participants so as not to influence the results; qualitative investigators may get to know participants to better understand why they think, feel, and act as they do, and it is assumed they are to some extent interpreting the results through the lens of their own experiences and characteristics.

Each of these methodologies uses different types of sampling and data collection. Table 2-3 summarizes the differences between the two types of research.

Sampling

Because studying an entire *population* (a group to whom the findings may apply) is usually too costly and time-consuming, investigators select a **sample,** a smaller group within the population. To be sure that the results of quantitative research are true generally, the sample should adequately represent the population under study—that is, it should show relevant characteristics in the same proportions as in the entire population. Otherwise the results cannot properly be *generalized,* or applied to the population as a whole. To judge how generalizable the findings are likely to be, the researchers must control who is in the study. For example, if the proportion of African Americans in a given population is estimated to be about 15 percent, then any sample drawn from that population should have approximately 15 percent African American research participants.

sample Group of participants chosen to represent the entire population under study.

Often quantitative researchers seek to achieve representativeness through **random selection,** in which each person in a population has an equal and independent chance of being chosen. If we wanted to study the effects of an educational program, one way to select a random sample would be to put all the names of participating children into a large bowl, stir it, and then draw out a certain number of names. A random sample, especially a large one, is likely to represent the population well. Unfortunately, a random sample of a large population is often difficult to obtain. Instead, many studies use samples selected for convenience or accessibility (for example, children born in a particular

random selection Selection of a sample in such a way that each person in a population has an equal and independent chance of being chosen.

Table 2-3 Comparing Qualitative and Quantitative Research

	Qualitative Research	Quantitative Research
Purpose and focus	Discovering and interpreting meaning and perceptions.	Testing a hypothesis developed before the research begins.
Standardization and replicability	The study is particular to the participant group. Replication is rare.	The study is standardized so that replication is possible.
Sampling	Subjects are selected to fit the purpose of the study.	Subjects are selected randomly.
Data	The primary data produced are words. Raw qualitative data may be researcher's notes, audiotapes, or transcripts of informal interviews. Secondary data such as existing written material and observations are often used.	The primary data are numbers or fixed responses that can be quantified.
Methods	Data are gathered using less structured methods, such as observation and interviews, to generate rich description. Questions are typically open-ended, allowing for flexibility in response. The researcher is the main instrument of inquiry, aided by semi-structured interview guides, observation strategies, and a thorough review of secondary data. Research generally takes place in the field and often involves face-to-face encounters with the participants.	Methods and instruments are structured beforehand to gather standardized data that can be coded or numerated. Questions are asked in such a way that the answers are a fixed set of choices. Instruments such as surveys are carefully designed to measure specific variables and are administered systematically, in a standardized fashion, to avoid researcher bias. Research can take place without direct contact with the subject, for example, by telephone or mailed surveys.
Analysis	Data are analyzed by systematically organizing and interpreting information using categories, themes, and motifs that identify patterns and relationships.	Data are analyzed using standardized statistics and procedures.
Results	Results are in-depth explanations for patterns of behavior.	Results tend to summarize patterns of similarities, variability, size, direction, and/or significance of any differences between specific groups.

Source: Adapted from Mathie & Carnozzi (2005).

Checkpoint

Can you . . .

- ✔ Contrast quantitative and qualitative research and give an example of each?
- ✔ Summarize the six steps in the scientific method and tell why each is important?
- ✔ Explain the purpose of random selection and tell how it can be achieved?

hospital or attending a particular day care center). The findings of such studies may not apply to the whole population.

In qualitative research, sampling is *focused* rather than random; participants are chosen for their ability to communicate the nature of a certain experience, such as how it feels to go through puberty or to undergo a particular type of surgery. The size and nature of the sample depend on the purpose of the study. In some studies samples are relatively small; in others, a broader sample may better represent variations within a population. A carefully selected qualitative sample may have a fair degree of generalizability.

Forms of Data Collection

Common ways of gathering data (Table 2-4) include *self-reports* (verbal or visual reports by study participants), *observation* of participants in laboratory or natural settings, and *behavioral* or *performance measures.* Depending in part on time and financial constraints, researchers may use one or more of these data collection techniques in any research design. Qualitative research tends to rely on self-reports, often in the form of in-depth, open-ended interviews or visual techniques (such as asking participants to draw or paint their impressions of an experience), and on observation in natural settings. Quantitative research typically uses standardized, structured methods involving numerical measurements of behavior or performance.

Let's look more closely at several common methods of data collection.

Table 2-4 Major Methods of Data Collection

Type	Main Characteristics	Advantages	Disadvantages
Self-report: diary, visual reports, interview, or questionnaire	Participants are asked about some aspect of their lives; questioning may be highly structured or more flexible; self-report may be verbal or visual.	Can provide firsthand information about a person's life, attitudes, or opinions. Visual techniques (i.e., drawing, mapping, graphing) avoid need for verbal skills.	Participant may not remember information accurately or may distort responses in a socially desirable way; how question is asked or by whom may affect answer.
Naturalistic observation	People are observed in their normal setting, with no attempt to manipulate behavior.	Provides good description of behavior; does not subject people to unnatural settings that may distort behavior.	Lack of control; observer bias.
Laboratory observation	Participants are observed in the laboratory, with no attempt to manipulate behavior.	Provides good descriptions; offers greater control than naturalistic observation because all participants are observed under same controlled conditions.	Observer bias; controlled situation can be artificial.
Behavioral and performance measures	Participants are tested on abilities, skills, knowledge, competencies, or physical responses.	Provides objectively measurable information; avoids subjective distortions.	Cannot measure attitudes or other nonbehavioral phenomena; results may be affected by extraneous factors.

Self-Reports: Diaries, Visual Techniques, Interviews, and Questionnaires

The simplest form of self-report is a *diary* or log. Adolescents may be asked, for example, to record what they eat each day or the times when they feel depressed. In studying young children, *parental self-reports*—diaries, journals, interviews, or questionnaires—are commonly used, often together with other methods, such as videotaping or recording. Parents may be videotaped playing with their babies and then may be shown the tapes and asked to explain why they acted or reacted as they did. Visual representation techniques—asking participants to draw or paint or to provide maps or graphs that illuminate their experience—can avoid reliance on verbal skills.

In a face-to-face or telephone *interview,* researchers ask questions about attitudes, opinions, or behavior. In a *structured* interview, each participant is asked the same set of questions. An *open-ended* interview is more flexible; the interviewer can vary the topics and order of questions and can ask follow-up questions based on the responses. To reach more people and to protect their privacy, researchers sometimes distribute a printed or online *questionnaire,* which participants fill out and return.

By questioning a large number of people, investigators can get a broad picture—at least of what the respondents *say* they believe or do or did. However, people willing to participate in interviews or fill out questionnaires may not accurately represent the population as a whole. Furthermore, heavy reliance on self-reports may be unwise because people may not have thought about what they feel and think or honestly may not know. They may forget when and how events took place or may consciously or unconsciously distort their replies to fit what is considered socially desirable.

How a question is asked, and by whom, can affect the answer. When questioned about risky or socially disapproved behavior, such as sexual habits and drug use, respondents may be more candid in responding to a computerized survey than to a face-to-face interview.

Naturalistic and Laboratory Observation

Observation can take two forms: *naturalistic observation* and *laboratory observation*. In **naturalistic observation,** researchers look at children in real-life settings. The researchers do not try to alter behavior or the environment; they simply record what they see. In **laboratory observation,** researchers observe and record behavior in a controlled situation, such as a laboratory. By observing all participants under the same

naturalistic observation Research method in which behavior is studied in natural settings without intervention or manipulation.

laboratory observation Research method in which all participants are observed under the same controlled conditions.

conditions, investigators can more clearly identify any differences in behavior not attributable to the environment.

Both kinds of observation can provide valuable descriptions of behavior, but they have limitations. For one, they do not explain *why* children behave as they do, though the observers may suggest interpretations. Then, too, an observer's presence can alter behavior. When children know they are being watched, they may act differently. Further, there is a risk of *observer bias:* the researcher's tendency to interpret data to fit expectations or to emphasize some aspects and minimize others. The issue of observer bias is most relevant to quantitative research, which must be *replicable* (repeatable) by other researchers to see whether they obtain similar results.

At one time, laboratory observation was favored as a means to more rigorous control. Now such technological devices as portable digital recorders and computers increase objectivity and enable researchers to analyze moment-by-moment changes in facial expressions or other behavior (Gottman & Notarius, 2000). Such methods can make naturalistic observation more accurate and objective than it otherwise would be.

Behavioral and Performance Measures

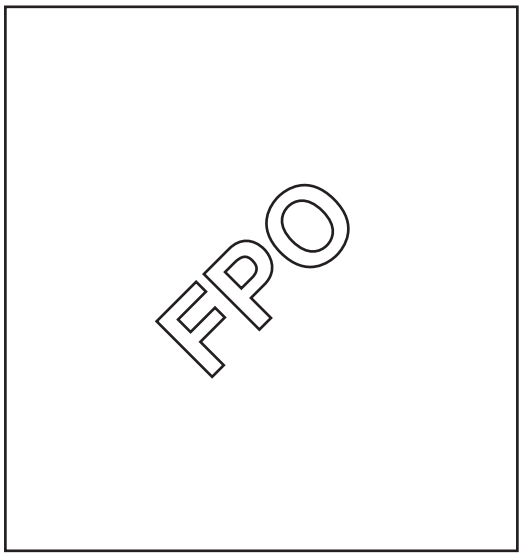
For quantitative research, investigators typically use objective measures of behavior or performance instead of, or in addition to, self-reports or observation. Tests and other behavioral and neuropsychological measures, including mechanical and electronic devices, may be used to assess abilities, skills, knowledge, competencies, or physiological responses, such as heart rate and brain activity. Although these measures are less subjective than self-reports or personal observation, such factors as fatigue and self-confidence can affect results.

Some written tests, such as intelligence tests, compare performance with that of other test-takers. Such tests can be meaningful and useful only if they are both *valid* (that is, the tests measure the abilities they claim to measure) and *reliable* (that is, the results are reasonably consistent from one time to another). To avoid bias, tests must be *standardized,* that is, given and scored by the same methods and criteria for all test-takers.

operational definition Definition stated solely in terms of the operations or procedures used to produce or measure a phenomenon.

cognitive neuroscience Study of links between neural processes and cognitive abilities.

When measuring any characteristic, intelligence for example, it is important to define exactly what is to be measured in a way that other researchers will understand so that they can comment on the results. For this purpose, researchers use an **operational definition**—a definition stated solely in terms of the operations or procedures used to produce or measure a phenomenon. Intelligence can be defined as the ability to achieve a certain score on a test covering logical relationships, memory, and vocabulary recognition. Some people may disagree with this definition, but no one can reasonably claim that it is not clear.



Researchers can analyze an fMRI (functional magnetic resonance imaging) brain scan taken during an activity or task to observe the link between cognitive activity and what happens in the brain. The regions shown in red are activated when thinking about making a gesture (preparation) and then in performing it (production).

For most of the history of psychology, theorists and researchers studied cognitive processes apart from the physical structures of the brain in which these processes occur. Now sophisticated imaging instruments, such as functional magnetic resonance imaging (fMRI) and positron emission tomography (PET), make it possible to see the brain in action, and the field of **cognitive neuroscience** is linking our understanding of cognitive functioning with what happens in the brain (Gazzaniga, 2000; Humphreys, 2002; Posner & DiGirolamo, 2000).

Evaluating Quantitative and Qualitative Research

In comparison with quantitative research based on the scientific method, qualitative research has both strengths and limitations. On the positive side, qualitative research can examine a question in great depth and detail, and the research framework can readily be revised in the light of new data. Findings of qualitative research can be a rich source of insights into attitudes and behavior. The interactive relationship between investigators and participants can humanize the research process and reveal information that would not emerge under the more impersonal conditions of quantitative research. On the other hand, qualitative research tends to be less

Table 2-5 Basic Research Designs

Type	Main Characteristics	Advantages	Disadvantages
Case study	In-depth study of single individual.	Flexibility; provides detailed picture of one person's behavior and development; can generate hypotheses.	May not generalize to others; conclusions not directly testable; cannot establish cause and effect.
Ethnographic study	In-depth study of a culture or subculture.	Can help overcome culturally based biases in theory and research; can test universality of developmental phenomena.	Subject to observer bias.
Correlational study	Attempt to find positive or negative relationship between variables.	Enables prediction of one variable on basis of another; can suggest hyptheses about causal relationships.	Cannot establish cause and effect.
Experiment	Controlled procedure in which an experimenter controls the independent variable to determine its effect on the dependent variable; may be conducted in the laboratory or field.	Establishes cause-and-effect relationships; is highly controlled and can be repeated by another investigator; degree of control greatest in the laboratory experiment.	Findings, especially when derived from laboratory experiments, may not generalize to situations outside the laboratory.

rigorous and more subject to bias than quantitative research. Because samples are often small and usually not random, results are less generalizable and replicable than the results of quantitative research. The large volume of data makes analysis and interpretation time-consuming, and the quality of the findings and conclusions depends greatly on the skills of the researcher (Mathie & Carnozzi, 2005).

Yet the line between these methodologies is not necessarily clear-cut. Qualitative data may be analyzed quantitatively—for example, by statistical analysis of interview transcripts or videotaped observations to see how many times certain themes or behaviors occur. Conversely, quantitative data may be illuminated by qualitative research—for example, by interviews designed to examine the motivations and attitudes of children who make high scores on achievement tests (Yoshikawa, Weisner, Kalil, & Way, 2008).

A current trend is to combine qualitative and quantitative methods. For example, quantitative research might reveal what proportion of teenagers in a particular country smoke tobacco and the average age at which they began to do so. Qualitative research, using in-depth interviews or focus groups, might discover why certain participants started smoking, and these findings might then be tested by quantitative research on a larger, more representative sample. In combination, quantitative and qualitative research often can provide more complex and more complete information about child development than can either method alone.

Checkpoint

Can you . . .

- ✔ Compare the advantages and disadvantages of various forms of data collection and give examples of how qualitative and quantitative methods can be combined?
- ✔ Explain how brain research contributes to the understanding of cognitive processes and social behaviors and attitudes?

Basic Research Designs

A research design is a plan for conducting a scientific investigation: what questions are to be answered, how participants are to be selected, how data are to be collected and interpreted, and how valid conclusions can be drawn. Four basic designs used in developmental research are case studies, ethnographic studies, correlational studies, and experiments. The first two designs are qualitative; the last two are quantitative. Each design has advantages and drawbacks, and each is appropriate for certain kinds of research problems (Table 2-5).

Case Studies

A **case study** is a study of a single case or individual, such as Genie, the 13-year-old girl who never learned to talk (refer to Box 1-3 in Chapter 1). Some theories, most notably Freud's, grew primarily out of clinical case studies, which included careful observation and interpretation of what patients said and did. Case studies also may use

case study Study of a single subject, such as an individual or family.

behavioral or physiological measures and biographical, autobiographical, or documentary materials.

Case studies offer useful in-depth information. They can explore sources of behavior and test treatments. They also can suggest potentially fruitful areas for other research. A related advantage is flexibility; the researcher is free to explore avenues of inquiry that arise during the course of the study. However, case studies, being qualitative in design, have shortcomings. From studying Genie, for instance, we learn much about the development of a single child, and although it is oftentimes assumed that some findings are relevant to all children, we cannot be sure the information applies to children in general. Furthermore, case studies cannot explain behavior with certainty or make strong causal statements because there is no way to test their conclusions. Even though it seems reasonable that Genie's severely deprived environment contributed to or even caused her language deficiency, it is impossible to know how she would have developed with a normal upbringing.

Ethnographic Studies

ethnographic study In-depth study of a culture, which uses a combination of methods including participant observation.

participant observation Research method in which the observer lives with the people or participates in the activity being observed.

An **ethnographic study** seeks to describe the pattern of relationships, customs, beliefs, technology, arts, and traditions that make up a society's way of life. In a way, it is like a case study of a culture. Ethnographic research can be qualitative, quantitative, or both. It uses a combination of methods, including informal, unstructured interviewing and **participant observation.** Participant observation is a form of naturalistic observation in which researchers live or participate in the societies or smaller groups they observe, as anthropologists often do for long periods of time.

Because of ethnographers' involvement in the events or societies they are observing, their findings are especially open to observer bias. On the positive side, ethnographic research can help overcome cultural biases in theory and research, as discussed in Box 2-2. Ethnography demonstrates the error of assuming that principles developed from research in Western cultures are universally applicable.

Correlational Studies

correlational study Research design intended to discover whether a statistical relationship between variables exists.

A **correlational study** is an attempt to find a *correlation,* or statistical relationship, between *variables,* phenomena that change or vary among people or can be varied for purposes of research. Correlations are expressed in terms of direction (positive or negative) and magnitude (degree). Two variables that are related *positively* increase or decrease together. As we report in Chapter 14, studies show a positive, or direct, correlation between televised violence and aggressiveness; that is, children who watch more violent television tend to fight more than children who watch less violent television. Two variables have a *negative,* or inverse, correlation if, as one increases, the other decreases. Studies show a negative correlation between amount of schooling and the risk of developing dementia (mental deterioration) due to Alzheimer's disease in old age. In other words, the less education, the more dementia (Katzman, 1993).

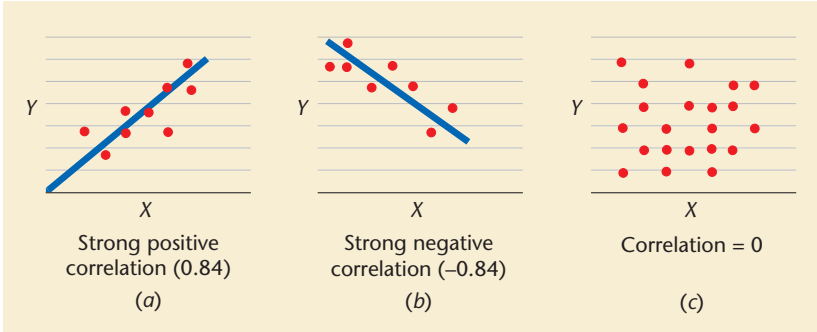


Figure 2-4

Correlational studies may find positive or negative correlations or no correlation. In a positive, or direct, correlation (*a*), data plotted on a graph cluster around a line showing that one variable (*X*) increases as the other variable (*Y*) increases. In a negative, or inverse, correlation (*b*), one variable (*X*) increases as the other variable (*Y*) decreases. No correlation, or a zero correlation (*c*), exists when increases and decreases in two variables show no consistent relationship (that is, data plotted on a graph show no pattern).

Correlations are reported as numbers ranging from +1.0 (a perfect positive relationship) to −1.0 (a perfect negative relationship). So, for example correlations of +0.6 and −0.6 are equal in strength, but in the opposite direction. Perfect correlations are rare. The closer a correlation comes to +1.0 or −1.0, the stronger the relationship, either positive or negative. A correlation of 0 means that the variables have no relationship (Figure 2-4).

Correlations enable us to predict one variable on the basis of another. On the basis

Around the World

Box 2-2 *Purposes of Cross-Cultural Research*

When David, a European American child, was asked to identify the missing detail in a picture of a face with no mouth, he said, "The mouth." But Ari, an Asian immigrant child in Israel, said that the *body* was missing. Because art in his culture does not present a head as a complete picture, he thought the absence of a body was more important than the omission of "a mere detail like the mouth" (Anastasi, 1988, p. 360).

By looking at children from different cultural groups, researchers can learn in what ways development is universal (and thus intrinsic to the human condition) and in what ways it is culturally determined. For example, children everywhere learn to speak in the same sequence, advancing from cooing and babbling to single words and then to simple combinations of words. The words vary from culture to culture, but around the world toddlers put them together to form sentences similar in structure. Such findings suggest that the capacity for learning language is universal and inborn.

On the other hand, culture can influence early motor development. African babies, whose parents often prop them in a sitting position and bounce them on their feet, tend to sit and walk earlier than U.S. babies (Rogoff & Morelli, 1989). The society in which children grow up also influences the skills they learn. In the United States, children learn to read, write, and use computers. In rural Nepal, they learn how to drive water buffalo and find their way along mountain paths.

One important reason to conduct research among different cultural groups is to recognize biases in traditional Western theories and research that often go unquestioned until they are shown to be a product of cultural influences. Because much research in child development has focused on Western industrialized societies, typical development in these societies may be seen as the *norm,* or standard of behavior. Measuring against this norm leads to narrow—and often wrong—ideas about development. Pushed to its extreme, this belief can cause the development of children in other ethnic and cultural groups to be seen as deviant.

Barriers exist to our understanding of cultural differences, particularly those involving minority subcultures. As with David and Ari in our opening example, a question or task may have different conceptual meanings for different cultural groups. Sometimes the barriers are linguistic. In a study of children's understanding of kinship relations among the Zinacanta people of Chiapas, Mexico (Greenfield & Childs, 1978), instead of asking "How many brothers do you have?" the researchers—knowing that the Zinacantas have separate terms for older and younger siblings—asked, "What is the name of your older brother?" Using the same question across cultures might have obscured, rather than revealed, cultural differences and similarities (Parke, 2004).

Results of observational studies of ethnic or cultural groups may be affected by the ethnicity of the researchers. For example, in one study European American observers noted more conflict and restrictiveness in African American mother-daughter relationships than African American observers did (Gonzales, Cauce, & Mason, 1996).

In this book we discuss several influential theories developed from research in Western societies that do not hold up when tested on people from other cultures—theories about gender roles, abstract thinking, moral reasoning, and other aspects of human development. Throughout this book, we consistently look at children in cultures and subcultures other than the dominant one in the United States to show how closely development is tied to society and culture and to add to our understanding of normal development in many settings. In so doing, however, we need to keep in mind the pitfalls involved in cross-cultural comparisons.

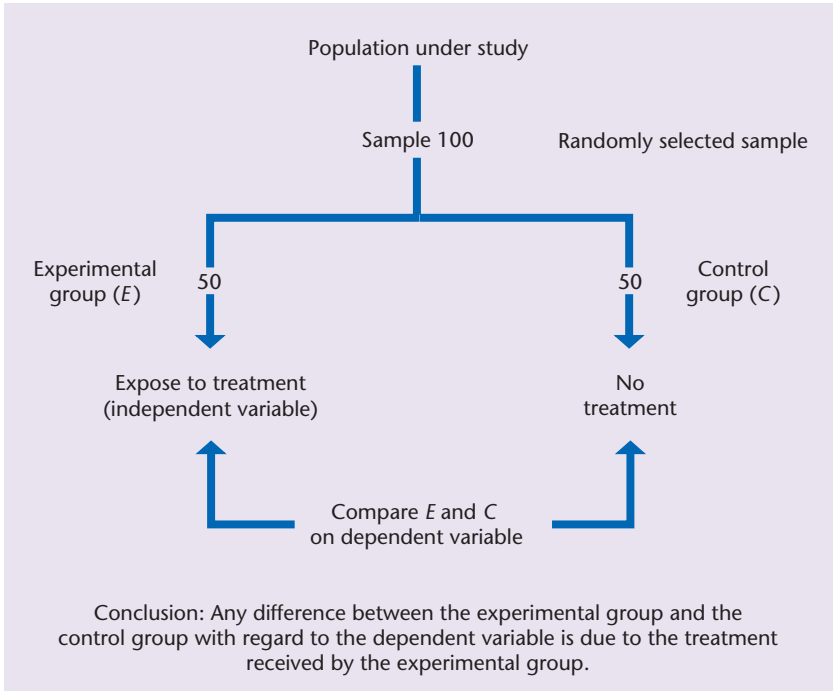
What's your view ?

Can you think of a situation in which you made an incorrect assumption about a person because you were unfamiliar with her or his cultural background?

of the positive correlation between viewing televised violence and aggressiveness, we can predict that children who watch violent shows are more likely to get into fights than children who do not watch such shows. The greater the magnitude of the correlation between two variables, the greater the ability to predict one from the other.

Although strong correlations suggest possible cause-and-effect relationships, these are merely hypotheses and need to be examined and tested very critically. We cannot be sure from a positive correlation between televised violence and aggressiveness that watching televised violence *causes* aggressive play; we can conclude only that the two variables are related. It is possible that the causation goes the other way: aggressive behavior may lead children to watch more violent programs. Or a third variable—perhaps an inborn predisposition toward aggressiveness or a violent living environment—may cause a child *both* to watch violent programs and to act aggressively. Similarly, we cannot be sure that schooling protects against dementia; it may be that another variable, such as socioeconomic status, might explain both lower levels of schooling and higher levels of dementia. The only way to show with certainty that one variable causes another is through experimentation—a method that, when studying human beings, is not always possible for practical or ethical reasons.

Figure 2-5
Design for an experiment. This experiment takes a random sample from the larger population being studied, randomly assigns participants to either the experimental (*E*) or control (*C*) group, and exposes the experimental group to a treatment that is not given to the control group. By comparing the two groups after the experimental group has received the treatment, the researcher can conclude that any difference between them is due to the experimental treatment.



Experiments

experiment Rigorously controlled, replicable procedure in which the researcher manipulates variables to assess the effect of one on the other.

An **experiment** is a controlled procedure in which the experimenter manipulates variables to learn how one affects another. Scientific experiments must be conducted and reported in such a way that another experimenter can *replicate* them, that is, repeat them in exactly the same way with different participants to verify the results and conclusions. Figure 2-5 shows how an experiment might be designed.

experimental group In an experiment, the group receiving the treatment under study.

control group In an experiment, a group of people, similar to those in the experimental group, who do not receive the treatment under study.

Groups and Variables A common way to conduct an experiment is to divide the participants into two kinds of groups. An **experimental group** consists of people who are to be exposed to the experimental manipulation or *treatment*—the phenomenon the researcher wants to study. Afterward, the effect of the treatment will be measured one or more times to find out what changes, if any, it caused. A **control group** consists of people who are similar to the experimental group but do not receive the treatment or may receive a different treatment. An experiment may include one or more of each type of group. If the experimenter wants to compare the effects of different treatments (say, of two methods of teaching), the overall sample may be divided into *treatment groups,* each of which receives one of the treatments under study. To ensure objectivity, some experiments, particularly in medical research, use *double-blind* procedures, in which neither participants nor experimenters know who is receiving the treatment and who is instead receiving an inert *placebo.*

One team of researchers (Whitehurst et al., 1988) wanted to find out what effect *dialogic reading,* a special method of reading picture books to very young children, might have on their language and vocabulary skills. The researchers compared two groups of middle-class children ages 21 to 35 months. In the *experimental group,* the parents adopted the new read-aloud method (the *treatment*), which consisted of encouraging children's active participation and giving frequent, age-based feedback. In the *control group,* parents simply read aloud as they usually did. After 1 month, the children in the experimental group were 8½ months ahead of the control group in level of speech and 6 months ahead in vocabulary; after 10 months, the experimental group was still 6 months ahead of the controls. It is fair to conclude, then, that this read-aloud method improves language and vocabulary skills.

independent variable In an experiment, the condition over which the experimenter has direct control.

dependent variable In an experiment, the condition that may or may not change as a result of changes in the independent variable.

In this experiment, the type of reading approach was the *independent variable,* and the children's language skills were the *dependent variable.* An **independent variable** is something over which the experimenter has direct control. A **dependent variable** is something

that may or may not change as a result of changes in the independent variable; in other words, it *depends* on the independent variable. In an experiment, a researcher manipulates the independent variable to see how changes in it will affect the dependent variable.

Random Assignment If an experiment finds a significant difference in the performance of the experimental and control groups, how do we know that the cause was the independent variable—in other words, that the conclusion is valid? For example, in the read-aloud study, how can we be sure that the reading method and not some other factor (such as intelligence) caused the difference in language development of the two groups? The best way to control for effects of such extraneous factors is through **random assignment:** assigning the participants to groups in such a way that each person has an equal chance of being placed in any group. (Random assignment is different from random selection, which determines who gets into the full sample.)

random assignment Assignment of participants in an experiment to groups in such a way that each person has an equal chance of being placed in any group.

If assignment is random and the sample is large enough, differences in factors not intended as variables, such as age, sex, race, IQ, and socioeconomic status, will be evenly distributed so that the groups initially are as alike as possible in every respect except for the variable to be tested. Otherwise, unintended differences between the groups might *confound,* or contaminate, the results, and any conclusions drawn from the experiment would have to be viewed with great suspicion. To control for confounds, the experimenter must make sure that everything except the independent variable is held constant during the course of the experiment. For example, in the read-aloud study, parents of the experimental and control groups must spend the same amount of time reading to their children. When participants in an experiment are randomly assigned to treatment groups, and conditions other than the independent variable are carefully controlled, the experimenter can be reasonably confident that a causal relationship has (or has not) been established—that any differences between the reading skills of the two groups are due to the reading method and not some other factor.

Of course, with respect to some variables we might want to study, such as age, gender, and race/ethnicity, random assignment is not possible. We cannot assign Sierra to be age 5 and Daniel to be 10, or one to be a boy and the other a girl, or one to be African American and the other Asian American. When studying such a variable—for example, whether boys or girls are stronger in certain abilities—researchers can strengthen the validity of their conclusions by randomly selecting participants and by trying to make sure that they are statistically equivalent in other ways that might make a difference in the study.

Laboratory, Field, and Natural Experiments The control necessary for establishing cause and effect is most easily achieved in laboratory experiments. In a *laboratory experiment* the participants are brought to a laboratory, where they experience conditions manipulated by the experimenter. The experimenter records the participants' reactions to these conditions, perhaps comparing them with their own or other participants' behavior under different conditions.

However, not all experiments can be readily done in the laboratory. A *field experiment* is a controlled study conducted in an everyday setting, such as home or school. The experiment described earlier (Whitehurst et al., 1988), in which parents tried out a new way of reading aloud to young children, was a field experiment.

Laboratory and field experiments differ in two important respects. One is the *degree of control* exerted by the experimenter; the other is the degree to which findings can be generalized beyond the study situation. Laboratory experiments can be more rigidly controlled and are thus easier to replicate; however, the results may be less generalizable to real life. Because of the artificiality of the situation, participants may not act as they normally would. Thus, if children who watch violent television shows in the laboratory become more aggressive in that setting, we cannot be sure that children who watch violent shows at home hit their little brothers or sisters more often than children who do not watch such shows or watch fewer of them.

When, for practical or ethical reasons, it is impossible to conduct a true experiment, a natural experiment may provide a way of studying certain events. A *natural experiment,* also called a *quasi-experiment* compares people who have been accidentally "assigned" to

Checkpoint

Can you . . .

- ✔ Compare the uses and drawbacks of case studies, ethnographic studies, correlational studies, and experiments?
- ✔ Explain why only a controlled experiment can establish causal relationships?
- ✔ Distinguish among laboratory, field, and natural experiments, and tell what kinds of research seem most suitable to each?

separate groups by circumstances of life—one group of children who were exposed, say, to famine or HIV or superior educational opportunities and another group who were not. A natural experiment, despite its name, is actually a correlational study because controlled manipulation of variables and random assignment to treatment groups are not possible.

One natural experiment dealt with what happened when a casino opened on an Indian reservation in North Carolina, boosting the income of tribal members (Costello, Compton, Keeler, & Angold, 2003). The study found a decline in behavioral disorders among children in tribal families as compared with children in the same area whose families did not receive increased income. However, being correlational, the study could not prove that the increased income *caused* improvements in mental health.

Controlled experiments have important advantages over other research designs: the ability to establish cause-and-effect relationships and to permit replication. However, such experiments can be too artificial and too narrowly focused. In recent decades, therefore, many researchers have concentrated less on laboratory experimentation or have supplemented it with a wider array of methods.

Developmental Research Designs

The two most common research strategies used to study child development are cross-sectional and longitudinal studies (Figure 2-6). *Cross-sectional studies* show similarities and differences among age groups; *longitudinal studies* reveal how children change or stay the same as they grow older. Because each of these designs has drawbacks, researchers also have devised *sequential* designs.

Cross-Sectional, Longitudinal, and Sequential Studies

cross-sectional study Study designed to assess age-related differences, in which people of different ages are assessed on one occasion.

In a **cross-sectional study,** children of different ages are assessed at one time. In one cross-sectional study, researchers asked 3-, 4-, 6-, and 7-year-olds such questions as what a pensive-looking woman was doing. These researchers found a striking increase with age in children's awareness of thinking as a mental activity (Flavell, Green, & Flavell, 1995). These findings strongly suggest that, as children become older, their understanding of mental processes improves. However, we cannot draw such a conclusion with certainty. We don't know whether the 7-year-olds' awareness of mental activity when they were 3 years old was the same as that of the current 3-year-olds in the study. The only way to see whether change occurs with age is to conduct a longitudinal study of a particular person or group.

longitudinal study Study designed to assess changes in a sample over time.

In a **longitudinal study,** researchers study the same person or group of people more than once, sometimes years apart. They may measure a single characteristic, such as vocabulary size, intelligence, height, or aggressiveness, or they may look at several aspects of development to find relationships among them.

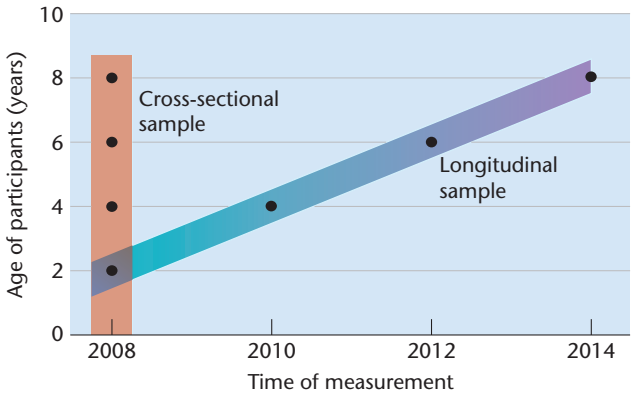


Figure 2-6

Developmental research designs. In the cross-sectional study, groups of 2-, 4-, 6-, and 8-year-olds were tested in 2008 to obtain data about age differences. In the longitudinal study, a group of children were first measured in 2008, when they were 2 years old; follow-up testing is done when the children are 4, 6, and 8, to measure age-related changes in performance.

The Oakland Growth Study was a groundbreaking longitudinal study of the physical, intellectual, and social development of 167 fifth and sixth graders in Oakland, California. The study, discussed in Box 1-2 in Chapter 1, began around the outset of the Great Depression of the 1930s. These young people were followed intensively until 1939, when they were 18 or 19 years old, and at five occasions during their adult years The follow-ups generally included interviews, health assessments, personality inventories, and fact-sheet questionnaires. One of the most important findings was that societal disruption, such as occurred during the Great Depression, affected family processes and child development.

Both cross-sectional and longitudinal designs have strengths and weaknesses (Table 2-6). Advantages of cross-sectional research include speed and economy—data can be gathered relatively quickly from large numbers of people. And, because participants are assessed only once, there is no problem

Table 2-6 Cross-Sectional, Longitudinal, and Sequential Research

Type of Study	Procedure	Advantages	Disadvantages
Cross-sectional	Date are collected on people of different ages at the same time.	Can show similarities and differences among age groups; speedy, economical; presents no problem of attrition or repeated testing.	Cannot establish age effects; masks individual differences; can be confounded by cohort effects.
Longitudinal	Data are collected on same person or persons over a period of time.	Can show age-related change or continuity; avoids confounding age with cohort effects.	Is time-consuming, expensive; presents problems of attrition, bias in sample, and effects of repeated testing; results may be valid only for cohort tested or sample studied.
Sequential	Data are collected on successive cross-sectional or longitudinal samples.	Can avoid drawbacks of both cross-sectional and longitudinal designs.	Requires large amount of time and effort and analysis of very complex data.

of either attrition (participants dropping out) or repeated testing (which can produce practice effects), as is the case with longitudinal research. One drawback of cross-sectional studies is that they may obscure individual differences by focusing on group averages alone. Their major disadvantage, however, is that the results may be affected by cohort differences—the differing experiences of people born at different times, for example, before and after the advent of the Internet. Cross-sectional studies are sometimes interpreted as yielding information about developmental changes, but such information is often misleading. Thus, the proportion of research devoted to longitudinal studies, especially short-term ones, is increasing (Parke, Ornstein, Rieser, & Zahn, 1994).

Longitudinal research, in repeatedly studying the same people, can track individual patterns of continuity and change. However, a longitudinal study done on one cohort may not apply to another. (The results of a study of children born in the 1920s, such as the Oakland Growth Study, may not apply to children born in the 1990s.) Furthermore, longitudinal studies generally are more time-consuming and expensive than cross-sectional studies; it is hard to keep track of a large group of participants over the years, to keep records, and to keep the study going despite possible turnover in research personnel. Then there is the problem of nonrandom attrition; participants may die, move away, or drop out. Also, longitudinal studies tend to be biased; those who stay with the study tend to be above average in intelligence and socioeconomic status. Also, results can be affected by repeated testing; participants may do better in later tests because of familiarity with test procedures.

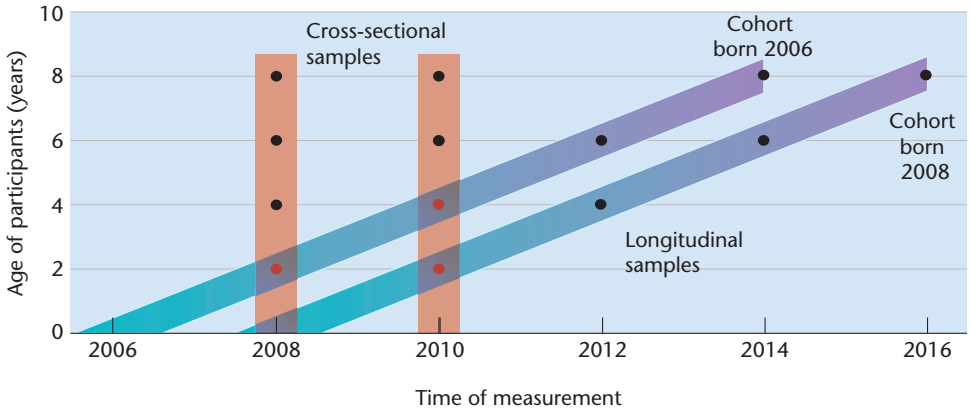
sequential study Study design that combines cross-sectional and longitudinal techniques.

The **sequential study**—a sequence of cross-sectional and/or longitudinal studies—is a complex strategy designed to overcome the drawbacks of longitudinal and cross-sectional research shown in Table 2-6. Researchers may assess a cross-sectional sample on two or more occasions in sequence to find out how members of each age cohort have changed. This procedure permits researchers to separate age-related changes from cohort effects. Another sequential design consists of a sequence of longitudinal studies, running concurrently but starting one after another. This design enables researchers to compare individual differences in the course of developmental change. A combination of cross-sectional and longitudinal sequences (as shown in Figure 2-7) can provide a more complete picture of development than would be possible with longitudinal or cross-sectional research alone. The major drawbacks of sequential studies relate to time, effort, and complexity. Sequential designs require large numbers of participants and the collection and analysis of huge amounts of data over a period of years. Interpreting their findings and conclusions can demand a high degree of sophistication.

Collaborative Research

Researchers use various means to share and pool data. One is the archiving of data sets for use by other researchers. Another is *meta-analysis,* which provides a systematic

Figure 2-7
A sequential design. Two successive cross-sectional groups of 2-, 4-, 6-, and 8-year-olds are tested in 2008 and 2010. Also, a longitudinal study of a group of children first measured in 2008, when they were 2 years old, is followed by a similar longitudinal study of another group of children who were 2 years old in 2010.



overview of the research on a topic through statistical analysis of the combined findings of multiple studies. Generally, meta-analyses are used for controversial findings and are an attempt to reconcile disparities across a large number of studies. A problem with meta-analysis is that the designs and methodologies of the studies may be inconsistent, making interpretation of the results less than precise.

Still another increasingly common approach is collaborative research by multiple researchers at multiple sites, sometimes with government or foundation funding. This collaborative model can trace development within a population on a very broad scale. It makes possible larger, more representative samples; makes it easier to carry out longitudinal studies that might otherwise be hampered by researcher attrition and burnout; and permits a blending of theoretical perspectives (Parke, 2004). An example of collaborative research is the National Institute of Child Health and Human Development (NICHD) Study of Early Child Care, discussed in Chapter 8.

A difficulty with the collaborative model is the need for group consensus on all aspects of the research, from the initial design to writing the report. Achieving consensus can be cumbersome and may require difficult compromises. The more flexible single-investigator or single-site model may be better suited to experimental work and to the development of novel methods and approaches.

Checkpoint

Can you . . .

- ✔ List advantages and disadvantages of longitudinal, cross-sectional, and sequential research?
- ✔ Discuss advantages and disadvantages of collaborative research?

Guidepost 4

What ethical problems may arise in research on children?

Ethics of Research

Should research that might harm its participants ever be undertaken? How can we balance the possible benefits against the risk of mental, emotional, or physical injury to individuals?

Objections to the study of "Little Albert" (described earlier in this chapter), as well as to a number of other early studies, gave rise to today's more stringent ethical standards. Institutional review boards at colleges, universities, and other institutions that receive federal funding must review proposed research from an ethical standpoint. Guidelines of the American Psychological Association (2002) cover such issues as *informed consent* (consent freely given with full knowledge of what the research entails), *avoidance of deception,* protection of participants from *harm and loss of dignity,* guarantees of *privacy and confidentiality,* the *right to decline or withdraw* from an experiment at any time, and the responsibility of investigators to *correct any undesirable effects,* such as anxiety or shame.

In resolving ethical dilemmas, researchers are expected to be guided by three principles: (1) *beneficence,* the obligation to maximize potential benefits to participants and minimize possible harm; (2) *respect* for participants' autonomy and protection of those who are unable to exercise their own judgment; and (3) *justice,* inclusion of diverse groups together with sensitivity to any special impact the research may have on them. In evaluating risks and benefits, researchers should consider participants' developmental needs (Thompson, 1990; Table 2-7) and be sensitive to cultural issues and values (Fisher et al., 2002).

Table 2-7 Developmental Considerations in Children's Participation in Research

Younger Children Are Especially Vulnerable to	Older Children Are Especially Vulnerable to
Stressful or unfamiliar situations	Apparent approval or disapproval by the researcher
Absence of parent or caregiver	Sense of failure, threats to self-esteem
Situations arousing inappropriate shame, guilt, or embarrassment	Expressed or implied comparisons with others
Coercion, deception, and unreasonable demands	Implied racial, ethnic, or socioeconomic biases
	Threats to privacy

Source: Based on Thompson, 1990.

The Society for Research in Child Development (2007) has developed standards for age-appropriate treatment of children in research, covering such principles as avoidance of physical or psychological harm, obtaining the child's assent as well as a parent's or guardian's informed consent, and responsibility to follow up on any information that could jeopardize the child's well-being. For example, infants' and very young children's ability to cope with the stress of the research situation may hinge on the presence of a parent or trusted caregiver, a familiar setting and procedure, and familiar objects.

Let's look more closely at a few specific ethical considerations that can present problems.

Right to Informed Consent

Informed consent exists when participants voluntarily agree to be in a study, are competent to give consent, are aware of the risks as well as the potential benefits, and are not being exploited. The National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research (1978) recommends that children age 7 or over be asked to give their consent to take part in research and that any children's objections should be overruled only if the research promises direct benefit to the child.

However, some ethicists argue that young children cannot give meaningful, voluntary *consent* because they cannot fully understand what is involved. They can merely *assent,* that is, agree to participate. Young children are less capable than adults of understanding what they are getting into and of making an informed decision on whether to participate. The usual procedure, therefore, when children under age 18 are involved, is to ask the parents or legal guardians and sometimes school personnel to give consent.

Avoidance of Deception

Can informed consent exist if participants are deceived about the nature or purpose of a study or about the procedures to which they will be subjected? Suppose that children are told they are trying out a new game when they are actually being tested on their reactions to success or failure? Experiments like this have added to our knowledge but at the cost of the participants' right to know what they were getting involved in.

Ethical guidelines call for withholding information *only* when it is essential to the study; and then investigators should avoid methods that could cause pain, anxiety, or harm. Participants should be debriefed afterward to let them know the true nature of the study and why deception was necessary and to make sure they have not suffered as a result.

Right to Self-Esteem

Some studies have a built-in *failure factor.* Researchers give harder and harder tasks until the participant is unable to do them. Might this inevitable failure affect a participant's self-worth? Similarly, when researchers publish findings that middle-class children are academically superior to poor children, unintentional harm may be done to some

participants' self-esteem. Even if such studies may lead to beneficial interventions for poor children, they also may affect teachers' expectations and students' performance.

Right to Privacy and Confidentiality

Not all ethical issues have clear answers; some hinge on researchers' judgment and scruples. In this gray area are issues having to do with privacy and with protecting the confidentiality of personal information that participants may reveal in interviews or questionnaires.

What if, during the course of research, an investigator suspects that a child may have a learning disability or some other treatable condition? Is the researcher obliged to share such information with the parents or guardians or to recommend services that may help, when sharing the information might contaminate the research findings? Such a decision should not be made lightly; sharing information of uncertain validity might create damaging misconceptions about a child. However, researchers need to know, and inform participants of, their legal responsibility to report abuse or neglect or any other illegal activity of which they become aware.

The final word in these introductory chapters is that this entire book is far from the final word. Although we have tried to incorporate the most important and up-to-date information about how children develop, developmental scientists are constantly learning more. As you read this book, you are certain to come up with questions. By thinking about them and perhaps eventually conducting research to find answers, it is possible that you, now embarking on the study of child development, will someday add to our knowledge about the interesting species to which we all belong.

Checkpoint ✓

Can you . . .

- ✔ Identify three principles that should govern inclusion of participants in research?
- ✔ Discuss four rights of research participants?
- ✔ Give examples of how children's developmental needs can be considered in research?

Summary and Key Terms

Basic Theoretical Issues

Guidepost 1 What purposes do theories serve, and what are two basic issues on which developmental theorists differ?

- A theory is used to organize and explain data and generate hypotheses that can be tested by research.
- Developmental theories differ on two basic issues: the active or reactive character of development and the existence of stages of development.
- Two contrasting models of development are the mechanistic model and the organismic model. Mechanistic theories deal with quantitative change; organismic theories, with qualitative change.

theory (24) **hypotheses (24)** **mechanistic model (25)** **organismic model (25)** **quantitative change (26)** **qualitative change (26)**

Theoretical Perspectives

Guidepost 2 What are five theoretical perspectives on child development, and what are some theories that are representative of each?

- The psychoanalytic perspective sees development as motivated by unconscious emotional drives and conflicts. Leading examples are Freud's and Erikson's theories.

psychoanalytic perspective (27) **psychosexual development (27)** **psychosocial development (28)**

- The learning perspective views development as a result of learning based on experience. Leading examples are Watson's and Skinner's behaviorism and Bandura's social learning (social cognitive) theory.

learning perspective (29) **behaviorism (29)** **classical conditioning (30)** **operant conditioning (31)** **reinforcement (31)** **punishment (31)** **social learning theory (31)** **reciprocal determinism (31)** **observational learning (32)** **self-efficacy (32)**

- The cognitive perspective is concerned with thought processes. Leading examples are Piaget's cognitive-stage theory, Vygotsky's sociocultural theory, the information-processing approach, and neo-Piagetian theories.

cognitive perspective (32) **cognitive-stage theory (32)** **organization (33)** **schemes (33)** **adaptation (33)** **assimilation (33)** **accommodation (33)** **equilibration (33)** **sociocultural theory (33)** **zone of proximal development (ZPD) (34)** **scaffolding (34)** **information-processing approach (34)**

- The contextual perspective focuses on interaction between the individual and the social context. A leading example is Bronfenbrenner's bioecological theory, although Vygotsky's sociocultural theory also can be considered a contextual approach.

contextual perspective (35) **bioecological theory (35)** **microsystem (36)** **mesosystem (36)** **exosystem (36)** **macrosystem (36)** **chronosystem (36)**

- The evolutionary/sociobiological perspective is based in part on Darwin's theory of evolution and describes adaptive behaviors that promote survival. A leading example is Bowlby's attachment theory.

evolutionary/sociobiological perspective (36) **ethology (36)** **evolutionary psychology (37)**

Research Methods

Guidepost 3 How do developmental scientists study children, and what are the advantages and disadvantages of each research method?

- Research can be quantitative, qualitative, or both.
- To arrive at sound conclusions, researchers use the scientific method.
- Random selection of a research sample can provide generalizability.

quantitative research (38) qualitative research (38) scientific method (38) sample (39) random selection (39)

- Three forms of data collection are self-reports, observation, and behavioral or performance measures.

naturalistic observation (41) laboratory observation (41) operational definition (42) cognitive neuroscience (42)

- Two qualitative designs used in developmental research are the case study and ethnographic study. Cross-cultural research can indicate whether certain aspects of development are universal or culturally influenced.
- Two quantitative designs are the correlational study and experiment. Only experiments can firmly establish causal relationships.

case study (43) ethnographic study (44) participant observation (44) correlational study (44) experiment (46)

- Experiments must be rigorously controlled so as to be valid and replicable. Random assignment of participants can ensure validity.
- Laboratory experiments are easiest to control and replicate, but findings of field experiments may be more generalizable. Natural experiments may be useful in situations in which true experiments would be impractical or unethical.

experimental group (46) control group (46) independent variable (46) dependent variable (46) random assignment (47)

- The two most common designs used to study age-related development are longitudinal and cross-sectional. Cross-sectional studies compare age groups; longitudinal studies describe continuity or change in the same participants. The sequential study is intended to overcome the weaknesses of the other two designs.

cross-sectional study (48) longitudinal study (48) sequential study (49)

Ethics of Research

Guidepost 4 What ethical problems may arise in research on children?

- Researchers seek to resolve ethical issues on the basis of principles of beneficence, respect, and justice.
- Ethical issues in research on child development involve the rights of participants to informed consent, avoidance of deception, protection from harm and loss of dignity or self-esteem, and guarantees of privacy and confidentiality.
- Standards for protecting children used in research cover such points as parental informed consent and avoidance of harm or jeopardy to the child's well-being.