Multiple-Choice Questions

1. Alcohol is a teratogen that can slip through the ________ and damage the fetus or embryo.

a. placenta
b. nervous system
c. womb
d. brainstem
e. zygote

2. Even as newborns, we prefer sights and sounds that facilitate social responsiveness. This can be seen by a newborn's preference for

a. soft music.
b. face-like images.
c. low pitched sounds.
d. soft colors.
e. loud music.

3. As infants gain familiarity with repeated exposure to a visual stimulus, their interest wanes and they look away sooner. The decrease in an infant's responsiveness is called

a. concentration.
b. teratogens.
c. habituation.
d. stability.
e. transference.

4. Which question expresses the developmental issue of stability and change?

a. Are individuals more similar or different from each other?
b. How much of development occurs in distinct stages?
c. How much of development is determined by genetics?
d. To what extent do certain traits persist through the life span?
e. Which traits are most affected by life changes and experience?

5. What is the prenatal development sequence?

a. Zygote, embryo, fetus
b. Fetus, zygote, embryo
c. Embryo, zygote, fetus
d. Zygote, fetus, embryo
e. Fetus, embryo, zygote

6. Some people think development occurs much in the way a tree grows, slowly and steadily adding one rin[g] each year. Others think that there are rather abrupt developmental jumps, like the transformation of a tadpole into a frog. Which of the following issues wo[uld] this difference of opinion relate to?

a. Nature and nurture
b. Maturation and learning
c. Prenatal and neonatal
d. Stability and change
e. Continuity and stages

7. Which of the following is the longest prenatal stage?

a. Teratogen
b. Conception
c. Zygote
d. Embryo
e. Fetus

Practice FRQs

1. What is habituation? How is this phenomenon used by researchers in examining newborns' abilities?

Answer

1 point: Habituation is the decrease in responding with repeated stimulation.

1 point: Researchers use habituation to see what infants recognize and remember.

2. Three major issues are addressed by psychologists in the study of human development. Identify and state how all three might be considered to explain how children's traits and abilities develop.

(3 points)

Module 46

Infancy and Childhood: Physical Development


Yukmin/Asia Images/Corbis

Module Learning Objectives

46-1 Describe some developmental changes in brain and motor abilities during infancy and childhood.

46-2 Describe how an infant's developing brain begins processing memories.

46-1 During infancy and childhood, how do the brain and motor skills develop?

During infancy, a baby grows from newborn to toddler, and during childhood from toddler to teenager. We all traveled this path, with its physical, cognitive, and social milestones.

As a flower unfolds in accord with its genetic instructions, so do we. **Maturation**—the orderly sequence of biological growth—decrees many of our commonalities. We stand before walking. We use nouns before adjectives. Severe deprivation or abuse can retard development. Yet the genetic growth tendencies are inborn. Maturation (nature) sets the basic course of development; experience (nurture) adjusts it. Once again, we see genes and scenes interacting.

"It is a rare privilege to watch the birth, growth, and first feeble struggles of a living human mind."
-Annie Sullivan, in Helen Keller's *The Story of My Life*, 1903

maturation biological growth processes that enable orderly changes in behavior, relatively uninfluenced by experience.

Brain Development

In your mother's womb, your developing brain formed nerve cells at the explosive rate of nearly one-quarter million per minute. The developing brain cortex actually overproduces neurons, with the number peaking at 28 weeks and then subsiding to a stable 23 billion or so at birth (Rabinowicz et al., 1996, 1999; de Courten-Myers, 2002).

From infancy on, brain and mind—neural hardware and cognitive software—develop together. On the day you were born, you had most of the brain cells you would ever have. However, your nervous system was immature: After birth, the branching neural networks that eventually enabled you to walk, talk, and remember had a wild growth spurt (**FIGURE 46.1** on the next page). From ages 3 to 6, the most rapid growth was in your frontal lobes, which enable rational planning. This explains why preschoolers display a rapidly developing ability to control their attention and behavior (Garon et al., 2008).

The association areas—those linked with thinking, memory, and language—are the last cortical areas to develop. As they do, mental abilities surge (Chugani & Phelps, 1986; Thatcher et al., 1987). Fiber pathways supporting language and agility proliferate into puberty. A use-it-or-lose-it *pruning process* shuts down unused links and strengthens others (Paus et al., 1999; Thompson et al., 2000).

AP® Exam Tip

Note that maturation, to developmental psychologists, is a biological sequence. This is much more precise than the general notion that maturation means to become more adult-like.

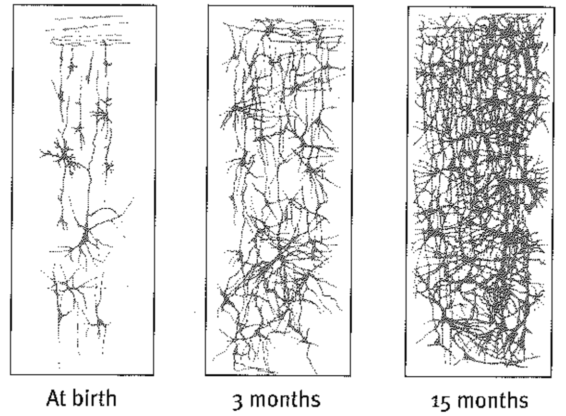

Figure 46.1
Drawings of human cerebral cortex sections In humans, the brain is immature at birth. As the child matures, the neural networks grow increasingly more complex.

Motor Development

The developing brain enables physical coordination. As an infant's muscles and nervous system mature, skills emerge. With occasional exceptions, the motor development sequence is universal. Babies roll over before they sit unsupported, and they usually crawl on all fours before they walk (**FIGURE 46.2**). These behaviors reflect not imitation but a maturing nervous system; blind children, too, crawl before they walk.

There are, however, individual differences in timing. In the United States, for example, 25 percent of all babies walk by age 11 months, 50 percent within a week after their first birthday, and 90 percent by age 15 months (Frankenburg et al., 1992). The recommended infant *back-to-sleep position* (putting babies to sleep on their backs to reduce the risk of a smothering crib death) has been associated with somewhat later crawling but not with later walking (Davis et al., 1998; Lipsitt, 2003).

FYI

In the eight years following the 1994 launch of a U.S. Back to Sleep educational campaign, the number of infants sleeping on their stomach dropped from 70 to 11 percent—and SIDS (Sudden Infant Death Syndrome) deaths fell by half (Braiker, 2005).

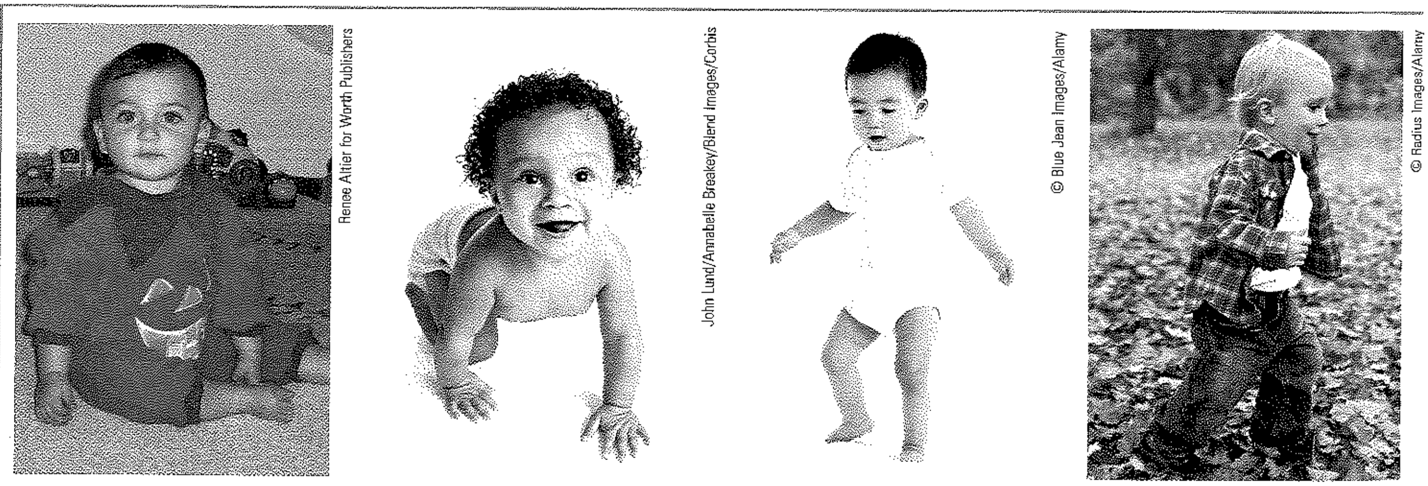

Figure 46.2
Triumphant toddlers Sit, crawl, walk, run—the sequence of these motor development milestones is the same the world around, though babies reach them at varying ages.

Genes guide motor development. Identical twins typically begin walking on nearly the same day (Wilson, 1979). Maturation—including the rapid development of the cerebellum at the back of the brain—creates our readiness to learn walking at about age 1. Experience before that time has a limited effect. The same is true for other physical skills, including bowel and bladder control. Before necessary muscular and neural maturation, don't expect pleading or punishment to produce successful toilet training.

Brain Maturation and Infant Memory

46-2 How does an infant's developing brain begin processing memories?

"This is the path to adulthood. You're here."

Can you recall your first day of preschool or your third birthday party? Our earliest memories seldom predate our third birthday. We see this *infantile amnesia* in the memories of some preschoolers who experienced an emergency fire evacuation caused by a burning popcorn maker. Seven years later, they were able to recall the alarm and what caused it—*if* they were 4 to 5 years old at the time. Those experiencing the event as 3-year-olds could not remember the cause and usually misrecalled being already outside when the alarm sounded (Pillemer, 1995). Other studies confirm that the average age of earliest conscious memory is 3½ years (Bauer, 2002, 2007). As children mature, from 4 to 6 to 8 years, childhood amnesia is giving way, and they become increasingly capable of remembering experiences, even for a year or more (Bruce et al., 2000; Morris et al., 2010). The brain areas underlying memory, such as the hippocampus and frontal lobes, continue to mature into adolescence (Bauer, 2007).

Apart from constructed memories based on photos and family stories, we *consciously* recall little from before age 4. Yet our brain was processing and storing information during those early years. In 1965, while finishing her doctoral work in psychology, Carolyn Rovee-Collier observed a nonverbal infant memory. She was also a new mom, whose colicky 2-month-old, Benjamin, could be calmed by moving a crib mobile. Weary of hitting the mobile, she strung a cloth ribbon connecting the mobile to Benjamin's foot. Soon, he was kicking his foot to move the mobile. Thinking about her unintended home experiment, Rovee-Collier realized that, contrary to popular opinion in the 1960s, babies are capable of learning. To know for sure that her son wasn't just a whiz kid, she repeated the experiment with other infants (Rovee-Collier, 1989, 1999). Sure enough, they, too, soon kicked more when hitched to a mobile, both on the day of the experiment and the day after. They had learned the link between moving legs and moving mobiles. If, however, she hitched them to a different mobile the next day, the infants showed no learning, indicating that they remembered the original mobile and recognized the difference. Moreover, when tethered to the familiar mobile a month later, they remembered the association and again began kicking (**FIGURE 46.3**).

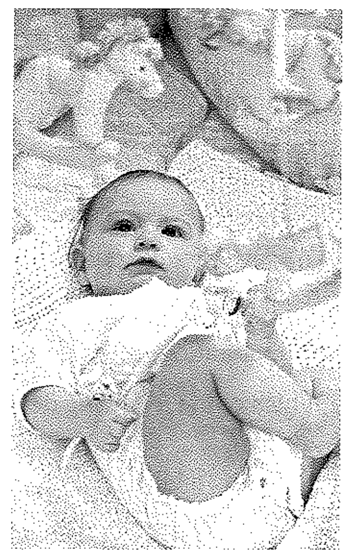

Figure 46.3
Infant at work Babies only 3 months old can learn that kicking moves a mobile, and they can retain that learning for a month. (From Rovee-Collier, 1989, 1997.)

Traces of forgotten childhood languages may also persist. One study tested English-speaking British adults who had no conscious memory of the Hindi or Zulu they had spoken as children. Yet, up to age 40, they could relearn subtle sound contrasts in these languages that other people could *not* learn (Bowers et al., 2009). What the conscious mind does not know and cannot express in words, the nervous system somehow remembers.

Before You Move On

▶ ASK YOURSELF

What do you tend to regard as your earliest memory? Now that you know about infantile amnesia, has your opinion changed about the accuracy of that memory?

▶ TEST YOURSELF

What is the biological growth process that explains why most children begin walking by about 12 to 15 months?

Answers to the Test Yourself questions can be found in Appendix E at the end of the book.

Module 46 Review

46-1 During infancy and childhood, how do the brain and motor skills develop?

- The brain's nerve cells are sculpted by heredity and experience. Their interconnections multiply rapidly after birth, a process that continues until puberty, when a pruning process begins shutting down unused connections.
- Complex motor skills—sitting, standing, walking—develop in a predictable sequence, though the timing of that sequence is a function of individual *maturation* and culture.

46-2 How does an infant's developing brain begin processing memories?

- We have no conscious memories of events occurring before about age 3½, in part because major brain areas have not yet matured.

Multiple-Choice Questions

1. As the infant's brain develops, some neural pathways will decay if not used. This use-it-or-lose-it process is known as

a. motor development.
b. pruning.
c. spacing.
d. accommodation.
e. maturation.

2. Which of the following depends least on the maturation process?

a. Riding a bike
b. Writing
c. Talking
d. Bladder control
e. Telling time

3. Which of the following is true of the early formation of brain cells?

a. They form at a constant rate throughout the prenatal period.
b. They begin forming slowly, and then the rate increases throughout prenatal development.
c. They form slowly during the prenatal period, and then the rate increases after birth.
d. They form at a constantly increasing rate prenatally and in early childhood.
e. They are overproduced early in the prenatal period, and then the rate decreases and stabilizes.

4. Neural networks grow more complex by

a. branching outward to form multiple connections.
b. keeping the nervous system immature.
c. controlling one another with a restricted response system.
d. limiting connections.
e. associating behaviors that would not normally be associated together.

Practice FRQs

1. Define and give an example of maturation. Define infantile amnesia and explain how maturation contributes to this phenomenon.

Answer

1 point: Maturation is the orderly changes in behavior that result from biological processes that are relatively unaffected by experience.

1 point: Various examples will serve here, such as the normal development of motor skills (e.g., rolling over, crawling) or bladder and bowel control.

1 point: Infantile amnesia is our inability to remember events that occurred before we are about 3½ years old.

1 point: The brain areas underlying memory need to mature before we can remember accurately. This maturation doesn't happen until after the age of 3.

2. Three types of development are listed below. Give a specific example of each.
   - Brain development
   - Motor development
   - Infant memory

(3 points)