10

CHAPTER TEN

Development

HIS MOTHER CALLED HIM ADI AND showered him with affection, but his father was not so kind. As his sister later recalled, "Adi challenged my father to extreme harshness and got his sound thrashing every day." Although his father wanted him to become a civil servant, Adi's true love was art, and his mother encouraged that gentler interest. Adi was just 18 years old when his mother was diagnosed with terminal cancer, and he was heartbroken when she died. Even her physician remarked that "in all my career, I have never seen anyone so prostrate with grief."

But Adi had little time for grieving. As he wrote, "Poverty and hard reality compelled me to make a quick decision. I was faced with the problem of somehow making my own living." Adi resolved to make his living as an artist. He moved to the city and applied to art school, but he was flatly rejected. Motherless and penniless, Adi wandered the city streets for 5 long years, sleeping on park benches, living in homeless shelters, and eating in soup kitchens, all the while trying desperately to sell his sketches and watercolors. Ten years later, Adi had achieved the fame he so desired—but not as an artist. Indeed, most of us know him not by the nickname Adi, but by his full legal name: Adolf Hitler. ■

AP PHOTO/BARRY GOMER

One of Adi's paintings, The Church of Preux-Au-Bois, sold at auction in 2006 for just under $20,000.

DANIEL GILBERT

From infancy to childhood to adolescence to adulthood, people exhibit both continuity and change.

Why is it so difficult to imagine the greatest mass murderer of the 20th century as a gentle child who loved to draw, as a compassionate adolescent who cared for his ailing mother, or as a dedicated young adult who suffered cold and hunger for the sake of art? After all, none of us began as the people we are now, and few of us will end up that way. From birth to infancy, from childhood to adolescence, from young adulthood to old age, one of the most obvious facts about human beings is that they change over time. Their development includes both dramatic transformations and striking consistencies in the way they look, think, feel, and act. **Developmental psychology** is *the study of continuity and change across the life span,* and every human being exhibits both. In the last century, psychologists have made some remarkable discoveries about how we acquire our first understanding of ourselves and our worlds; about what we seem to know at birth, what we must learn along the way, and what we never seem to get quite right; about the emotional bonds between us and our parents and, later, between us and our children; about how we develop our sense of right and wrong; and about the radical transformations of adolescence, the subtle transformations of adulthood, and the surprising delights of old age.

THE NEW YORKER COLLECTION 1994 SIDNEY HARRIS
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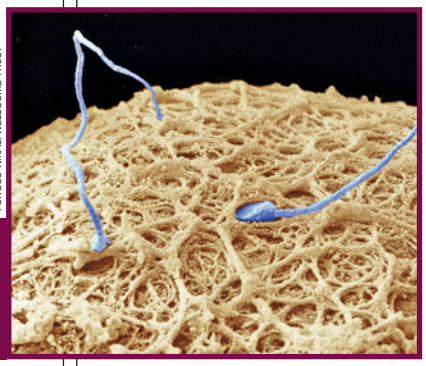
Prenatality: A Womb with a View

You probably calculate your age by counting your birthdays, but the fact is that when you were born, you were already 9 months old. The *prenatal stage* of development ends with birth, but it begins 9 months earlier when about 200 million sperm begin a hazardous journey from a woman's vagina, through her uterus, and on to her fallopian tubes. Many of these sperm have defects that prevent them from swimming vigorously enough to make progress, and others get stuck in the spermatazoidal equivalent of a traffic jam. Of those that manage to make their way through the uterus, many take a wrong turn and end up in the fallopian tube that does not contain an egg. A mere 200 or so of the original 200 million sperm manage to find the right fallopian tube and get close enough to an egg to release digestive enzymes that erode the egg's protective outer layer. As soon as one of these sperm manages to penetrate the coating, the egg quickly releases a chemical that seals the coating and keeps all the remaining sperm from entering. After triumphing over massive odds, the one successful sperm sheds its tail and fertilizes the egg. In about 12 hours, the nuclei of the sperm and the egg merge, and the prenatal development of a unique human being begins.



YORGOS NIKAS/WELLCOME TRUST

This electron micrograph shows a false-color image of several human sperm, one of which is fertilizing an egg.

Prenatal Development

A **zygote** is *a fertilized egg that contains chromosomes from both a sperm and an egg.* From the first moment of its existence, a zygote has one thing in common with the person it will ultimately become: gender. Each human sperm cell and each human egg cell contain 23 *chromosomes* that contain *genes,* which provide the blueprint for all biological development. One of these chromosomes (the 23rd) can come in two variations: X or Y. Some sperm carry an X chromosome, and others carry a Y chromosome. If the egg is fertilized by a sperm that carries a Y chromosome, then the zygote is male; if the egg is fertilized by a sperm that carries an X chromosome, the zygote is female.

The 2-week period that begins at conception is known as the **germinal stage**, and it is during this stage that the one-celled zygote begins to divide—into two cells which divide into four, which divide into eight, and so on. By the time of birth, the zygote has divided into trillions of cells, each of which contains exactly one set of 23 chromosomes from the sperm and one set of 23 chromosomes from the egg. During the germinal stage, the zygote migrates back down the fallopian tube and implants itself in the wall of the uterus. This is a difficult journey, and about half of all zygotes do not complete it, either because they are defective or because they implant themselves in an inhospitable part of the uterus.

When the zygote implants itself on the uterine wall, a new stage of development begins. The **embryonic stage** is *a period that lasts from the second week until about the eighth week* (see FIGURE 10.1). During this stage, the zygote continues to divide and its cells begin to differentiate. The zygote at this stage is known as an *embryo,* and although it is just an inch long, it already has a beating heart and other body parts, such as arms and legs. Embryos that have one X chromosome and one Y chromosome begin to produce a hormone called testosterone, which masculinizes their reproductive organs, and embryos that have two X chromosomes do not. Without testosterone, the embryo continues developing as a female. In a sense, then, males are a specialized form of females.

● What distinguishes an embryo from a zygote and a fetus?

The **fetal stage** is *a period that lasts from the ninth week until birth.* The embryo at this stage is known as a *fetus,* and it has a skeleton and muscles that make it capable of movement. During the last 3 months of the fetal stage, the size of the fetus increases rapidly. It develops a layer of insulating fat beneath its skin, and its digestive and respiratory systems mature. The cells that ultimately become the brain divide very quickly around the third and fourth week after conception. During the fetal stage, these brain cells begin to generate axons and dendrites (which permit communication with other brain cells). They also begin to undergo a process known as **myelination**—which is *the formation of a fatty sheath around the axons of a brain cell.* Just as plastic sheathing insulates a wire, myelin insulates a brain cell and prevents the leakage of neural signals

developmental psychology The study of continuity and change across the life span.

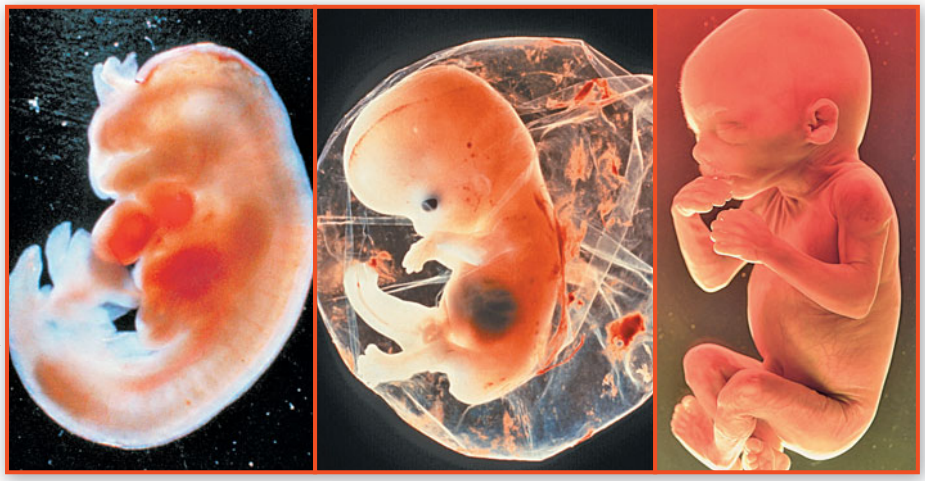
zygote A single cell that contains chromosomes from both a sperm and an egg.

germinal stage The 2-week period of prenatal development that begins at conception.

embryonic stage The period of prenatal development that lasts from the second week until about the eighth week.

fetal stage The period of prenatal development that lasts from the ninth week until birth.

myelination The formation of a fatty sheath around the axons of a brain cell.



LEFT: CLAUDE EDELMAN/PHOTO RESEARCHERS
CENTER: BIOPHOTO ASSOCIATES/PHOTO RESEARCHERS
RIGHT: JAMES STEVENSON/PHOTO RESEARCHERS

FIGURE 10.1 Prenatal Development *Human beings undergo amazing development in the 9 months of prenatal development. These images show an embryo at 30 days, an embryo at 8 to 9 weeks, and a fetus at 5 months.*

that travel along the axon. The process of myelination does not occur at a constant rate across all areas; for example, the myelination of the cortex continues into adulthood.

Although the brain undergoes rapid and complex growth during the fetal period, at birth it is nowhere near its adult size. Whereas a newborn chimp's brain is nearly 60% of its adult size, a newborn human's brain is only 25% of its adult size, which is to say that 75% of the brain's development occurs outside the womb. Why are human beings born with such underdeveloped brains when other primates are not? There are at least two reasons. First, the human brain has nearly tripled in size in just 2 million years of evolution, and bigger brains require bigger heads to house them. If a newborn's head were closer to its adult size, the baby could not pass through its mother's birth canal. Second, one of our species' greatest talents is its ability to adapt to a wide range of novel environments that differ in terms of climate, social structure, and so on. Rather than arriving in the world with a fully developed brain that may or may not meet the requirements of its environment, human beings arrive with brains that do much of their developing *within* the very environments in which they will function. The fact that our underdeveloped brains are specifically shaped by the unique social and physical environment into which we are born allows us to be exceptionally adaptable.

COURTESY OF STERLING K. CLARREN, MD CLINICAL PROFESSOR OF PEDIATRICS, UNIVERSITY OF BRITISH COLUMBIA FACULTY OF MEDICINE

GEORGE STEINMETZ

The two photographs above show the brains of a normal 6-week-old child (left) and a 6-week-old child born with fetal alcohol syndrome (FAS) (right). The child in the photo at right has the telltale facial features associated with FAS: short eye openings, a flat midface, an indistinct or flat ridge under the nose, and a thin upper lip. Children with FAS may also have tiny folds of tissue along the eye opening, a low nasal ridge, an underdeveloped jaw, and minor ear anomalies.

Prenatal Environment

It is natural to assume that genes influence development from the moment of conception and that the environment influences development from the moment of birth. But that's not so. Even before birth, the womb is an environment that influences development in a multitude of ways. For example, the *placenta* is the organ that physically links the bloodstreams of the mother and the developing embryo or fetus and permits the exchange of materials. As such, the foods a woman eats during pregnancy can affect fetal development. Toward the end of World War II, the Nazis imposed a food embargo on large Dutch cities, and many pregnant women suffered severe food deprivation. Subsequent research on their children's development demonstrated that food deprivation during the first 6 months of pregnancy caused the children to have both physical and psychological problems (Neugebauer, Hoek, & Susser, 1999; Stein et al., 1975; Susser, Brown, & Matte, 1999).

These effects are not unique to food. Almost anything that a woman eats, drinks, inhales, injects, or otherwise comes into contact with can pass through the placenta and affect the development of her fetus. *Agents that damage the process of development* are called **teratogens**, which literally means "monster makers." Alcohol is a particularly popular teratogen. **Fetal alcohol syndrome** is *a developmental disorder that stems from heavy alcohol use by the mother during pregnancy,* and it increases the risk of birth defects, especially with respect to the shape and size of the head and the structure of the brain. Children with fetal alcohol syndrome frequently exhibit mental retardation and have more problems with academic achievement than other children (Carmichael Olson et al., 1997; Streissguth et al., 1999). Tobacco is another popular teratogen. Babies whose mothers smoke tobacco have lower birth weights (Horta et al., 1997) and are more likely to have perceptual and attentional problems in childhood (Fried & Watkinson, 2000). As far as scientists can tell, there are no "safe amounts" of alcohol and tobacco for pregnant women. Other teratogens include lead in the water, paint dust in the air, and mercury in fish.

The prenatal environment is rich with chemicals, but it is also rich with information. The developing fetus can sense stimulation—and can learn. Wombs are dark, because

only the brightest light can filter through the mother's abdomen, but they are not quiet. High-frequency sounds tend to be muffled, but low-frequency sounds such as human voices can penetrate the mother's abdomen. Newborns who are just 2 hours old will suck a nipple more vigorously when they hear the sound of their mother's voice than when they hear the voice of a female stranger (Querleu et al., 1984), which suggests that they became familiar with their mother's voice while they were developing inside her. In one study, researchers arranged for some women to read aloud a short passage from *The Cat in the Hat* repeatedly during the last 6 weeks of pregnancy. Once the babies were born, the researchers tested their reactions to this passage as well as passages from other stories. Babies whose mothers had read aloud reacted to the passage from *The Cat in the Hat* differently than they reacted to an unfamiliar passage, whereas infants whose mothers had not read aloud reacted to both passages similarly (DeCasper & Spence, 1986). Clearly, the fetus is listening.

Can a fetus learn?

summary quiz [10.1]

1. Developmental psychology is the study of
   a. the child, from birth to adolescence.
   b. adulthood, from the 20s through old age.
   c. prenatal growth, from conception until birth.
   d. continuity and change across the life span.

2. During the embryonic stage, which of the following occurs?
   a. An insulating layer of fat develops below the skin.
   b. The digestive and respiratory systems mature.
   c. The embryo grows to the length of six inches.
   d. The heart begins to beat.

3. Which is true of vulnerability to teratogens?
   a. Vulnerability is greatest early in the pregnancy.
   b. Vulnerability is greatest in the late stages of pregnancy.
   c. The central nervous systems is most vulnerable late in pregnancy.
   d. Small amounts of alcohol and tobacco will not harm the fetus.

teratogens Agents that damage the process of development, such as drugs and viruses.

fetal alcohol syndrome A developmental disorder that stems from heavy alcohol use by the mother during pregnancy.

infancy The stage of development that begins at birth and lasts between 18 and 24 months.

Infancy and Childhood: Becoming a Person

Newborns may appear to be capable of little more than squalling and squirming, but in the last decade, researchers have discovered that they are actually more sophisticated than anyone suspected. **Infancy** is *the stage of development that begins at birth and lasts between 18 and 24 months,* and as you will see, much more happens during this stage than meets the untrained eye.

Perceptual and Motor Development

New parents like to stand around the crib and make goofy faces at the baby because they think the baby will be amused. In fact, newborns have a rather limited range of vision, but when visual stimuli are close enough to be seen, newborns are quite responsive to them. Newborns in one study were shown a circle with diagonal stripes, and they initially stared at it for quite some time. But as the circle was presented again and again, the infants stared less and less each time (Slater, Morison, & Somers, 1988). Recall from

ONLY HUMAN

NO OFFENSE TAKEN In December 1996, officials at the Wellington City Art Gallery in New Zealand denied entry to a 9-day-old baby whose mother sought to buy a ticket. Director Paula Savage said she was strictly enforcing the gallery's policy of not permitting minors to see the sexually explicit work of controversial photographer Robert Mapplethorpe.

QILAI SHEN/PANOS PICTURES

Some children develop motor skills earlier than others.

Infants mimic the facial expressions of adults. And vice versa.

CARLOS E. SANTA MARIA/SHUTTERSTOCK.COM

Chapter 6 that *habituation* is the tendency for organisms to respond less intensely to a stimulus as the frequency of exposure to that stimulus increases, and babies habituate just like the rest of us do.

Interestingly, newborns seem to be especially attuned to social stimuli. For example, newborns in one study were shown a blank disk, a disk with scrambled facial features, or a disk with a regular face. When one of the disks was moved across their fields of vision, the newborns tracked the disk by moving both their heads and their eyes. Moreover, they tracked the disk with the regular face longer than they tracked the other disks (Johnson et al., 1991). But newborns don't merely track social stimuli with their eyes; they respond to them in other surprising ways. Researchers in one study stood close to some newborns while sticking out their tongues and stood close to other newborns while pursing their lips. Newborns in the first group stuck out their own tongues more often than those in the second group did, and newborns in the second group pursed their lips more often than those in the first group did (Meltzoff & Moore, 1977). Indeed, newborns have been shown to mimic facial expressions in their very first *hour* of life (Reissland, 1988).

How do newborns respond to social stimuli?

Although infants can use their eyes right away, they must spend considerably more time learning how to use most of their other parts. **Motor development** is *the emergence of the ability to execute physical actions* such as reaching, grasping, crawling, and walking. Infants are born with a small set of **reflexes,** which are *specific patterns of motor response that are triggered by specific patterns of sensory stimulation.* For example, the *rooting reflex* is the tendency for infants to move their mouths toward any object that touches their cheek, and the *sucking reflex* is the tendency to suck any object that enters their mouths. These two reflexes allow newborns to find their mother's nipple and begin feeding—a behavior so vitally important that nature took no chances and hardwired it into every one of us. Interestingly, these and other reflexes that are present at birth seem to disappear in the first few months as children learn to execute more sophisticated motor behavior.

The development of these more sophisticated behaviors tends to obey two general rules. The first is the **cephalocaudal rule** (or the "top-to-bottom" rule), which describes *the tendency for motor skills to emerge in sequence from the head to the feet.* Infants tend to gain control over their heads first, their arms and trunks next, and their legs last. The second rule is the **proximodistal rule** (or the "inside-to-outside" rule), which describes *the tendency for motor skills to emerge in sequence from the center to the periphery.* Babies learn to control their trunks before their elbows and knees, and they learn to control their elbows and knees before their hands and feet (see **FIGURE 10.2**, on page 303). Motor skills generally emerge in an orderly sequence that corresponds to these rules, but they do not emerge on a strict timetable. Rather, the timing of these skills is influenced by many factors, such as the baby's incentive for reaching, body weight, muscular development, and general level of activity. In one study, babies who had visually stimulating mobiles hanging above their cribs began reaching for objects 6 weeks earlier than babies who did not (White & Held, 1966). Furthermore, different infants seem to acquire the same skill in different ways. One study examined how children learn to reach by closely following the development of four infants (Thelen et al., 1993). Two of the infants were especially energetic and initially produced large circular movements of both arms. To reach accurately, these infants had to learn to dampen these large circular movements by holding their arms rigid at the elbow and swiping at an object. The other two infants were less energetic and did not produce large, circular movements. Thus, their first step in learning to reach involved learning to lift their arms against the force of gravity and extend them forward. Detailed observations such as these suggest that while all infants learn skills such as reaching, different infants accomplish this goal in different ways (Adolph & Avoilio, 2000).

In what order do motor skills develop?

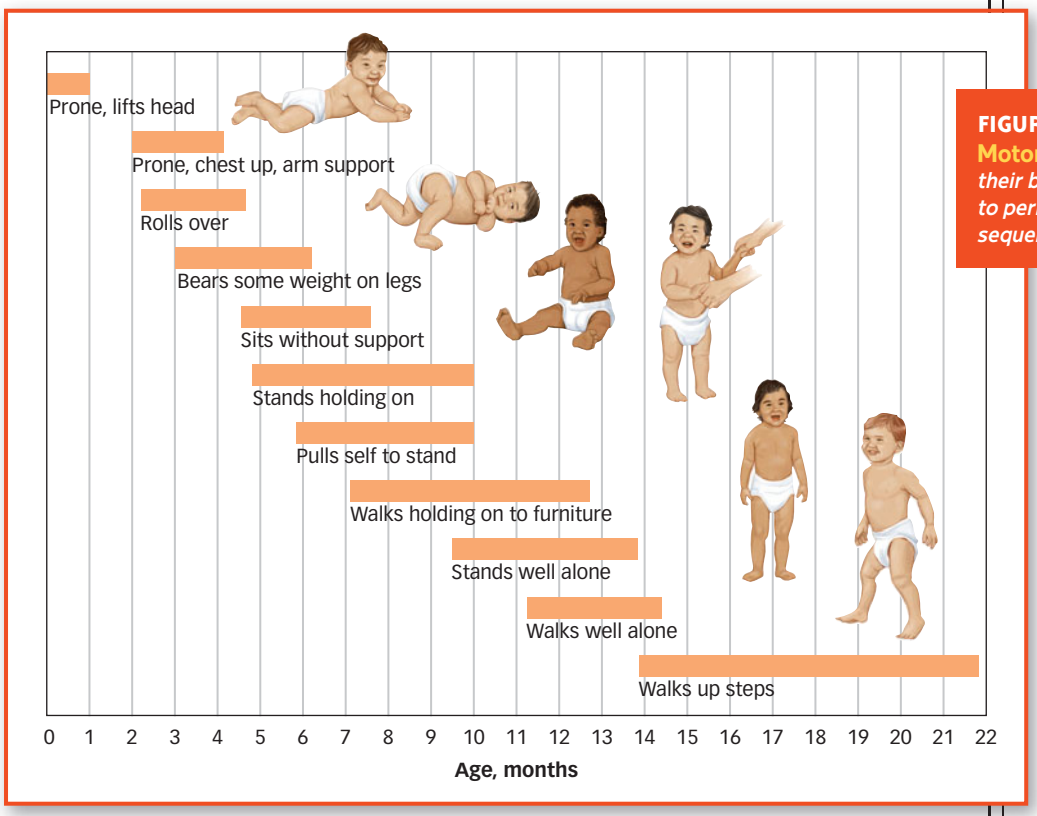


FIGURE 10.2
Motor Development *Infants learn to control their bodies from head to feet and from center to periphery. These skills emerge in a strict sequence.*

Cognitive Development

Infants can see. But what exactly do they make of the visual stimuli to which their eyes respond? In the first half of the 20th century, a Swiss biologist named Jean Piaget was following up work by Alfred Binet, who had pioneered the development of intelligence tests for children. To his surprise, Piaget found that when children in the same age group were confronted with difficult problems, they made the same mistakes—mistakes that virtually disappeared when these children graduated to the next age group. The similarity and the age specificity of children's mistakes led Piaget to suspect that as children grow, they move through several stages of **cognitive development**—which refers to *the emergence of the ability to understand the world*. Piaget proposed that children pass through four sequential stages, which he called the *sensorimotor* stage, the *preoperational* stage, the *concrete operational* stage, and the *formal operational* stage (Piaget, 1954a; see **TABLE 10.1**).

TABLE 10.1

Piaget's Four Stages of Cognitive Development

Stage	Characteristics
Sensorimotor (Birth–2 years)	Infant experiences world through movement and senses, develops schemas, begins to act intentionally, and shows evidence of understanding object permanence.
Preoperational (2–6 years)	Child acquires motor skills but does not understand conservation of physical properties. Child begins this stage by thinking egocentrically but ends with a basic understanding of other minds.
Concrete operational (6–11 years)	Child can think logically about physical objects and events and understands conservation of physical properties.
Formal operational (11 years and up)	Child can think logically about abstract propositions and hypotheticals.

motor development The emergence of the ability to execute physical action.

reflexes Specific patterns of motor response that are triggered by specific patterns of sensory stimulation.

cephalocaudal rule The "top-to-bottom" rule that describes the tendency for motor skills to emerge in sequence from the head to the feet.

proximodistal rule The "inside-to-outside" rule that describes the tendency for motor skills to emerge in sequence from the center to the periphery.

cognitive development The emergence of the ability to understand the world.

FARRELL GREHAN/CORBIS

Jean Piaget (1896–1980) is widely considered to be the father of modern developmental psychology.

Discovering Our Worlds

The first of Piaget's four stages is the **sensorimotor stage**, which is *a stage of development that begins at birth and lasts through infancy.* As the word *sensorimotor* suggests, infants at this stage use their ability to *sense* and their ability to *move* to acquire information about the world in which they live. By actively exploring their environments with their eyes, mouths, and fingers, infants begin to construct **schemas**, which are *theories about or models of the way the world works.*

As every scientist knows, the key advantage of having a theory is that one can use it to predict and control what will happen in novel situations. If an infant learns that tugging at a stuffed animal causes the toy to come closer, then that observation is incorporated into the infant's theory about how physical objects behave, and the infant can later use that theory when he or she wants a different object to come closer, such as a rattle or a ball. Piaget called this process **assimilation**, which occurs when *infants apply their schemas in novel situations.* Of course, if the infant tugs the tail of the family cat, the cat is likely to sprint in the opposite direction. Infants' theories about the world ("Things come closer if I pull them") are occasionally disconfirmed, and thus infants must occasionally adjust their schemas in light of their new experiences ("Aha! Only *inanimate* things come closer when I pull them"). Piaget called this process **accommodation**, which occurs when *infants revise their schemas in light of new information.*

How are infants like scientists when they learn about the world?

What kinds of schemas do infants develop, apply, and revise? Piaget suggested that infants do not have—and hence must acquire—some very basic understandings about the physical world. For example, when you put a pair of socks away, you know that the socks exist even after you close the drawer, and you would be quite surprised if you opened the drawer a moment later and found it empty. But according to Piaget, this would not surprise an infant because infants do not have a theory of **object permanence**, which is *the idea that objects continue to exist even when they are not visible.* Piaget noted that in the first few months of life, infants act as though objects stop existing the moment they are out of sight. For instance, he observed that a 2-month-old infant will track a moving object with her eyes, but once the object leaves her visual field, she will not search for it.

Was Piaget right? Recent research suggests that when infants are tested in other ways, they demonstrate a sense of object permanence much earlier than Piaget realized. For instance, in one study, infants were shown a miniature drawbridge that flipped up and down. Once the babies got used to this, they watched as a box was placed behind the drawbridge—in its path but out of their sight. Some infants then saw a *possible* event: The drawbridge began to flip and then suddenly stopped, as if impeded by the box that the infants could not see. Other infants saw an *impossible* event: The drawbridge began to flip and then continued, as if unimpeded by the box (see **FIGURE 10.3**, on page 305). What did infants do? Four-month-old infants stared longer at the impossible event than at the possible event, suggesting that they were puzzled by it (Baillargeon, Spelke, & Wasserman, 1985). The fact that the infants were puzzled by the impossible event suggests that they knew the box existed even when they could not see it (Fantz, 1964).

Studies such as these suggest that infants do have some understanding of object permanence. Clearly, infants do not think of the world only in terms of its visible parts, and at some level they must "know" that when objects continue to exist even when they are out of sight. Although infants seem to have a better understanding of the physical world than Piaget claimed, it is still not clear just how much they know or how and when they come to know it. As Piaget (1977/1927) wrote: "The child's first year of life is unfortunately still an abyss of

MICHAEL HAGEDORN/CORBIS

During the sensorimotor stage, infants explore with their hands and mouths, learning important lessons about the physical world such as "No matter how hard you try you can't actually swallow silverware."

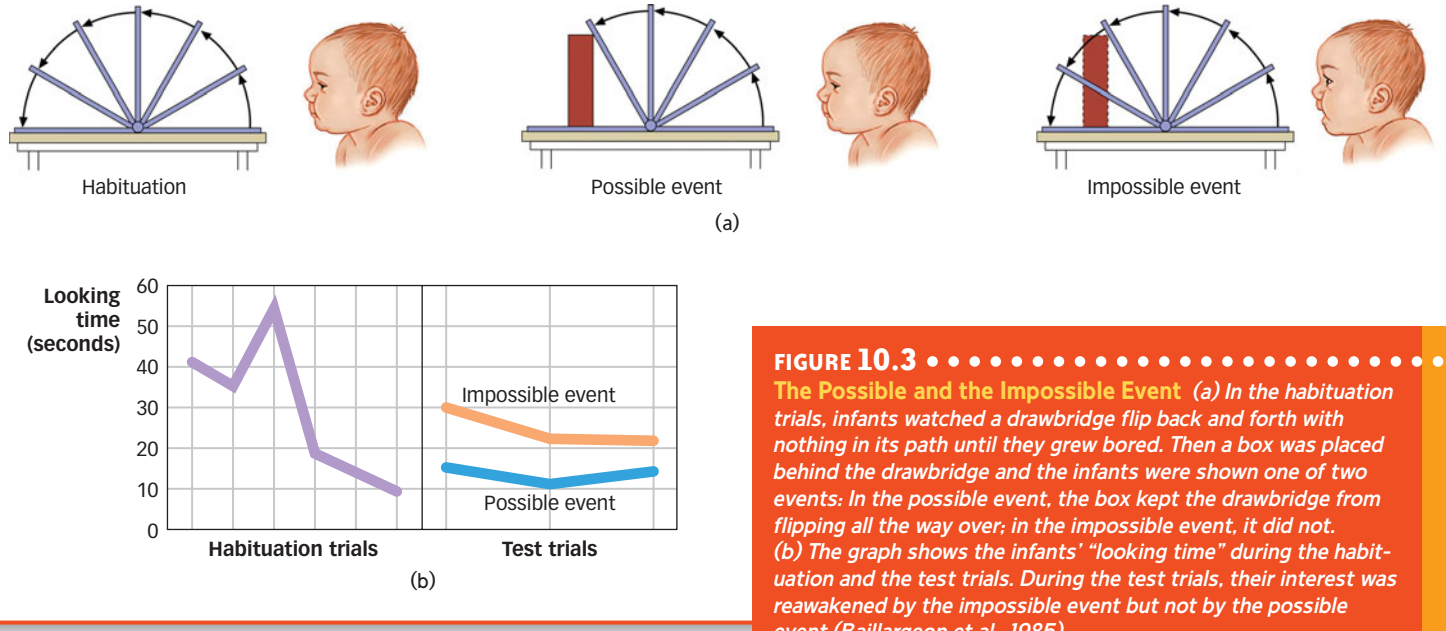


FIGURE 10.3 **The Possible and the Impossible Event** *(a) In the habituation trials, infants watched a drawbridge flip back and forth with nothing in its path until they grew bored. Then a box was placed behind the drawbridge and the infants were shown one of two events: In the possible event, the box kept the drawbridge from flipping all the way over; in the impossible event, it did not. (b) The graph shows the infants' "looking time" during the habituation and the test trials. During the test trials, their interest was reawakened by the impossible event but not by the possible event (Baillargeon et al., 1985).*

mysteries for the psychologist. If only we could know what is going on in a baby's mind while observing him in action, we could certainly understand everything there is to psychology."

Discovering Our Minds

The long period following infancy is called **childhood**, which is *the stage of development that begins at about 18 to 24 months and lasts until adolescence, which begins between 11 and 14 years.*

According to Piaget, childhood consists of two stages. The first is a **preoperational stage**, which is *the stage of development that begins at about 2 years and ends at about 6 years,* during which the child learns about physical (or "concrete") objects. Next is the **concrete operational stage**, which is *the stage of development that begins at about 6 years and ends at about 11 years,* during which the child can perform "concrete operations" which means that the child learns how actions (or "operations") can affect or transform objects. A key difference between children in the preoperational stage and children in the concrete operational stage is that only the latter understand that the number of objects doesn't change when those objects are rearranged. For example, in one study, Piaget showed children a row of cups and asked them to place an egg in each. Preoperational children were able to do this, and afterward they readily agreed that there were just as many eggs as there were cups. Then Piaget removed the eggs and spread them out in a long line that extended beyond the row of cups. Preoperational children incorrectly claimed that there were now more eggs than cups because the row of eggs was longer than the row of cups. Concrete-operational children, on the other hand, correctly reported that the number of eggs did not change when those eggs were spread out in a longer line. They understood that *quantity* is a property of a set of objects that does not change when an operation such as *spreading out* alters the set's appearance (Piaget, 1954b). Piaget called this insight **conservation**, which is *the notion that the quantitative properties of an object are stable despite changes in the object's appearance.*

● **What do children come to understand at the concrete-operational stage?**

Why don't preoperational children seem to grasp the notion of conservation? One reason is that preoperational children do not fully grasp the fact that they have *minds*

sensorimotor stage A stage of development that begins at birth and lasts through infancy in which infants acquire information about the world by sensing it and moving around within it.

schemas Theories about or models of the way the world works.

assimilation The process by which infants apply their schemas in novel situations.

accommodation The process by which infants revise their schemas in light of new information.

object permanence The idea that objects continue to exist even when they are not visible.

childhood The stage of development that begins at about 18 to 24 months and lasts until adolescence.

preoperational stage The stage of development that begins at about 2 years and ends at about 6 years, in which children have a preliminary understanding of the physical world.

concrete operational stage The stage of development that begins at about 6 years and ends at about 11 years, in which children acquire a basic understanding of the physical world and a preliminary understanding of their own and others' minds.

conservation The notion that the quantitative properties of an object are invariant despite changes in the object's appearance.


LAURA DWIGHT/PHOTOEDIT

When preoperational children are shown two equal-size glasses filled with equal amounts of liquid, they correctly say that neither glass "has more." But when the contents of one glass are poured into a taller, thinner glass, they incorrectly say that the taller glass now "has more." Concrete operational children don't make this mistake because they recognize that operations such as pouring change the appearance of the liquid but not its actual volume.

and that these minds contain *mental representations* of the world. As adults, we all distinguish between the subjective and the objective, between appearances and realities, between things in the mind and things in the world. We realize that things aren't always as they seem—that a wagon can *be* red but *look* gray at dusk, a highway can *be* dry but *look* wet in the heat. We make a distinction between the way things *are* and the way we *see* them. But preoperational children don't make this distinction so easily. When something *looks* gray or wet, they tend to assume it *is* gray or wet. As children develop into the concrete operational stage, they begin to realize that the way the world *appears* is not necessarily the way the world really *is*. Once children understand that brains represent—and hence can misrepresent—objects in the world, they are in a better position to solve a variety of problems that require them to ignore an object's subjective appearance while attempting to understand its objective properties.


RICHARD B. LEVINE

At the preoperational stage, children generally do not distinguish between the way things look and the way things are. They do not realize that when a friendly adult wears a scary mask, he is still a friendly adult.

For example, children who are in the concrete operational stage understand that when water is poured from a short, wide beaker into a tall, thin cylinder, it is still the same amount of water despite the fact that the water level in the cylinder is higher. But it isn't until these children move on to the **formal operational stage**, which is *the stage of development that begins around the age of 11 and lasts through adulthood,* that they can solve nonphysical problems with similar ease. Childhood ends when formal operations begin, and people who move on to this stage are able to reason systematically about abstract concepts such as *liberty* and *love* and about events that *will* happen, that *might have* happened, and that *never* happened. There are no tangible objects in the world to which words such as *liberty* or *love* refer, and yet people at the formal operational stage can think and reason about such concepts in a systematic way. The ability to generate, consider, reason about, or otherwise operate on abstract objects is the hallmark of formal operations.

Discovering Other Minds

As children develop, they discover their own minds. They also discover the minds of others. Because preoperational children don't fully grasp the fact that they have minds that mentally represent objects, they also don't fully grasp the fact that other people have minds that may mentally represent the same objects in different ways. Hence, they generally expect others to see the world as they do. **Egocentrism** is *the failure to understand that the world appears differently to different observers*. When 3-year-old children are asked what a person on the opposite side of a table is seeing, they typically claim that the other person sees what they see.

Just as 3-year-old children have trouble understanding that others may not see what they see, so too do they have trouble understanding that others may not know what they know. In one study using the *false belief test,* children saw a puppet named Maxi deposit some chocolate in a cupboard and then leave the room. A second puppet arrived a moment later, found the chocolate, and moved it to a different cupboard. The children were then asked where Maxi would look for the chocolate when he returned—in the first cupboard where he had initially put it or in the second cupboard where the children knew it was currently. Most 5-year-olds realized that Maxi would search the first cupboard because, after all, Maxi had not seen the chocolate being moved. But 3-year-olds typically claimed that Maxi would look in the second cupboard because, after all, that's where *the children* knew the chocolate really was (Wimmer & Perner, 1983). Children all over the world pass and fail the false belief test at about the same age (Callaghan et al., 2005; see **FIGURE 10.4**, on page 307).

● What does the *false belief test* show?

ONLY HUMAN

VOTE EARLY, VOTE OFTEN In August 1991, the government of Finland proposed having a referendum on the age at which children should start school and suggested that children as young as 5 should be allowed to vote on the measure. The "preliterate" voters would be presented three drawings of birthday cakes with 5, 6, and 7 candles and would be asked to circle one of them.

Only when the child understands the concept of mental representation can she understand that different people sometimes have different beliefs. Although we all ultimately achieve this insight, research suggests that even adults have trouble believing that others see the world differently than they do (Gilovich, Kruger, & Savitsky, 1999; Royzman, Cassidy, & Baron, 2003). It seems that egocentrism goes away, but it doesn't go very far.

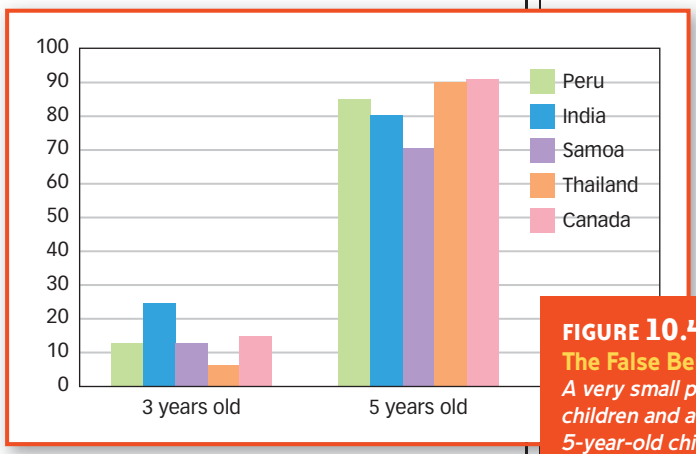


FIGURE 10.4
The False Belief Test across Cultures
A very small percentage of 3-year-old children and a very large percentage of 5-year-old children give the correct response in the false belief test. Research shows that this transition happens at about the same time in a wide variety of cultures (Callaghan et al., 2005).

Different people have different perceptions and beliefs, but they also have different desires and emotions. Surprisingly, even very young children (who cannot understand that others have different perceptions or beliefs) seem to understand that other people have different desires. For example, a 2-year-old who likes dogs can understand that other children don't and can correctly predict that other children will avoid dogs that she herself would approach. When 18-month-old toddlers see an adult express disgust while eating a food that the toddlers enjoy, they hand the adult a different food, as if they understand that different people have different tastes (Repacholi & Gopnik, 1997).

Children take quite a long time, however, to understand that other people may have emotional reactions unlike their own. When 5-year-olds hear a story in which Little Red Riding Hood knocks on her grandmother's door, unaware that a wolf is inside waiting to devour her, they realize that Little Red Riding Hood does not know what they know. Nonetheless, they expect Little Red Riding Hood to feel afraid (Bradmetz & Schneider, 2004; DeRosnay et al., 2004; Harris et al., 1989). It is only at about 6 years of age that children come to understand that because they and others have different knowledge, they and others may also experience different emotions in the same situation.

Clearly, children have a whole lot to learn about how the mind works—and most of them eventually do. The vast majority of children ultimately come to understand that they and others have minds and that these minds represent the world in different ways. Once children understand these things, they are said to have acquired a **theory of mind**, which is *the idea that human behavior is guided by mental representations*. But two groups of children lag far behind their peers in acquiring this understanding. *Autism* is a relatively rare disorder that affects approximately 1 in 2,500 children (Frith, 2003). Children with autism typically have difficulty communicating with other people and making friends, and some psychologists have suggested that this is because these children fail to acquire a theory of mind. Although children with autism are typically normal—and sometimes far *better* than normal—on most intellectual dimensions, they have difficulty understanding other people. Specifically, they do not seem to understand that other people can have false beliefs (Baron-Cohen, Leslie, & Frith, 1985), belief-based emotions (Baron-Cohen, 1991), or self-conscious emotions such as embarrassment and shame (Heerey, Keltner, & Capps, 2003). Deaf children who are born

formal operational stage The stage of development that begins around the age of 11 and lasts through adulthood, in which children gain a deeper understanding of their own and others' minds and learn to reason abstractly.

egocentrism The failure to understand that the world appears differently to different observers.

theory of mind The idea that human behavior is guided by mental representation, which gives rise to the realization that the world is not always the way it looks and that different people see it differently.

Because children are egocentric, they think that others see what they see. When small children are told to hide, they sometimes cover their eyes. Because they cannot see themselves, they think that others can't see them either.

SW PRODUCTIONS/AGEFOTOSTOCK

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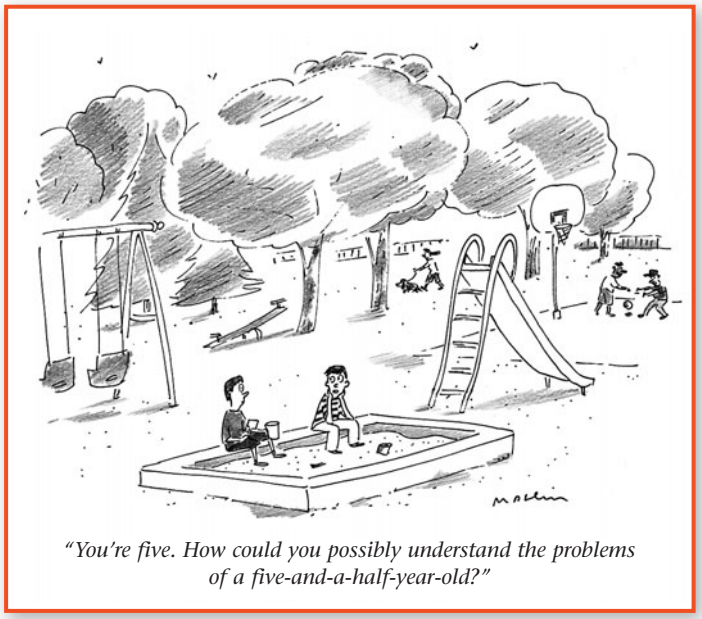
Daniel Tammet is an autistic man who cannot drive a car or tell left from right. But he recently broke a European record by spending 5 hours, 9 minutes, and 24 seconds reciting the first 22,514 digits of pi from memory. "I just wanted to show people that disability needn't get in the way," he said (Johnson, 2005). Although only 10% of autistic people have extraordinary abilities such as this, they are 10 times more likely to have such abilities than are nonautistic people. No one knows why.

THE ROYAL COLLECTION © 2006 HER MAJESTY QUEEN ELIZABETH II

Prior to the 18th century, children were thought of as "faulty small adults" and were typically portrayed with adult features, proportions, gestures, and dress. But modern research reveals that children and adults are remarkably different and that they think about the world in fundamentally different ways. These two boys are George Villiers, Second Duke of Buckingham, and his brother, Lord Francis Villiers, painted by Van Dyke in 1635.



"You're five. How could you possibly understand the problems of a five-and-a-half-year-old?"

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to hearing parents who do not know sign language also seem to lag behind their peers in acquiring a theory of mind. These children are slow to learn to communicate because they do not have ready access to any form of conventional language, and this restriction seems to slow the development of their understanding of other minds. Like children with autism, these deaf children display difficulties in understanding false beliefs even at 5 or 6 years of age (DeVilliers, 2005; Peterson & Siegal, 1999).

Even among children with no obvious disabilities, there is considerable variability in the rate at which a theory of mind is acquired. What causes this variability? A variety of factors have been examined, including the number of siblings that a child has, the frequency with which the child engages in pretend play, whether the child has an imaginary companion, and the socioeconomic status of the child's family. Of all the factors researchers have studied, language seems to be the most important (Astington & Baird, 2005). Children's language skills are an excellent predictor of how well they perform on false belief tests (such as the one in which Maxi looks for chocolate), and the likelihood of correctly completing this test increases with verbal ability (Happe, 1995). This is true both for children with and without autism.

The way caregivers talk to children is also a good predictor of their success at these tests. Children whose caregivers frequently talk about thoughts and feelings tend to be good at understanding beliefs and belief-based emotions. Some psychologists speculate that children benefit from hearing psychological words such as *want, think, know,* and *sad;* others suggest that children benefit from the grammatically complex sentences that typically contain these psychological words; and some believe that caregivers who use psychological words are also more effective in getting children to reflect on mental states. Whatever the explanation, it is clear that language—and especially language about thoughts and feelings—is an important tool for helping children make sense of their own and others' minds (Harris, de Rosnay, & Pons, 2005).

How does language influence the child's understanding of the mind?

Cognitive development—from the sensorimotor stage to formal operations—is a complex journey, and Piaget's ideas about it were nothing less than groundbreaking. Although many of these ideas have held up quite well, in the last few decades, psychologists have discovered two important qualifications. First, Piaget thought that children graduated from one stage to another in the same way that they graduated from kindergarten to first grade: A child is in kindergarten *or* first grade, he is never in both, and there is a particular moment of transition to which everyone can point. Modern

psychologists see development as a more continuous and less steplike progression than Piaget believed. Children who are transitioning between stages may perform more mature behaviors one day and less mature behaviors the next.

A second qualification of Piaget's claims is that children acquire many of the abilities that Piaget described much *earlier* than he realized. For example, Piaget suggested that infants had no sense of object permanence because they did not actively search for objects that were moved out of their sight. But when researchers use experimental procedures that allow infants to "show what they know," even 4-month-olds display a sense of object permanence. Every year, it seems, research lowers the age at which babies can demonstrate their ability to perform sophisticated cognitive tasks.

Discovering Our Cultures

Piaget saw the child as a lone scientist who made observations through interactions with objects, developed theories, and then revised those theories in light of new observations. And yet, most scientists don't start from scratch. Rather, they receive training from more experienced scientists and they inherit the theories and methods of their disciplines. According to Russian psychologist Lev Vygotsky, children do much the same thing. Unlike Piaget, Vygotsky believed that cognitive development was largely the result of children's interaction with members of their own cultures rather than interaction with objects. He noted that *cultural tools,* such as language and counting systems, exert a strong influence on cognitive development (Vygotsky, 1978).

For example, in both Chinese and English, the numbers beyond 20 are named by a decade (twenty) that is followed by a digit (one) and their names follow a logical pattern (twenty-one, twenty-two, twenty-three, etc.). In Chinese, the numbers from 11 to 19 are similarly constructed (ten-one, ten-two, ten-three . . .). But in English, the names of the numbers between 11 and 19 are constructed differently than the others. They either reverse the order of the decade and the digit (sixteen, seventeen) or they are entirely arbitrary (eleven, twelve). The difference in the regularity of these two systems makes a big difference to the children who must learn them. It is obvious to a Chinese child that 12—which is called "ten-two"—can be decomposed into 10 and 2, but it is not so obvious to an American child who calls the number "twelve" (see **FIGURE 10.5**). In one study, children from many countries were asked to hand an experimenter a certain number of bricks. Some of the bricks were single, and some were glued together in strips of 10. When Asian children were asked to hand the experimenter 26 bricks, they tended to hand over two strips of

How does language influence a child's ability to do math?

JAMES V. WERTSCH/WASHINGTON UNIVERSITY

Lev Vygotsky (pictured here with his daughter) was a Soviet developmental psychologist whose theories emphasized the role that social life—rather than individual experience—plays in cognitive development.

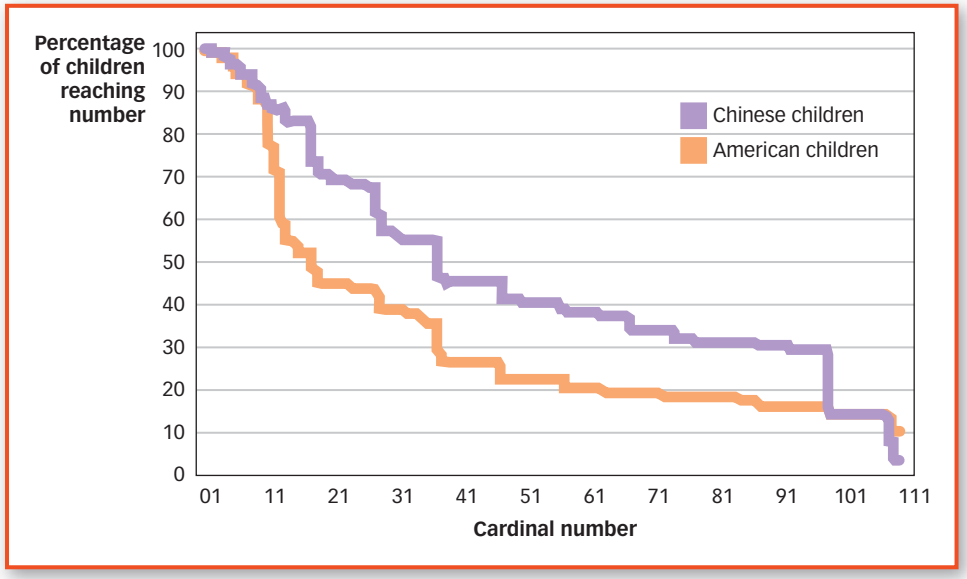
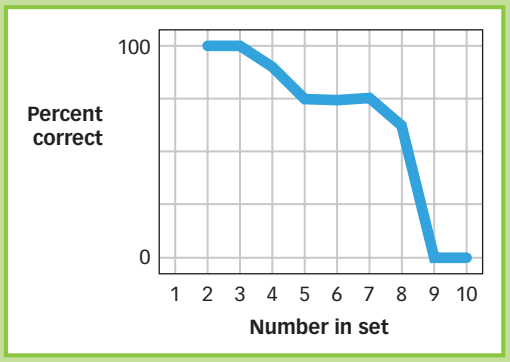


FIGURE 10.5
Twelve or Two-Teen? *As this graph shows, the percentage of American children who can count through the cardinal numbers drops off suddenly when they hit the number 11, whereas the percentage of Chinese children shows a more gradual decline (Miller, Smith, & Zhu, 1995).*

Culture & Community

Are Counting Abilities Determined in Part by Culture?

Peter Gordon of Columbia University investigated the numerical abilities of members of the Piraha tribe, a community of hunter-gatherers living in Brazil. The Piraha have an extremely simple counting system with just three terms: *one, two,* and *many*. Gordon asked members of the community to perform a "copying task" in which he laid out a certain number of ground nuts in a cluster and asked the participants to lay out the same number of a different object, such as batteries, in a line. Once the number exceeded two, participants' accuracy declined rapidly, and by the time the cluster contained nine ground nuts, they couldn't do the task at all (Gordon, 2004). These findings suggest that counting systems do not merely express our ability to count; they help create it. This study demonstrates how culture-specific means of expression can alter our understanding of the world around us.



DANIEL GILBERT

Children are not lone explorers who discover the world for themselves but members of families, communities, and societies that teach them much of what they need to know.

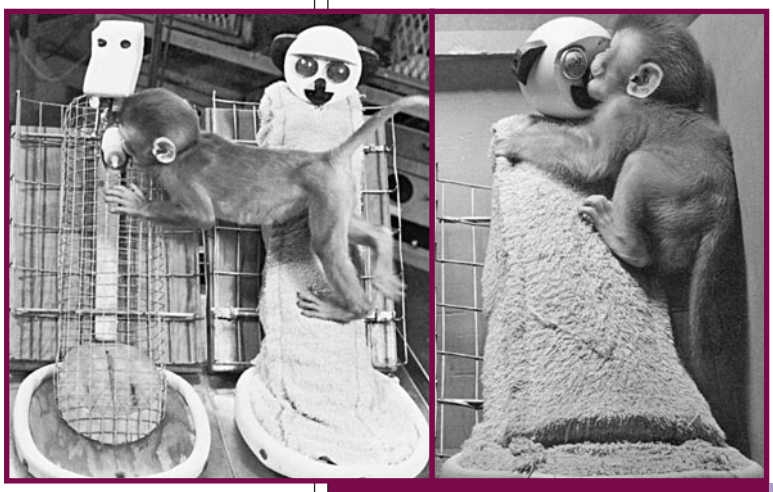
10 plus six singles. Non-Asian children tended to use the clumsier strategy of counting out 26 single bricks (Miura et al., 1994). Results such as these suggest that the regularity of the counting system that children inherit can promote or discourage their discovery of the fact that two-digit numbers can be decomposed.

Vygotsky believed that at any age, a child was capable of acquiring a range of skills, and he called this range the child's *zone of proximal development* (Vygotsky, 1978). He suggested that children who interacted with teachers tended to acquire skills toward the top of this range, whereas children who did not tended to acquire skills toward the bottom. The ability to acquire skills from others requires some basic communicative abilities. For example, communication requires that infants look at adults to gauge their reactions, a phenomenon known as *social referencing*. It also requires that infants and adults focus on the same object and not just on each other. Babies will look at an adult's eyes quite early, but it isn't until around 9 to 15 months that they begin looking at the point in space to which an adult's eyes are directed, a phenomenon known as *joint attention*. These two abilities prepare human infants to learn from more skilled members of their species.

Social Development

Unlike baby turtles, baby humans cannot survive without caregivers. But what exactly do caregivers provide? The obvious answers are warmth, safety, and food, and those obvious answers are right. But caregivers also provide something else that is every bit as essential to an infant's development.

During World War II, psychologists studied infants who were living in orphanages while awaiting adoption. Although these children were warm, safe, and well fed, many were physically and developmentally retarded, and nearly two out of five died before they could be adopted (Spitz, 1949). Shortly thereafter, psychologist Harry Harlow (1958; Harlow & Harlow, 1965) discovered that baby rhesus monkeys that were warm, safe, and well fed but were allowed no social contact for the first 6 months of their lives developed a variety of pathologies. The socially isolated monkeys turned out to be incapable of communicating with or learning from others of their kind, and when the females matured and became mothers, they ignored, rejected, and sometimes even attacked their own babies. Harlow also discovered that when socially isolated monkeys were put in a cage with two "artificial mothers"—one that was made of wire and dispensed food and one that was made of cloth and dispensed no food—they spent most of their time clinging to the soft cloth mother despite the fact that the wire mother was the source of their nourishment. Clearly, infants of all these species require something more from their caregivers than mere sustenance. But what?


HARLOW PRIMATE LAB

Harlow's monkeys preferred the comfort and warmth of a terry-cloth mother (right) to the wire mother (left) even when the wire mother was associated with food.

Becoming Attached

Psychiatrist John Bowlby was fascinated by the studies of rhesus monkeys reared in isolation and children in orphanages, and he sought to understand how human infants form attachments to their caregivers (Bowlby, 1969, 1973, 1980). Bowlby noted that from the moment they are born, monkeys cling to their mothers' furry chests because they must stay close to their caregivers to survive. Newly hatched ducks and geese show a related tendency to follow after their mother from the minute they are born. Indeed, this tendency is so strong that newly hatched geese can be "tricked" into faithfully following the first moving object they see—even if that object is a human being or a tennis ball. The ethologist Konrad Lorenz called this *imprinting* and theorized that the first moving object a hatchling saw was somehow imprinted on its bird brain as "the thing I must always stay near" (Lorenz, 1952).

Human babies, Bowlby suggested, have a similar need, but they are much less physically developed than goslings or monkeys and hence cannot waddle or cling. Because they cannot stay close to their caregivers, human babies have developed a different strategy: they do things that cause their caregivers to stay close to them. When a baby cries, gurgles, coos, makes eye contact, or smiles, most adults reflexively move toward the baby, and Bowlby claimed that this is *why* the baby emits these "come hither" signals.

● **How and why do infants form attachments?**

Bowlby claimed that babies begin their lives by sending these signals to anyone within range to receive them, but during their first 6 months, they begin to keep a mental tally of who responds most often and most promptly, and they soon begin to target their signals to the best responder or *primary caregiver.* This person quickly becomes the emotional center of the infant's universe. Infants feel secure in the primary caregiver's presence and will happily crawl around, exploring their environments with their eyes, ears, fingers, and mouths. But if their primary caregiver gets too far away, infants begin to feel insecure, and they take


CORBIS ALAMY

Like goslings, human babies need to stay close to their mothers to survive. Unlike goslings, human babies know how to get their mothers to come to them rather than the other way around.

JEFF GREENBERG/OMNI PHOTO

It doesn't take a psychologist to see that this child is securely attached.

action to decrease the distance between themselves and their primary caregiver, perhaps by crawling toward their caregiver or by crying until their caregiver moves toward them. Bowlby believed that all this happens because evolution has equipped human infants with a social reflex that is every bit as basic as the physical reflexes that cause them to suck and to grasp. Human infants, Bowlby suggested, are predisposed to form an **attachment**—that is, *an emotional bond*—with a primary caregiver.

Given the fundamental importance of attachment, it is not surprising that infants who are deprived of the opportunity to become attached suffer a variety of social and emotional deficits (O'Connor & Ruter, 2000; Rutter, O'Connor, & the English and Romanian Adoptees Study Team, 2004). Furthermore, even when attachment does happen, it can happen in ways that are more or less successful (Ainsworth et al., 1978). Psychologist Mary Ainsworth developed the Strange Situation test to measure a child's attachment style. The test involves bringing a child and his or her primary caregiver (usually the child's mother) to a laboratory room and then staging a series of episodes, including ones in which the primary caregiver briefly leaves the room and then returns. Research shows that infants' reactions tend to fit one of four attachment styles.

Among American infants, the majority (about 60%) show a secure attachment style, meaning that, when the caregiver returns, infants who had been distressed by the caregiver's absence go to her and are calmed by her proximity, while those who had not been distressed acknowledge her return with a glance or greeting. Another 20% of American infants display an avoidant attachment style, meaning that they are generally not distressed when their caregiver leaves the room, and they generally do not acknowledge her when she returns. About 15% of American infants display an *ambivalent* attachment style, meaning that they are almost always distressed when their caregiver leaves the room; but then rebuff their caregiver's attempt to calm them when she returns, arching their backs and squirming to get away. And a very few American infants (5% or fewer) display a *disorganized* attachment style, with no consistent pattern of responses when their caregiver leaves or returns.

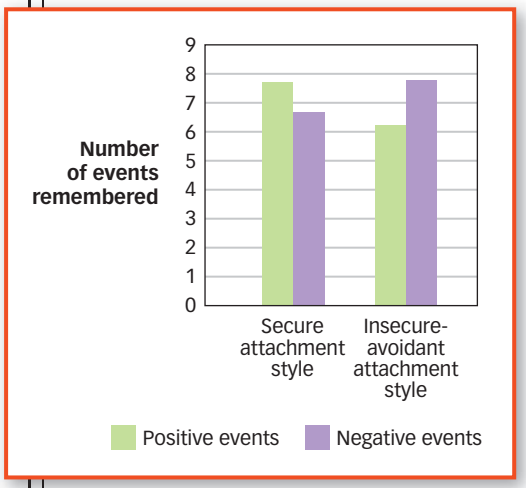


FIGURE 10.6
Attachment Style and Memory
We often remember best those events that fit with our view of the world. Researchers assessed 1-year-old children's attachment styles with the strange situation test. Two years later, the same group of children were shown a puppet show in which some happy events (e.g., the puppet got a present) or unhappy events (e.g., the puppet spilled his juice) occurred. Securely attached children later remembered more of the happy events than the unhappy ones, but insecurely attached children showed the opposite pattern (Belsky, Spritz, & Crnic, 1996).

Research has shown that a child's behavior in the Strange Situation test correlates fairly well with his or her behavior at home (Solomon & George, 1999) and in the laboratory (see **FIGURE 10.6**). Nonetheless, it is not unusual for a child's attachment style to change over time (Lamb, Sternberg, & Prodromidis, 1992). And while some aspects of attachment styles appear to be stable across cultures—secure attachment is the most common style in just about every country that has ever been studied (van IJzendoorn & Kroonenberg, 1988)—other attachment styles vary across cultures. For example, German children (whose parents tend to foster independence) are more likely to have avoidant than ambivalent attachment styles, whereas Japanese children (whose mothers typically stay home) are more likely to have ambivalent than avoidant attachment styles (Takahashi, 1986).

Working Models

Why do different infants have different attachment styles? The capacity for attachment may be innate, but the quality of that attachment is influenced by the child, the primary caregiver, and their interaction. Infants seem to keep track of the responsiveness of their primary caregiver and use this information to create an **internal working model of**

attachment The emotional bond that forms between newborns and their primary caregivers.

internal working model of attachment A set of expectations about how the primary caregiver will respond when the child feels insecure.

temperaments Characteristic patterns of emotional reactivity.

attachment, which is *a set of expectations about how the primary caregiver will respond when the child feels insecure.* Infants with different attachment styles appear to have different working models. Specifically, infants with a secure attachment style seem to be certain that their primary caregiver will respond, infants with an avoidant attachment style seem to be certain that their primary caregiver will not respond, and infants with an ambivalent attachment style seem to be uncertain about whether their primary caregiver will respond. Infants with a disorganized attachment style seem to be confused about their caregivers, which has led some psychologists to speculate that this style primarily characterizes children who have been abused (Carolson, 1998; Cicchetti & Toth, 1998).

How do caregivers influence the quality of a child's attachment?

Attachment is an interaction between two people, and thus both of them—the primary caregiver and the child—play a role in determining the nature of the child's working model (see FIGURE 10.7). Different children are born with different **temperaments**, or *characteristic patterns of emotional reactivity* (Thomas & Chess, 1977). These differences in temperament seem to emerge from stable differences in biology (Kagan, 1997). For example, 10% to 15% of infants have highly reactive limbic systems that produce an "inhibited" temperament. These infants thrash and cry when shown a new toy or a new person; they grow into children who tend to avoid novel people, objects, and situations; and they ultimately become quiet, cautious, and sometimes shy adults (Schwartz et al., 2003). These studies suggest that from the earliest moments of life, some infants are prone to feel insecure when their primary caregiver leaves a room and are inconsolable when she returns.

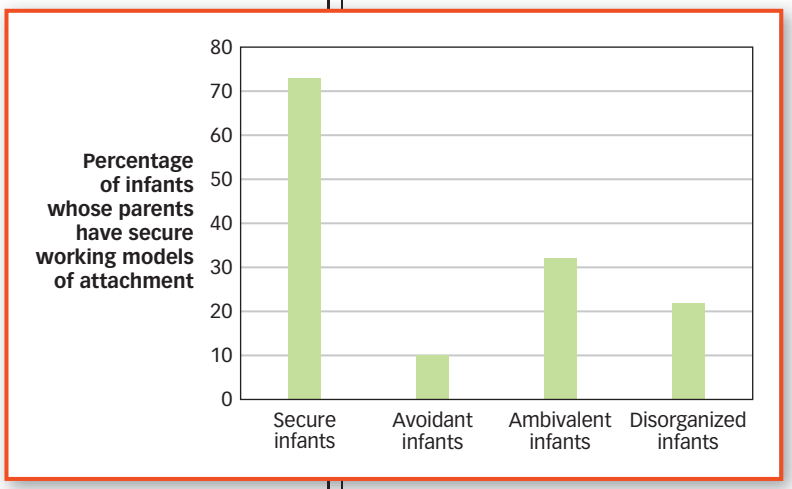


FIGURE 10.7
Parents' Attachment Styles Affect Their Children's Attachment Styles
Studies suggest that securely attached infants tend to have parents who have secure working models of attachment (van IJzendoorn, 1995).

A caregiver's behavior also has an important influence on the infant's working model and attachment style. Studies have shown that mothers of securely attached infants tend to be especially sensitive to signs of their child's emotional state, especially good at detecting their infant's "request" for reassurance, and especially responsive to that request (Ainsworth et al., 1978; De Wolff & van IJzendoorn, 1997). Mothers of infants with an ambivalent attachment style tend to respond inconsistently, only sometimes attending to their infants when they show signs of distress. Mothers of infants with an avoidant attachment style are typically indifferent to their child's need for reassurance and may even reject their attempts at physical closeness (Isabelle, 1993). Another study found that when mothers think of their babies as unique individuals with emotional lives rather than as creatures with urgent physical needs, their infants end up more securely attached (Meins, 2003; Meins et al., 2001). In short, a child's social development may reflect not just innate temperament and biological differences, but also social interaction with the caregiver (see the Real World box on the next page).

Moral Development

From the moment of birth, human beings can make one distinction quickly and well, and that's the distinction between pleasure and pain. Before babies hit their very first diapers, they can tell when something feels good, they can tell when something feels bad, and they strongly prefer the former to the latter. But as they mature, they begin to notice that their pleasures ("Throwing food is fun") don't always please others ("Throwing food makes Mom mad"). This is a problem. Human beings need each other to survive and thrive, and when we make other people feel bad, those others tend to avoid us, exclude us, or retaliate against us. We are social animals, and it is in our own selfish interests to learn how to balance our needs and the needs of others. We do this by developing a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How do children learn to decide what is right and what is wrong?

[THE REAL WORLD]

The Truth about Day Care

In 1975, about 37% of married American women with children under age 6 worked outside the home. In 1998, that figure had risen to 64%. The majority of working parents entrust their children's care to someone else for some part of the day, and that someone else is often a day care provider. While liberals applaud the economic liberation of women, conservatives lament the emotional toll that they believe day care takes on children. Researchers at the National Institute for Child Health and Development have been trying to approach the matter scientifically by conducting a large-scale study of the effects of day care on approximately 1,300 children living in a wide variety of settings in North America. So far, the results of the study suggest that day care has little effect on the quality of the attachment that children establish with their primary caregivers. While the attachment styles of infants and toddlers are strongly influenced by their mother's sensitivity and responsiveness, attachment styles are generally not influenced by the quality, amount, age of entry, stability, or type of day care the children receive (NICHD Early Child Care Research Network, 1997).

But the results were not all good news. Although day care had no large, direct effects on children's attachments, there was evidence of a subtle interaction between a child's experience at home and at day care. Specifically, 15-month-old infants were likely to be insecurely attached if their mothers were low in sensitivity *and* the infants (a) attended a poor-quality day care, (b) spent more than 10 hours a week in day care, or (c) had more than one day care arrangement. This suggests that day care itself does not increase the risk of emotional insecurity, but certain kinds of day care can do so when combined with the stress of having a mother who is unresponsive and insensitive. A similar effect was observed among toddlers who were 24 and 36 months old (NICHD Early Child Care Research Network, 1999). It is also important to note that while the quality of day care does not have a powerful influence on emotional attachment, it does influence a child's cognitive and social competence (NICHD Early Child Care Research Network, 2002).

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Would these children in day care be better off at home with their mothers?

In short, the best evidence to date suggests that day care does not put children at risk, but that *bad* day care puts *some* children at risk. This may not be the all-or-none conclusion that spinmeisters on both the left and right want to hear, but it has the redeeming quality of being true.

new distinction—the distinction between right and wrong. "Bad behavior" usually involves the gratification of our own desires at the expense of someone else's, and most moral systems are a set of recommendations for balancing different people's competing needs.

Knowing What's Right

How do children think about right and wrong? Piaget spent time playing marbles with children and quizzing them about how they came to know the rules of the game and what they thought should happen to children who broke them. By listening carefully to what children said, Piaget noticed that their moral thinking changed systematically over time in three important ways (Piaget, 1932/1965):

- First, Piaget noticed that children's moral thinking tends to shift *from realism to relativism*. Very young children regard moral rules as real, inviolable truths about the world. Young children generally don't believe that a bad action, such as hitting someone, can be good even if everyone agreed to allow it. As they mature, children begin to realize that some moral rules (e.g., wives should obey their husbands) are inventions and that groups of people can therefore agree to adopt them, change them, or abandon them entirely.

- Second, Piaget noticed that children's moral thinking tends to shift *from prescriptions to principles*. Young children think of moral rules as guidelines for specific actions in specific situations ("Children should take turns playing marbles"). As they mature, children come to see that rules are expressions of more general principles, such as fairness and equity, which means that rules can be abandoned or modified when they fail to serve the general principle ("If a child missed his turn, then it would be fair to give him two turns").
- Finally, Piaget noticed that children's moral thinking tends to shift *from outcomes to intentions*. For the young child, an unintentional action that causes great harm seems "more wrong" than an intentional action that causes slight harm because young children tend to judge the morality of an action by its outcome rather than by what the actor intended (cf. Yuill & Perner, 1988). As they mature, children begin to see that the morality of an action is critically dependent on the actor's state of mind.

Psychologist Lawrence Kohlberg picked up where Piaget left off and offered a more detailed theory of the development of moral reasoning (Kohlberg, 1963, 1986). According to Kohlberg, moral reasoning proceeds through three major stages. Kohlberg based his theory on people's responses to a series of moral dilemmas such as this one:

A woman was near death from a special kind of cancer. There was one drug that the doctors thought might save her. It was a form of radium that a druggist in the same town had recently discovered. The drug was expensive to make, but the druggist was charging 10 times what the drug cost him to make. He paid $200 for the radium and charged $2,000 for a small dose of the drug. The sick woman's husband, Heinz, went to everyone he knew to borrow the money, but he could only get together about $1,000, which is half of what it cost. He told the druggist that his wife was dying and asked him to sell it cheaper or let him pay later. But the druggist said, "No, I discovered the drug, and I'm going to make money from it." So Heinz got desperate and broke into the man's store to steal the drug for his wife. Should the husband have done that?

According to Kohlberg, how does a child's moral thinking develop?

On the basis of their responses, Kohlberg concluded that most children are at the **preconventional stage**, *a stage of moral development in which the morality of an action is primarily determined by its consequences for the actor.* Immoral actions are those for which one is punished, and the appropriate resolution to any moral dilemma is to choose the behavior with the least likelihood of punishment. For example, children at this stage often base their moral judgment of Heinz on the relative costs of one decision ("It would be bad if he got blamed for his wife's death") and another ("It would be bad if he went to jail for stealing").

Kohlberg argued that older children move to the **conventional stage**, which is *a stage of moral development in which the morality of an action is primarily determined by the extent to which it conforms to social rules*. Children at this stage believe that everyone should uphold the generally accepted norms of their cultures, obey the laws of society, and fulfill their civic duties and familial obligations. They believe that Heinz must weigh the dishonor he will bring upon himself and his family by stealing (i.e., breaking a law) against the guilt he will feel if he allows his wife to die (i.e., failing to fulfill a duty).

Finally, Kohlberg believed that some adults move to the **postconventional stage**, which is *a stage of moral development at which the morality of an action is determined by a set of general principles that reflect core values*, such as the right to life, liberty, and the pursuit of happiness. When a behavior violates these principles, it is immoral; and if a law requires these principles to be violated, then it should be disobeyed. For a person who has reached the postconventional

preconventional stage A stage of moral development in which the morality of an action is primarily determined by its consequences for the actor.

conventional stage A stage of moral development in which the morality of an action is primarily determined by the extent to which it conforms to social rules.

postconventional stage A stage of moral development at which the morality of an action is determined by a set of general principles that reflect core values.

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After World War II, Lawrence Kohlberg served served in the Merchant Marine, and volunteered to help smuggle Jewish refugees into British-controlled Palestine. He spent his life trying to understand how people determine what is right and what is wrong.

stage, a woman's life is always more important than a shopkeeper's profits, so stealing the drug is not only a moral behavior—it is a moral obligation.

Research supports Kohlberg's general claim that moral reasoning shifts from an emphasis on punishment to an emphasis on social rules and finally to an emphasis on ethical principles (Walker, 1988). But research also suggests that these stages are not quite as discrete as Kohlberg thought. For instance, a single person may use preconventional, conventional, and postconventional thinking in different circumstances, which suggests that the developing person does not "reach a stage" so much as "acquires a skill" that may or may not be used on a particular occasion. Because Kohlberg developed his theory by studying a sample of American boys, some critics of Kohlberg's theory have suggested that it does not describe the development of moral thinking in girls (Gilligan, 1982) or non-Westerners (Simpson, 1974). Other critics have noted that the correlation between a child's level of moral reasoning and that same child's degree of moral behavior is not particularly strong (Blasi, 1980; Haidt, 2001; Thoma et al., 1999). These critics suggest that how people reason about morality may be interesting in the abstract, but it has little to do with how people actually behave in their everyday lives.

Feeling What's Right

Research on moral reasoning portrays children as little jurists who use rational analysis—sometimes simple and sometimes sophisticated—to distinguish between right and wrong. But moral dilemmas don't just make us think. They also make us *feel*. Consider the following scenario.

You are standing on a bridge. Below you can see a runaway trolley hurtling down the track toward five people who will be killed if it remains on its present course. You are sure that you can save these people by flipping a lever that will switch the trolley onto a different track, where it will kill just one person instead of five. Is it morally permissible to divert the trolley and prevent five deaths at the cost of one?

Now consider a slightly different version of this problem:

You and a large man are standing on a bridge. Below you can see a runaway trolley hurtling down the track toward five people who will be killed if it remains on its present course. You are sure that you can save these people by pushing the large man onto the track, where his body will be caught up in the trolley's wheels and stop it before it kills the five people. Is it morally permissible to push the large man and thus prevent five deaths at the cost of one?

If you are like most people, you believe that it is morally permissible to sacrifice one person for the sake of five in the first case but not in the second case. And if you are like most people, you can't say why. Indeed, you probably didn't reach this conclusion by moral reasoning at all. Rather, you had a negative emotional reaction to the thought of pushing another human being into the path of an oncoming trolley, and that reaction was sufficient to convince you that pushing him would be wrong. You may have come up with a few good arguments to support this position, but those arguments probably followed rather than preceded your conclusion (Greene et al., 2001).

Most people are upset by the suffering of others, and research suggests that even young children have this response, which may be the basis of their emerging morality.

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The way people respond to cases such as these has convinced some psychologists that our moral judgments are the consequences—and not the causes—of our emotional reactions (Haidt, 2001). According to this *moral intuitionist* perspective, we have evolved to react emotionally to a small family of events that are particularly relevant to reproduction and survival, and we have developed the distinction between right and wrong as a way of labeling and explaining these emotional reactions. According to the moral intuitionist perspective, the reason most people consider it permissible to stop a trolley by pulling a switch but not by pushing someone

onto the tracks is that people have negative emotional reactions to other people's physical pain (Greene et al., 2001). This aversion to others' suffering begins early in childhood. Even very young children distinguish between actions that are wrong because they violate a social rule and actions that are wrong because they cause suffering. When asked whether it would be okay to leave toys on the floor in a school that allowed such behavior, young children tend to say it would. But when asked whether it would be okay to hit another child in a school that allowed such behavior, young children tend to say it would not (Smetana, 1981; Smetana & Braeges, 1990).

How do emotions influence our moral judgments?

Children clearly think about transgressions that cause others to be observably distressed (e.g., hitting) differently from transgressions that do not (e.g., leaving toys on the floor). Why might that be? One possibility is that observing distress automatically triggers an empathic reaction in the brain of the observer. Recent research has shown that some of the same brain regions that are activated when people experience an unpleasant emotion are also activated when people see someone else experience that emotion (Carr et al., 2003). (See the discussion of mirror neurons in Chapter 3.) Studies such as these suggest that our brains respond to other people's *expressions* of distress by creating within us the *experience* of distress, and this mechanism may have evolved because it allows us to know instantly what others are feeling. The fact that we can actually *feel* another person's distress may explain why even a small child who is incapable of sophisticated moral reasoning still considers it wrong to inflict distress on others.

summary quiz [10.2]

4. In terms of motor development, babies gain control over their _____ before they gain control over their _____.
   a. extremities; trunk
   b. legs; arms
   c. head; trunk
   d. arms; shoulders

5. Little Isabel sees a butterfly and exclaims "Bird!" "No, that's a butterfly," says her grandmother. The next time Isabel sees a butterfly, she says "Butterfly." According to Piaget, Isabel has just shown
   a. habituation.
   b. concrete operations.
   c. assimilation.
   d. accommodation.

6. Baby Maria plays without a fuss when her mother leaves and, upon her return, ignores her. Maria is demonstrating which type of attachment style?
   a. avoidant
   b. ambivalent
   c. disorganized
   d. secure

7. For Lawrence Kohlberg, the sequence of moral development unfolds in the following order: emphasis on _____, then emphasis on _____, and finally, emphasis on _____.
   a. social roles; consequences; ethical principles
   b. ethical principles; social roles; consequences
   c. social roles; ethical principles; consequences
   d. consequences; social roles; ethical principles

adolescence The period of development that begins with the onset of sexual maturity (about 11 to 14 years of age) and lasts until the beginning of adulthood (about 18 to 21 years of age).

puberty The bodily changes associated with sexual maturity.

primary sex characteristics Bodily structures that are directly involved in reproduction.

secondary sex characteristics Bodily structures that change dramatically with sexual maturity but that are not directly involved in reproduction.

Adolescence: Minding the Gap

Between childhood and adulthood is an extended developmental stage that may not qualify for a hood of its own but that is clearly distinct from the stages that come before and after. **Adolescence** is *the period of development that begins with the onset of sexual maturity (about 11 to 14 years of age) and lasts until the beginning of adulthood (about 18 to 21 years of age)*. Unlike the transition from embryo to fetus or from infant to child, this transition is both sudden and clearly marked. In just 3 or 4 years, the average adolescent gains about 40 pounds and grows about 10 inches. Girls' growth rates begin to accelerate around the age of 10, and they reach their full heights at around 15½ years. Boys experience an equivalent growth spurt about 2 years later and reach their full heights at around 17½ years. The growth spurt signals the onset of **puberty**, which refers to *the bodily changes associated with sexual maturity*. These changes involve **primary sex characteristics**, which are *bodily structures that are directly involved in reproduction,* for example, the onset of menstruation in girls and the emergence of the capacity for ejaculation in boys. They also involve **secondary sex characteristics**, which are *bodily structures that change dramatically with sexual maturity but that are not directly involved in reproduction,* for example, the enlargement of the breasts and the widening of the hips in girls and the appearance of facial hair, pubic hair, underarm hair, and the lowering of the voice in both genders. This pattern of changes is caused by increased production of sex-specific hormones: estrogen in girls and testosterone in boys.

Just as the body changes during adolescence, so too does the brain. An infant's brain forms many more new synapses than it actually needs, and by the time a child is 2 years old, she has about 15,000 synapses per neuron—which is twice as many as the average adult (Huttenlocher, 1979). This early period of synaptic proliferation is followed by a period of synaptic pruning in which the synapses that are not frequently used are eliminated. This is a clever system that allows our brain's wiring to be determined both by our genes and our experiences: Our genes "offer" a very large set of synaptic connections to the environment, which then "chooses" which ones to keep. Scientists used to think that this process ended early in life, but recent evidence suggests that some brain areas including the prefrontal cortex undergo a second round of synaptic proliferation just before puberty and a second round of synaptic pruning during adolescence (Giedd et al., 1999). Clearly, the adolescent brain is a work in progress.

● How does experience change the structure of the brain?

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Early puberty is big news.

The Protraction of Adolescence

Although the onset of puberty is largely determined by a genetic program, there is considerable variation across individuals (e.g., people tend to reach puberty at about the same age as their same-sexed parent did) and across cultures (e.g., African American girls tend to reach puberty before European American girls do) (see **FIGURE 10.8**, on page 319). There is also considerable variation across generations (Malina, Bouchard, & Beunen, 1988). For example, in Scandinavia, the United Kingdom, and the United States, the age of first menstruation was between 16 and 17 years in the 19th century but was approximately 13 years in 1960. Currently, about a third of all boys in the United States show some signs of genital maturity by the age of 9 (Reiter & Lee, 2001). The decrease in the age of the onset of puberty is due at least in part to changes in the environment (Ellis & Garber, 2000). For

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Some cultures skip adolescence entirely. When a Krobo female menstruates for the first time, older women take her into seclusion for 2 weeks and teach her about sex, birth control, and marriage. Afterward, a public ceremony called the durbar is held, and the young female who that morning was regarded as a child is thereafter regarded as an adult.

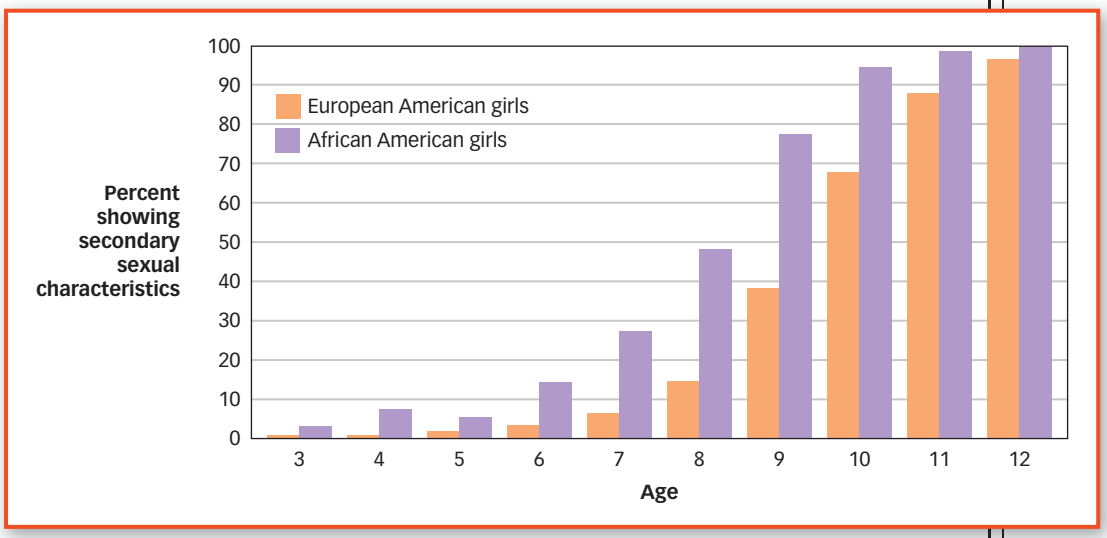

FIGURE 10.8 **Secondary Sexual Characteristics** *The graph shows the percentage of girls in each age group who show breast and/or pubic hair development. These characteristics appear earlier in African American than European American girls. There is no evidence that African American boys mature earlier than European American boys (Herman-Giddens et al., 1997).*

example, both body fat and stress hormones hasten the onset of puberty (Kim & Smith, 1998), and there is reason to suspect that both factors have increased over the last century in the industrialized world.

The increasingly early onset of puberty has important psychological consequences. Just two centuries ago, the gap between childhood and adulthood was relatively brief because people became physically adult at roughly the same time that they were ready to accept adult roles in society. But in modern societies, people typically spend 3 to 10 years in school after they reach puberty. Thus, while the age at which people become physically mature has decreased, the age at which they are recognized by society as adults has increased, and so the period between childhood and adulthood has become extended or *protracted*. What are the consequences of a protracted adolescence?

Adolescence is often characterized as a time of internal turmoil and external recklessness, and some psychologists have speculated that the protraction of adolescence is in part to blame for its bad reputation (Moffitt, 1993). According to these theorists, adolescents are adults who have temporarily been denied a place in adult society. As such, they feel especially compelled to do things to demonstrate their adulthood, such as smoking, drinking, using drugs, having sex, and committing crimes. In a sense, adolescents are people who are forced to live in the gap between two worlds, and the so-called storm and stress of adolescence may be understood in part as a consequence of this dilemma.

What does research say about the popular view of stormy adolescence?

With that said, it is important to note that the storm and stress of adolescence is not quite as intense as all those coming-of-age movies would have us believe (Steinberg & Morris, 2001). Research suggests that the "moody adolescent" who is a victim of "raging hormones" is largely a myth. In fact, adolescents are no moodier than children (Buchanan, Eccles, & Becker, 1992), and fluctuations in their hormone levels have only a tiny impact on their moods (Brooks-Gunn, Graber, & Paikoff, 1994). The common stereotype of adolescents as "reckless rebels" is also more than a little misleading. The vast majority of adolescents do dabble in misbehavior, but their experiments appear to have few long-term consequences, and most adolescents who try drugs or break the law end up becoming sober, law-abiding adults (Steinberg, 1999). In short, adolescence is not a terribly troubled time for most people, and adolescents typically "age out" of the troubles they get themselves into (Sampson & Laub, 1995).

Although many adolescents experiment with various forms of reckless behavior, few continue to behave recklessly as adults.

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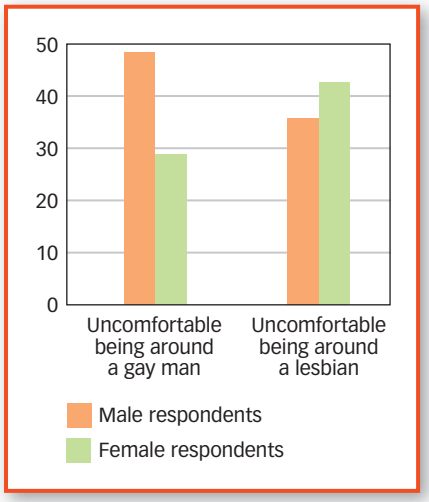

FIGURE 10.9
Heterosexuals' Attitudes toward Homosexuals *It isn't surprising that homosexual adolescents are reluctant to reveal their sexual orientations. As a recent public opinion survey shows, a sizable percentage of heterosexual men and women say that they feel "somewhat or very uncomfortable" being around a gay man or a lesbian (Herek, 2002).*

KAREN KASMAUSKI/CORBIS

Sex education does not increase the likelihood that teenagers will have sex, but it does decrease the likelihood that they will have babies. Teenage mothers and their children fare quite poorly on most measures of success and well-being.

Sexuality

Puberty is not an easy time for anyone, but it is especially difficult for some. Boys who reach puberty later than their peers often find this period especially stressful because immature boys may be less athletic and may feel less "manly" than their peers (Petersen, 1985). Among girls, those who reach puberty earlier than their peers are most likely to experience a variety of negative consequences, ranging from distress (Peskin, 1973) to delinquency (Caspi & Moffitt, 1991). Early-maturing girls don't have as much time as their peers do to develop the skills necessary to cope with adolescence (Petersen & Grockett, 1985), but because they appear to be mature, others expect them to act like adults. Early-maturing girls also tend to receive attention from older men, who may lead them into a variety of unhealthy activities (Ge, Conger, & Elder, 1996). Some research suggests that the timing of puberty has a greater influence on emotional and behavioral problems than does the occurrence of puberty itself (Buchanan et al., 1992).

For some adolescents, puberty is additionally complicated by the fact that they are attracted to members of the same sex. Not only does this make them different from the majority of their peers, but with few exceptions, human cultures tend to disapprove of homosexual behavior and react to it with responses that range from snickering to beheading (see **FIGURE 10.9**). What determines whether a person is sexually oriented toward the same or the opposite sex? In the past, psychologists believed that a person's sexual orientation depended entirely on his or her upbringing. For example, psychoanalytic theorists suggested that boys who grow up with a domineering mother and a submissive father are less likely to identify with their father and are thereby more likely to become homosexual. However, scientific research has failed to identify *any* aspect of parenting that has a significant impact on sexual orientation (Bell, Weinberg, & Hammersmith, 1981), and indeed, children raised by homosexual couples and heterosexual couples are equally likely to become heterosexual adults (Patterson, 1995). There is also little support for the idea that a person's early sexual encounters have a lasting impact on his or her sexual orientation (Bohan, 1996).

In contrast, considerable evidence suggests that genetics plays a role in determining sexual orientation. Gay men and lesbians tend to have a larger proportion of gay and lesbian siblings than do heterosexuals (Bailey et al., 1999). Furthermore, the identical twin of a gay man (with whom he shares 100% of his genes) has a 50% chance of being gay, whereas the fraternal twin or nontwin brother of a gay man (with whom he shares 50% of his genes) has only a 15% chance (Bailey & Pillard, 1991; Gladue, 1994). A similar pattern has emerged in studies of women (Bailey et al., 1993). In addition, some evidence suggests that the fetal environment may play a role in determining sexual orientation and that high levels of androgens predispose the fetus—whether male or female—later to develop a sexual preference for women (Ellis & Ames, 1987; Meyer-Bahlberg et al., 1995). Although the science of sexual orientation is still young and fraught with conflicting findings, one fact is clear: Sexual orientation is not a simple matter of choice.

Is sexual orientation simply a choice people make?

But *having* sex is a matter of choice, and American teenagers typically choose it. More than 65% of American women report having had sexual intercourse by age 18 and 90% by age 21 (Hogan, Sun, & Cornwell, 2000). Unfortunately, teenagers' interest in sex often surpasses their knowledge about it. A quarter of American teenagers have had four or more sexual partners by their senior year in high school, but only about half report using a condom during their last intercourse (CDC, 2002). The United States has one of the highest rates of teen pregnancy of all modern industrialized nations (Darroch et al., 2001), not because American teens have more sex than others but because they are less knowledgeable about it. Most American parents do not talk to their children extensively about sex (Ansuini, Fiddler-Woite, & Woite, 1996), and those who do start too late (Jaccard, Dittus, & Gordon, 1998). Despite what some people may believe, sex education lowers the likelihood that teenagers will get pregnant or catch a sexually transmitted disease, and does not increase the likelihood that they will have sex in the first place (Satcher, 2001).

Parents and Peers

Adolescents spend a lot of time trying to figure out what they want, what they believe, and what they *should* want and believe. The child's view of herself and her world is tightly tied to the views of her parents, but puberty creates a new set of needs that begins to snip away at these bonds by orienting the adolescent toward peers rather than parents. The psychologist Erik Erikson characterized each stage of life by the major task confronting the individual at that stage, and he suggested that the major task of adolescence was the development of an adult identity (see **TABLE 10.2**). Whereas children define themselves almost entirely in terms of their relationships with parents and siblings, adolescence marks a shift in emphasis from family relations to peer relations.

Two things can make this shift difficult. First, children cannot choose their parents, but adolescents can choose their peers. As such, adolescents have the power to shape themselves by joining groups that will lead them to develop new values, attitudes, beliefs, and perspectives. In a sense, adolescents have the opportunity to invent the adults they will soon become, and the responsibility this opportunity entails can be overwhelming. Second, as adolescents strive for greater autonomy, their parents naturally rebel. For instance, parents and adolescents tend to disagree about the age at which

TABLE 10.2

Erikson's Stages of Human Development

Stage	Ages	Crisis	Key Event	Positive Resolution
1. Oral-sensory	Birth to 12 to 18 months	Trust vs. mistrust	Feeding	Child develops a belief that the environment can be counted on to meet his or her basic physiological and social needs.
2. Muscular-anal	18 months to 3 years	Autonomy vs. shame/doubt	Toilet training	Child learns what he or she can can control and develops a sense of free will and corresponding sense of regret and sorrow for inappropriate use of self-control.
3. Locomotor	3 to 6 years	Initiative vs. guilt	Independence	Child learns to begin action, to explore, to imagine, and to feel remorse for actions.
4. Latency	6 to 12 years	Industry vs. inferiority	School	Child learns to do things well or correctly in comparison to a standard or to others.
5. Adolescence	12 to 18 years	Identity vs. role confusion	Peer relationships	Adolescent develops a sense of self in relationship to others and to own internal thoughts and desires.
6. Young adulthood	19 to 40 years	Intimacy vs isolation	Love relationships	Person develops the ability to give and receive love; begins to make long-term commitment to relationships.
7. Middle adulthood	40 to 65 years	Generativity vs. stagnation	Parenting	Person develops interest in guiding the development of the next generation.
8. Maturity	65 to death	Ego integrity vs. despair	Reflection on and acceptance of one's life	Person develops a sense of acceptance of life as it was lived and the importance of the people and relationships that developed over the life span.

"So I blame you for everything—whose fault is that?"

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certain adult behaviors, such as staying out late or having sex, become permissible, and you don't need a psychologist to tell you which position each party tends to hold (Holmbeck & O'Donnell, 1991). Because adolescents and parents often have different ideas about who should control the adolescent's behavior, their relationships may become more conflictive and less close and their interactions briefer and less frequent (Larson & Richards, 1991).

But these conflicts and tensions are not as dramatic, pervasive, and inevitable as movies might lead us to believe. For example, adolescents tend to have aspirations and values that are quite similar to those of their parents (Elder & Conger, 2000). Familial bickering tends to be about much smaller issues, such as dress and language (Caspi et al., 1993). Furthermore, in cultures that emphasize the importance of duty and obligation, parents and adolescents may show few if any signs of tension and conflict (Greenfield et al., 2003).

As adolescents pull away from their parents, they move toward their peers. Studies show that across a wide variety of cultures, historical epochs, and even species, peer relations evolve in a similar way (Dunphy, 1963; Weisfeld, 1999). Young adolescents initially form groups or "cliques" (Brown, Mory, & Kinney, 1994) with others of their own gender. Next, male cliques and female cliques begin to meet in public places, such as town squares or shopping malls, and they begin to interact—but only in groups and only in public. After a few years, the older members of these single-sex cliques "peel off" and form smaller, mixed-sex cliques, which may assemble in private as well as in public but usually assemble as a group. Finally, couples "peel off" from the small mixed-sex clique and begin romantic relationships.

What factors contribute to parent-child conflict in adolescence?

Studies show that throughout adolescence, people spend increasing amounts of time with opposite-sex peers while maintaining the amount of time they spend with same-sex peers (Richards et al., 1998), and they accomplish this by spending less time with their parents (Larson & Richards, 1991). Although peers exert considerable influence on the adolescent's beliefs and behaviors—both for better and for worse—this influence generally occurs because adolescents respect, admire, and like their peers and not because their peers pressure them (Susman et al., 1994). Acceptance by peers is of tremendous importance to adolescents, and those who are rejected by their peers tend to be

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Adolescents form same-sex cliques that meet opposite-sex cliques in public places. Eventually, these people will form mixed-sex cliques, pair off into romantic relationships, get married, and have children who will take their places at the mall.

withdrawn, lonely, and depressed (Pope & Bierman, 1999). Fortunately for those of us who were seventh-grade nerds, individuals who are unpopular in early adolescence can become popular in later adolescence as their peers become less rigid and more tolerant (Kinney, 1993).

summary quiz [10.3]

8. Which of the following is a primary sex characteristic?
a. onset of menstruation
b. breast enlargement
c. appearance of pubic hair
d. lowering of the voice

9. Over the past few generations, the age of onset of puberty has _____, and the age at which young people take on adult responsibilities has _____.
a. increased; increased
b. decreased; decreased
c. decreased; increased
d. increased; decreased

10. Reaching puberty earlier than one's peers
a. is especially stressful for boys.
b. can lead to negative consequences, such as distress and delinquency, in girls.
c. is beneficial for both girls and boys.
d. is associated with negative consequences for both girls and boys.

11. Throughout adolescence, young people spend _____ time with other-sex peers, _____ time with same-sex peers, and _____ time with parents.
a. less; more; more
b. more; less; the same amount of
c. more; the same amount of; less
d. the same amount of; more; less

adulthood The stage of development that begins around 18 to 21 years and ends at death.

Adulthood: The Short Happy Future

It takes fewer than 7,000 days for a single-celled zygote to become a registered voter. The speed of this radical transformation is astonishing, but it slows considerably when a person reaches **adulthood**, which is *the stage of development that begins around 18 to 21 years and ends at death.* Because observable physical change slows from a gallop to a crawl, we sometimes have the sense that adulthood is a destination to which development delivers us and that, once we've arrived, our journey is complete. But that's not so. Although they are more gradual and less noticeable, many physical, cognitive, and emotional changes take place between our first legal beer and our last legal breath.

At the annual family reunion, the changes in children are usually more obvious than the changes in adults. But the fact is that development occurs throughout the entire lifespan.

BLEND IMAGES/ALAMY

Changing Abilities

The early 20s are the peak years for health, stamina, vigor, and prowess, and because our psychology is so closely tied to our biology, these are also the years during which most of our cognitive abilities are at their sharpest. At this very moment you see further, hear better, remember more, and weigh less than you ever will again. Enjoy it. Somewhere between the ages of 26 and 30, you will begin the slow and steady decline that does not end until you do. A mere 10 or 15 years after puberty, your body will begin to deteriorate

in almost every way: Your muscles will be replaced by fat, your skin will become less elastic, your hair will thin and your bones will weaken, your sensory abilities will become less acute, and your brain cells will die at an accelerated rate. Eventually, if you are a woman, your ovaries will stop producing eggs and you will become infertile; if you are a man, your erections will be fewer and further between.

As these physical changes accumulate, they will begin to have measurable psychological consequences. For instance, as your brain ages, your prefrontal cortex and its associated subcortical connections will deteriorate more quickly than will the other areas of your brain (Raz, 2000). Recall from Chapter 3 that your prefrontal cortex is responsible for *controlled processing,* which means that you will experience the most noticeable cognitive decline on tasks that require effort, initiative, or strategy. For example, older adults show a much more pronounced decline on tests of working memory (the ability to hold information "in mind") than on tests of long-term memory (the ability to retrieve information), a much more pronounced decline on tests of episodic memory (the ability to remember particular past events) than on tests of semantic memory (the ability to remember general information such as the meanings of words), and a much more pronounced decline on tests of retrieval (the ability to "go find" information in memory) than on tests of recognition (the ability to decide whether information was encountered before).

And yet, while the cognitive machinery gets rustier with age, research suggests that the operators of that machinery often compensate by using it more skillfully (Bäckman & Dixon, 1992; Salthouse, 1987). Although older chess players *remember* chess positions more poorly than younger players do, they *play* as well as younger players because they search the board more efficiently (Charness, 1981). Although older typists *react* more slowly than younger typists do, they *type* as quickly and accurately as younger typists because they are better at anticipating the next word (Salthouse, 1984). Older airline pilots are considerably worse than younger pilots when it comes to keeping a list of words in short-term memory, but this age difference disappears when those words are the "heading commands" that pilots receive from the control tower every day (Morrow et al., 1994). These patterns of error suggest that older adults are somehow compensating for age-related declines in memory and attention.

How do we compensate for our aging brains?

How do they do it? When young adults try to keep verbal information in working memory, the left prefrontal cortex is more strongly activated than the right, and when young adults try to keep spatial information in working memory, the right prefrontal cortex is more strongly activated than the left (Smith & Jonides, 1997). But this *bilateral asymmetry* is not seen among older adults, and some scientists take this to mean that

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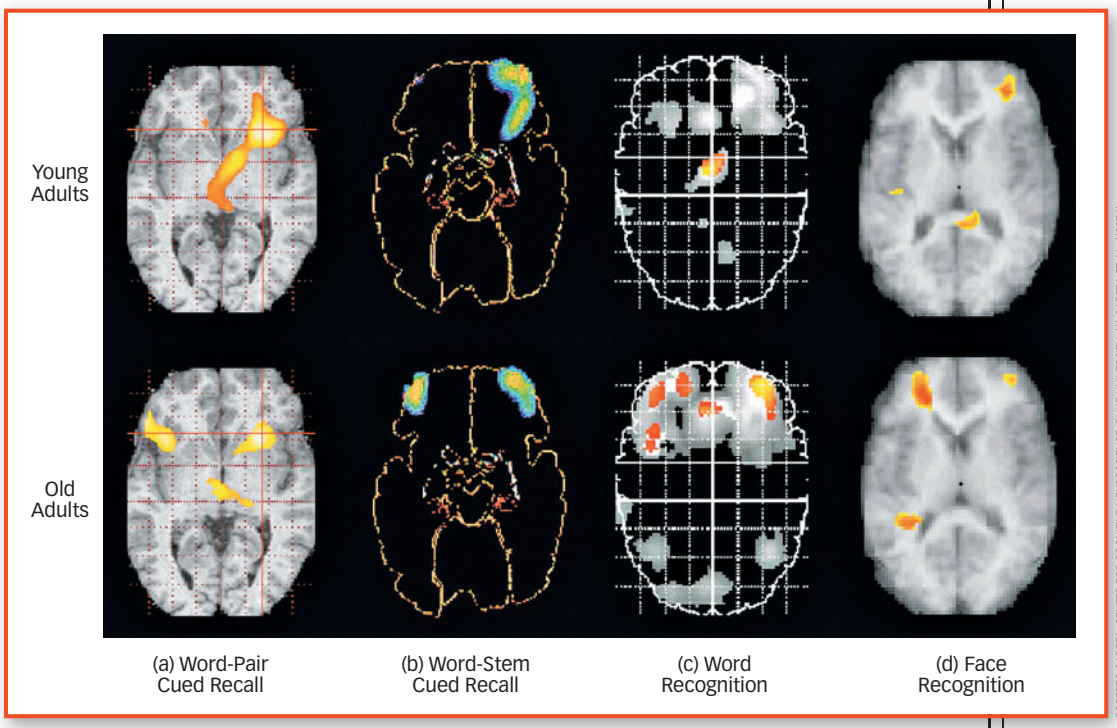
Although young chess players can remember the positions of pieces better than older players can, older players search the board more efficiently.



ROBERTO CABEZA, CENTER FOR COGNITIVE NEUROSCIENCE, DUKE UNIVERSITY; (A) CABEZA ET AL. (1997A); (B) BACKMAN ET AL. (1997); (C) MADDEN ET AL. (1999A); (D) GRADY ET AL. (2000A).

older brains compensate for the declining abilities of one neural structure by calling on other neural structures to help out (Cabeza, 2002; see **FIGURE 10.10**). The young brain can be characterized as a group of specialists, but as these specialists becomes older and less able, they begin to work together on tasks that each once handled independently. In short, the machinery of body and brain do break down with age, but a seasoned driver in an old jalopy can often hold his own against a rookie in a hot rod.

FIGURE 10.10
Bilaterality in Older and Younger Brains *Across a variety of tasks, older adult brains show bilateral activation, and young adult brains show unilateral activation. One possible explanation for this is that older brains compensate for the declining abilities of one neural structure by calling on other neural structures for help (Cabeza, 2002).*

Changing Orientations

One reason why Grandpa can't find his car keys is that his prefrontal cortex doesn't function like it used to. But another reason is that the location of car keys just isn't the sort of thing that grandpas spend their precious time memorizing. According to *socioemotional selectivity theory* (Carstensen & Turk-Charles, 1994), younger adults are generally oriented toward the acquisition of information that will be useful to them in the future (e.g., reading the newspaper), whereas older adults are generally oriented toward information that brings emotional satisfaction in the present (e.g., reading novels). Because young people have such long futures, they *invest* their time attending to, thinking about, and remembering potentially *useful information* that may serve them well in the many days to come. But older people have shorter futures and so they *spend* their time attending to, thinking about, and remembering *positive information* that serves them well in the moment (see **FIGURE 10.11**). Interestingly, this basic change in orientation toward information also occurs among younger people whose futures are sadly shortened by terminal illness (Carstensen & Fredrickson, 1998). Although people spend

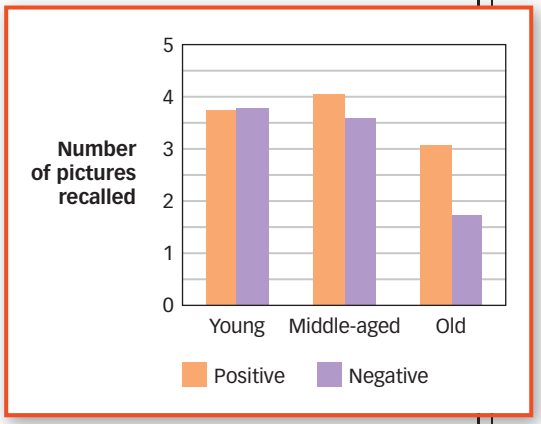


FIGURE 10.11
Memory for Pictures *Memory declines with age in general, but the ability to remember negative information such as unpleasant pictures declines much more quickly than the ability to remember positive information (Carstensen et al., 2000).*


DANIEL GILBERT

As people age, they prefer to spend time with family and a few close friends rather than large circles of acquaintances. Some grandfathers will even dress like ducks to impress important members of their small social networks.

less time thinking about the future as they age, they do not spend more time thinking about the past (Carstensen, Isaacowitz, & Charles, 1999). Rather, they spend more time thinking about the present.

This change in older people's orientation toward information influences much more than memory. Not only are older adults less likely than younger adults to attend to or remember negative information, but they are also less likely to be emotionally influenced by it. Whereas younger adults show activation of the amygdala when they see both pleasant and unpleasant pictures, older adults show greater activation when they see pleasant pictures than when they see unpleasant pictures (Mather et al., 2004). Studies also reveal that as people age, they tend to experience fewer negative emotions and more complex emotions (Carstensen et al., 2000; Charles, Reynolds, & Gatz, 2001; Mroczek & Spiro, 2005; see **FIGURE 10.12**). What's more, older people seem better able than younger people to sustain their positive emotional experiences and to curtail their negative ones (Lawton et al., 1992).

These changes influence the activities in which older people choose to engage. Psychologists have long known that social networks get smaller as people age, and they have assumed that this happens because friends die at an accelerating rate. Some of this shrinkage is indeed due to loss, but it now appears that much of it is a matter of choice: in general, older adults become more selective about their interaction partners, choosing to spend time with family and a few close friends rather than with a large circle of acquaintances. A study of older adults who ranged in age from 69 to 104 found that the oldest adults had fewer peripheral social partners than the younger adults did, but they had just as many emotionally close partners whom they identified as member of their "inner circle" (Lang & Carstensen, 1994).

Why are older people generally happier than younger people?

Together, these changes tend to produce emotional satisfaction. In one survey, 38% of people over 65 described themselves

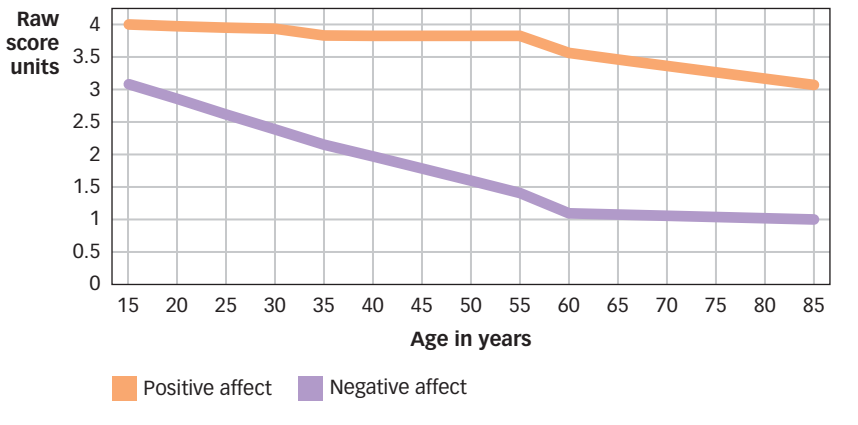


FIGURE 10.12
Happiness and Age *Despite what our youth-oriented culture would have you believe, people's overall happiness generally increases with age. As this graph shows, people experience a small decrease in positive affect beginning around age 55, but this is more than compensated for by the large decrease in negative affect that begins around the age of 15 and continues through middle age (Charles et al., 2001).*

as very happy, but only 28% of 18- to 29-year-olds said the same (Pew Research Center for the People & the Press, 1997). Although Western culture values youth (which is why Westerners spend billions of dollars every year trying appear younger than they are), research suggests that one of the best ways to increase one's share of happiness in life is simply to get older. The machinery may not work as well, but the passengers seem to enjoy the ride more.

"Two Stones tickets, please, senior discount."

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Changing Roles

The psychological separation from parents that begins in adolescence becomes a physical separation in adulthood. In virtually all human societies, young adults eventually leave their parents' home, get married, and have children of their own. Marriage and parenthood are two of the most significant aspects of adult life, and most people experience both of them. The average college-aged American will get married around the age of 27, have approximately 1.8 children, and consider their marriage and children to be their greatest sources of happiness. Indeed, in one survey, a whopping 93% of American mothers said that their children were a source of happiness all or most of the time (Pew Research Center, 1997).

But do marriage and children really make us happy? Research has consistently shown that married people live longer (see **FIGURE 10.13**), have more frequent sex (and enjoy that sex more), and earn several times as much money as unmarried people do (Waite, 1995). Given these differences, it is no surprise that married people report being happier than unmarried people—whether those unmarried people are single, widowed, divorced, or

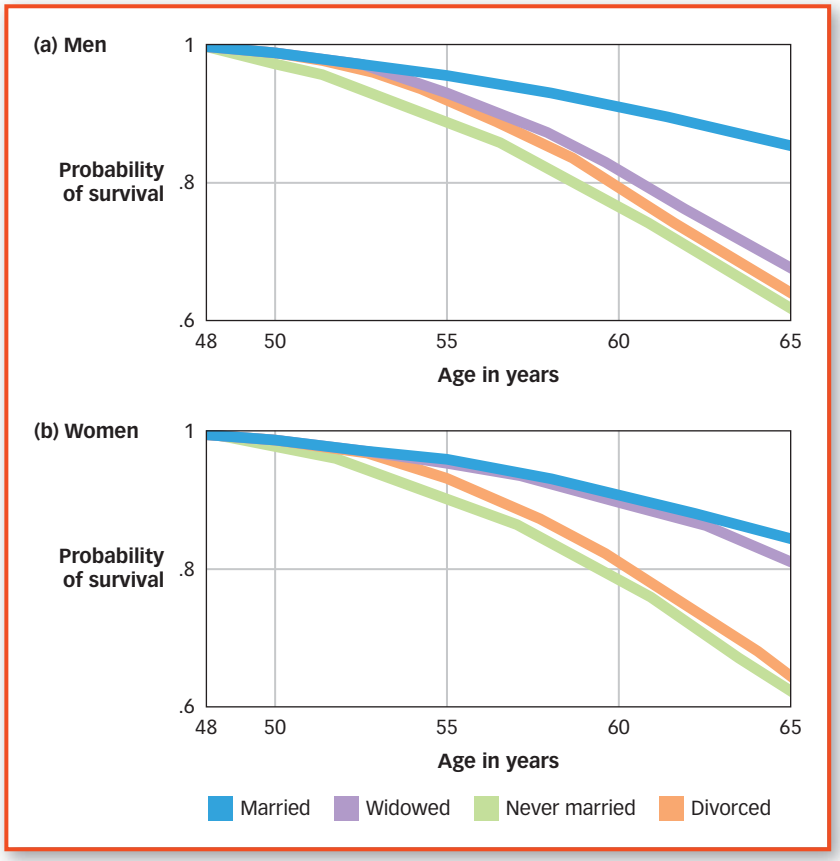


FIGURE 10.13
'Til Death Do Us Part *Married people live longer than unmarried people, and this is true of both men and women. But while widowed men die as young as never-married and divorced men do (a), widowed women live longer than never-married or divorced women do (b). In other words, the loss of a wife is always bad, but the loss of a husband is only bad if he's still alive! (Lillard & Waite, 1995).*

cohabiting (Johnson & Wu, 2002). But some researchers suggest that married people may be happier because happy people may be more likely to get married and that marriage may be the consequence—and not the cause—of happiness (Lucas et al., 2003). The general consensus among scientists seems to be that both of these positions are right: Even before marriage, people who end up married tend to be happier than those who never marry, but marriage does seem to confer further benefits.

Children are another story. In general, research suggests that children slightly decrease rather than increase their parents' happiness (DiTella, MacCulloch, & Oswald, 2003). For example, parents typically report lower marital satisfaction than do nonparents—and the more children they have, the less satisfaction they report (Twenge, Campbell, & Foster, 2003). Studies of marital satisfaction at different points in the life span reveal an interesting pattern of peaks and valleys: Marital satisfaction starts out high, plummets at about the time that the children are in diapers, begins to recover, plummets again when the children are in adolescence, and returns to its premarital levels only when children leave home (see **FIGURE 10.14**). A study that measured the moment-to-moment happiness of American women as they went about their daily activities found that women were less happy when taking care of their children than when eating, exercising, shopping, napping, or watching television and only slightly happier than when they were doing housework (Kahneman et al., 2004). *Thinking* about children is a delight, but *raising* children is hard work. Perhaps that's why when women in a national survey were asked to name a mother's most important quality, mothers of grown children were most likely to name "love," whereas mothers of young children were most likely to name "patience" (Pew Research Center, 1997).

Are children really bundles of joy?

Does all of this mean that people would be happier if they didn't have children? Not necessarily. Because researchers cannot randomly assign people to be parents or nonparents, studies of the effects of parenthood are necessarily correlational. People who want children and have children may be somewhat less happy than people who neither want them nor have them, but it is possible that people who want children would be even less happy if they didn't have them. What seems clear is that raising children is a challenging job that most people find to be meaningful and rewarding—especially when it's over.

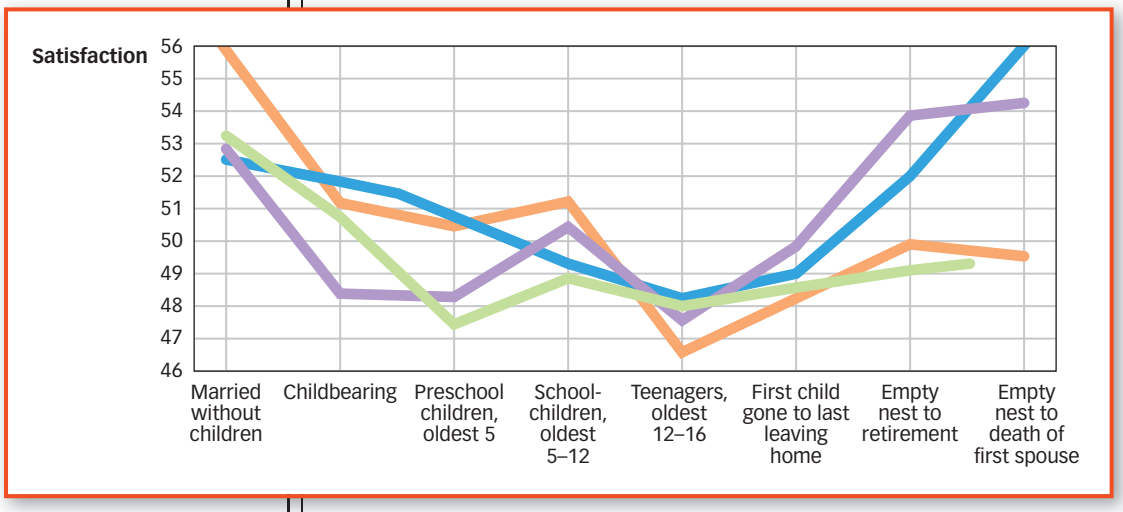


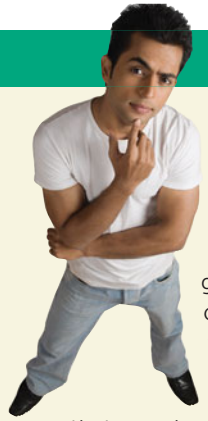
FIGURE 10.14
Marital Satisfaction over the Life Span *This graph shows the results of four independent studies of marital satisfaction among men and women. All four studies suggest that marital satisfaction is highest before children are born and after they leave home (Walker, 1977).*

summary quiz [10.4]

12. The peak years for health, stamina, and vigor are the
a. early 20s.
b. late 20s.
c. early 30s.
d. late 30s.

13. According to socioemotional selectivity theory, older adults are
a. more likely to remember negative information than positive information.
b. more likely than young adults to seek potentially useful information.
c. less likely than young adults to seek emotionally satisfying information.
d. increasingly likely to think about the present.

14. Which is true of marital satisfaction over the life span?
a. It increases steadily.
b. It decreases steadily.
c. It is remarkably stable.
d. It shows peaks and valleys, corresponding to the presence and ages of children.



WhereDoYouStand?

Licensing Parents

Common law states that "when practice of a profession or calling requires special knowledge or skill and intimately affects public health, morals, order or safety, or general welfare, legislature may prescribe reasonable qualifications for persons desiring to pursue such professions or calling and require them to demonstrate possession of such qualifications by examination." Most of us would probably agree that this is reasonable and that people who want to operate automobiles, use firearms, pilot airplanes, or perform surgeries should be required to demonstrate their proficiency and obtain a license. After all, if people were allowed to practice law or build bridges without first demonstrating their knowledge and skill, the public welfare would be gravely compromised.

So why not apply this logic to parenting? Why not outlaw reproduction by citizens who can't qualify for a parenting license? Because this suggestion sounds so outrageous, you may be surprised to learn that it has become the subject of serious debate among ethicists who are trying to decide how best to balance the interests of parents against the damage that bad parenting can do (Tittle, 2004; Warnock, 2003). The arguments *against* parental licensing are all too obvious: People have a fundamental right to reproduce; people have different definitions of "good parenting"; a licensing system would invite abuse by governments that want to limit the reproduction of citizens who have the wrong genes, the wrong skin color, or the wrong political beliefs. Americans are naturally suspicious of governmental intrusion into private affairs, and what could be more private than the decision to have a child?

For most people, parental licensing is a ridiculous and dangerous idea. And yet some of the arguments in its favor are not easily dismissed. Consider a few:

- Bad flossing is a private affair. Bad parenting is not. Every one of us pays the price when parents abuse, neglect, or fail to educate their children. Bad parents impose significant social and economic burdens on the rest of society—not to mention on their own children. Society has a clear interest in *preventing* (and not just punishing) abusive and negligent parenting.
- Licensing is not meant to prevent potentially bad parents from having children; it is meant to make potentially bad parents into good ones. Driver's education turns potentially bad drivers into good ones, but most people wouldn't sign up for such training if they didn't have to do so in order to qualify for a driver's license. Parental licensing would motivate people to learn the things that every parent should know.
- If we demand that people meet certain standards before they are allowed to *adopt* children, then why should we not demand that they meet the same standards before being allowed to bear children? Are our biological children worth less than our adopted ones?

Anyone who has read George Orwell's *1984* or Aldous Huxley's *Brave New World* will find the notion of parental licensing more than a little frightening. And yet, bad parenting can have devastating consequences for children and for society. Is parental licensing the right solution, or is it a bad answer to a good question? Where do you stand?

CHAPTER REVIEW

Summary

Prenatality: A Womb with a View

- Developmental psychology studies continuity and change across the life span.
- During the prenatal stage of development, a fertilized egg (zygote) develops into an embryo and then a fetus.
- The environment has important physical and psychological influences on the fetus.

Infancy and Childhood: Becoming a Person

- Infants slowly develop perceptual and motor skills that allow them to start to develop theories about how the world works.
- Piaget proposed that a child's cognitive development occurs in four stages: the sensorimotor stage, the preoperational stage, the concrete operational stage, and the formal operational stage.
- Cognitive development also reflects social development, as children form attachments to caregivers and are given tools for understanding that have been developed by their cultures.
- Humans also develop moral principles; Piaget conceived the development of moral thinking as a shift from realism to relativism, from prescriptions to principles, and from consequences to principles. Kohlberg conceived the development of moral reasoning as occurring in three stages: the preconventional stage, the conventional stage, and the postconventional stage; later researchers have noted that moral behavior depends on feeling as much as on abstract reasoning.

Adolescence: Minding the Gap

- Adolescence, the stage between childhood and adulthood, begins with the onset of puberty.
- Puberty is occurring earlier than ever before, while the entrance of young people into adult society is occurring later.
- During puberty, sexual interest intensifies and, in some cultures, sexual activity begins.
- As adolescents seek to develop their adult identities, they seek increasing autonomy from their parents and become more peer oriented.

Adulthood: The Short Happy Future

- Gradual physical decline begins early in adulthood.
- Older adults show declines in working memory, episodic memory, and retrieval tasks, but they often develop strategies to compensate.
- Older people are more oriented toward emotionally satisfying information, which influences their basic cognitive performance, the size and structure of their social networks, and their general happiness.
- People who get married are typically happier than people who do not, but children and the responsibilities that parenthood entails present a significant challenge.

Key Terms

developmental psychology (p. 298)
zygote (p. 299)
germinal stage (p. 299)
embryonic stage (p. 299)
fetal stage (p. 299)
myelination (p. 299)
teratogens (p. 300)
fetal alcohol syndrome (p. 300)
infancy (p. 301)
motor development (p. 302)
reflexes (p. 302)
cephalocaudal rule (p. 302)
proximodistal rule (p. 302)
cognitive development (p. 303)
sensorimotor stage (p. 304)
schemas (p. 304)
assimilation (p. 304)
accommodation (p. 304)
object permanence (p. 304)
childhood (p. 305)
preoperational stage (p. 305)
concrete operational stage (p. 305)
conservation (p. 305)
formal operational stage (p. 306)
egocentrism (p. 306)
theory of mind (p. 307)
attachment (p. 312)
internal working model of attachment (p. 312–313)
temperaments (p. 313)
preconventional stage (p. 315)
conventional stage (p. 315)
postconventional stage (p. 315)
adolescence (p. 318)
puberty (p. 318)
primary sex characteristics (p. 318)
secondary sex characteristics (p. 318)
adulthood (p. 323)

Critical Thinking Questions

1. Perceptual and motor development tend to obey the proximodistal rule, meaning that motor skills tend to emerge in sequence from center to periphery. Piaget proposed that cognitive development also passes through stages.

   Might the stages of cognitive development be thought of as also following a proximodistal rule?

2. Adolescence is a period of transition, as the body reaches sexual maturity and the individual prepares to take an adult role in society. In modern industrialized societies, puberty is coming earlier than ever before, while the entry into adult roles is delayed.

   In what ways might the protraction of adolescence influence the rates of teenage sexual activity and teenage pregnancy?

3. As we age, portions of our brain deteriorate and cognitive function may decline, but older adults can often compensate by recruiting additional brain areas to help. Also as we age, we are more likely to experience and remember positive emotions than negative ones.

   Could this emotional selectivity be a side effect of cognitive decline? Or might it be a compensation mechanism?

Answers to Summary Quizzes

Summary Quiz 10.1
1. d; 2. d; 3. a

Summary Quiz 10.2
4. c; 5. d; 6. a; 7. d

Summary Quiz 10.3
8. a; 9. c; 10. b; 11. c

Summary Quiz 10.4
12. a; 13. d; 14. d