

2 Puberty, Health, and Biological Foundations



*In youth, we clothe ourselves with rainbows and go brave as
the zodiac.*

—RALPH WALDO EMERSON
American Poet and Essayist, 19th Century

CHAPTER OUTLINE

LEARNING GOALS

PUBERTY

- Determinants of Puberty
- Growth Spurt
- Sexual Maturation
- Secular Trends in Puberty
- Psychological Dimensions of Puberty

1

Discuss the determinants, characteristics, and psychological dimensions of puberty.

HEALTH

- Adolescence: A Critical Juncture in Health
- Emerging Adults' Health
- Nutrition
- Exercise and Sports
- Sleep

2

Summarize the nature of adolescents' and emerging adults' health.

EVOLUTION, HEREDITY, AND ENVIRONMENT

- The Evolutionary Perspective
- The Genetic Process
- Heredity-Environment Interaction

3

Explain the contributions of evolution, heredity, and environment to adolescent development.

Images of Adolescent Development

Puberty's Mysteries and Curiosities

I am pretty confused. I wonder whether I am weird or normal. My body is starting to change, but I sure don't look like a lot of my friends. I still look like a kid for the most part. My best friend is only 13, but he looks like he is 16 or 17. I get nervous in the locker room during PE class because when I go to take a shower, I'm afraid somebody is going to make fun of me since I'm not as physically developed as some of the others.

—Robert, age 12

I don't like my breasts. They are too small, and they look funny. I'm afraid guys won't like me if they don't get bigger.

—Angie, age 13

I can't stand the way I look. I have zits all over my face. My hair is dull and stringy. It never stays in place. My nose is too big. My lips are too small. My legs are too short. I have four warts on my left hand, and people get grossed out by them. So do I. My body is a disaster!

—Ann, age 14

I'm short and I can't stand it. My father is 6 feet tall, and here I am only 5 feet 4. I'm 14 already. I look like a kid, and I get teased a lot, especially by other guys. I'm always the last one picked for sides in basketball because I'm so short. Girls don't seem to be interested in me either because most of them are taller than I am.

—Jim, age 14

The comments of these four adolescents in the midst of pubertal change underscore the dramatic upheaval in their bodies following the calm, consistent growth of middle and late childhood. Young adolescents develop an acute concern about their bodies.

PREVIEW

Puberty's changes are perplexing to adolescents. Although these changes bring forth doubts, fears, and anxieties, most adolescents eventually overcome them. We explore many aspects of pubertal change in this chapter from growth spurts and sexual

maturity to the psychological aspects of puberty. We also examine other topics related to adolescent physical development, including health and nutrition, the role of evolution, and the interaction of heredity and the environment.

1

Determinants of Puberty

Sexual Maturation

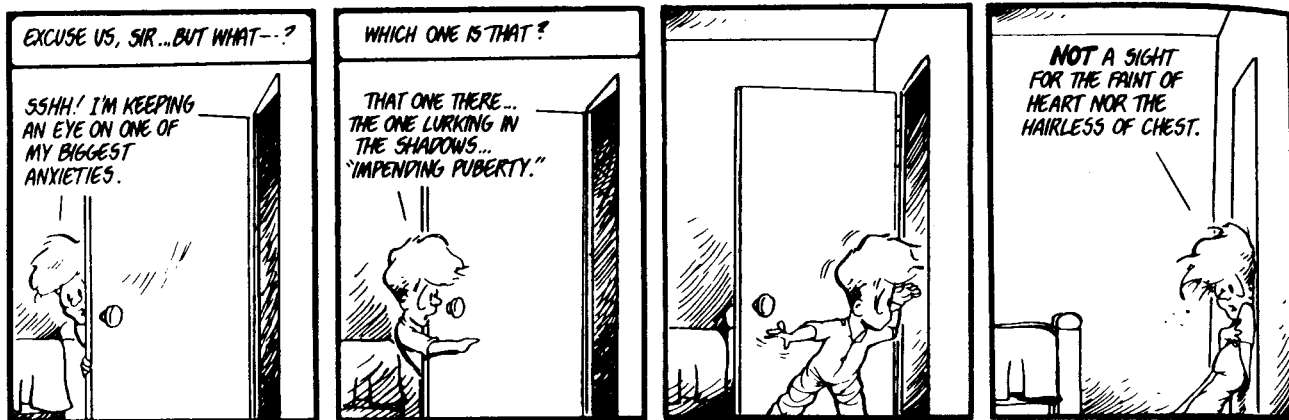
Psychological Dimensions of Puberty

Growth Spurt

Secular Trends in Puberty

puberty A period of rapid physical maturation involving hormonal and bodily changes that take place primarily in early adolescence.

Puberty can be distinguished from adolescence. For virtually everyone, puberty ends long before adolescence is exited. Puberty is often thought of as the most important marker for the beginning of adolescence. **Puberty** is a period of rapid physical maturation involving hormonal and bodily changes that take place primarily in early adolescence.



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Determinants of Puberty

Although we do not know precisely what initiates puberty, a number of complex factors are involved. Puberty is accompanied by changes in the endocrine system, weight, body fat, and leptin, but we don't know if these are a cause or a consequence of puberty (Dorn & others, 2006). Also, there is increased interest in the role that birth weight, rapid weight gain in infancy, obesity, and sociocultural factors might play in pubertal onset and characteristics. As discussed next, heredity is an important factor in puberty.

Heredity Puberty is not an environmental accident. Programmed into the genes of every human being is the timing for the emergence of puberty (Hirschhorn, 2005; Roth & Ojeda, 2005). Puberty does not take place at 2 or 3 years of age and it does not occur in the twenties. In the future, molecular genetic studies may identify specific genes that are linked to the onset and progression of puberty. Nonetheless, as we see later in our discussion of puberty, which takes place between about 9 and 16 years of age for most individuals, environmental factors can also influence its onset and duration (vandenBerg & Boomsa, 2007).

Hormones Behind the first whisker in boys and the widening of hips in girls is a flood of **hormones**, powerful chemical substances secreted by the endocrine glands and carried throughout the body by the bloodstream. Two classes of hormones have significantly different concentrations in males and females: **androgens**, the main class of male sex hormones, and **estrogens**, the main class of female hormones. Note that although these hormones function more strongly in one sex or the other, they are produced by both males and females.

Testosterone is an androgen that plays an important role in male pubertal development. Throughout puberty, rising testosterone levels are associated with a number of physical changes in boys, including the development of external genitals, an increase in height, and voice changes (Campbell & Mbizo, 2006). Testosterone level in adolescent boys is also linked to sexual desire and activity (Cameron, 2004). *Estradiol* is an estrogen that plays an important role in female pubertal development. As estradiol levels rise, breast development, uterine development, and skeletal changes occur. The identity of hormones that contribute to sexual desire and activity in adolescent girls is less clear for girls than boys (Cameron, 2004). Both boys and girls experience an increase in both hormones during puberty. In one study, testosterone levels increased 18-fold in boys but only 2-fold in girls during puberty; estradiol levels increased 8-fold in girls but only 2-fold in boys during puberty (Nottelmann & others, 1987) (see Figure 2.1).

hormones Powerful chemicals secreted by the endocrine glands and carried through the body by the bloodstream.

androgens The main class of male sex hormones.

estrogens The main class of female sex hormones.

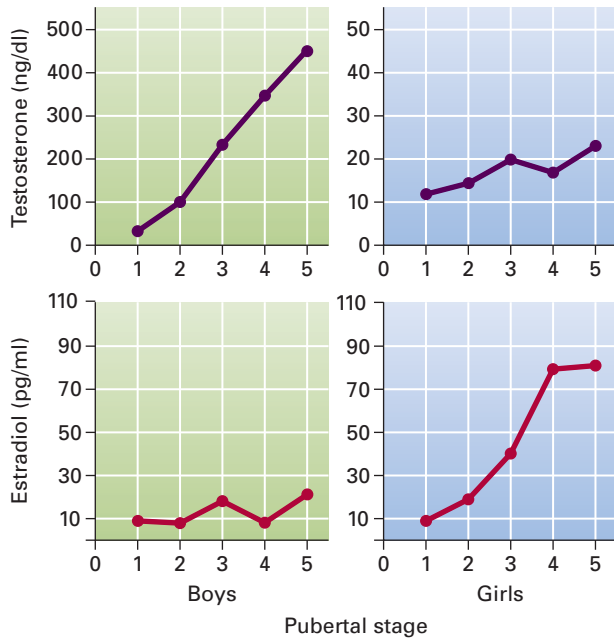


FIGURE 2.1 Hormone Levels by Sex and Pubertal Stage for Testosterone and Estradiol The five stages range from the early beginning of puberty (stage 1) to the most advanced stage of puberty (stage 5). Notice the significant increase in testosterone in boys and the significant increase in estradiol in girls.

The Endocrine System The endocrine system's role in puberty involves the interaction of the hypothalamus, the pituitary gland, and the gonads (sex glands) (see Figure 2.2). The *hypothalamus* is a structure in the higher portion of the brain that monitors eating, drinking, and sex. The *pituitary gland* is the endocrine gland that controls growth and regulates other glands. The *gonads* are the sex glands—the testes in males, the ovaries in females. How does the endocrine system work? The pituitary gland sends a signal via gonadotropins (hormones that stimulate sex glands) to the testes or ovaries to manufacture the hormone. Then, through interaction with the hypothalamus, the pituitary gland detects when the optimal level of hormones has been reached and maintains it with additional gonadotropin secretions (Clarkson & Herbison, 2006; Yoo & others, 2006).

Levels of sex hormones are regulated by two hormones secreted by the pituitary gland: *FSH* (*follicle-stimulating hormone*) and *LH* (*luteinizing hormone*). FSH stimulates follicle development in females and sperm production in males. LH regulates estrogen secretion and ovum development in females and testosterone production in males (Ojeda & others, 2006; Rapkin & others, 2006). In addition, the hypothalamus secretes a substance called *GnRH* (*gonadotropin-releasing hormone*) that is linked to pubertal timing (Hughes & Kumanan, 2006; Whitlock & others, 2006).

These hormones are regulated by a *negative feedback system*. If the level of sex hormones rises too high, the hypothalamus and pituitary gland reduce their stimulation of the gonads, decreasing the production

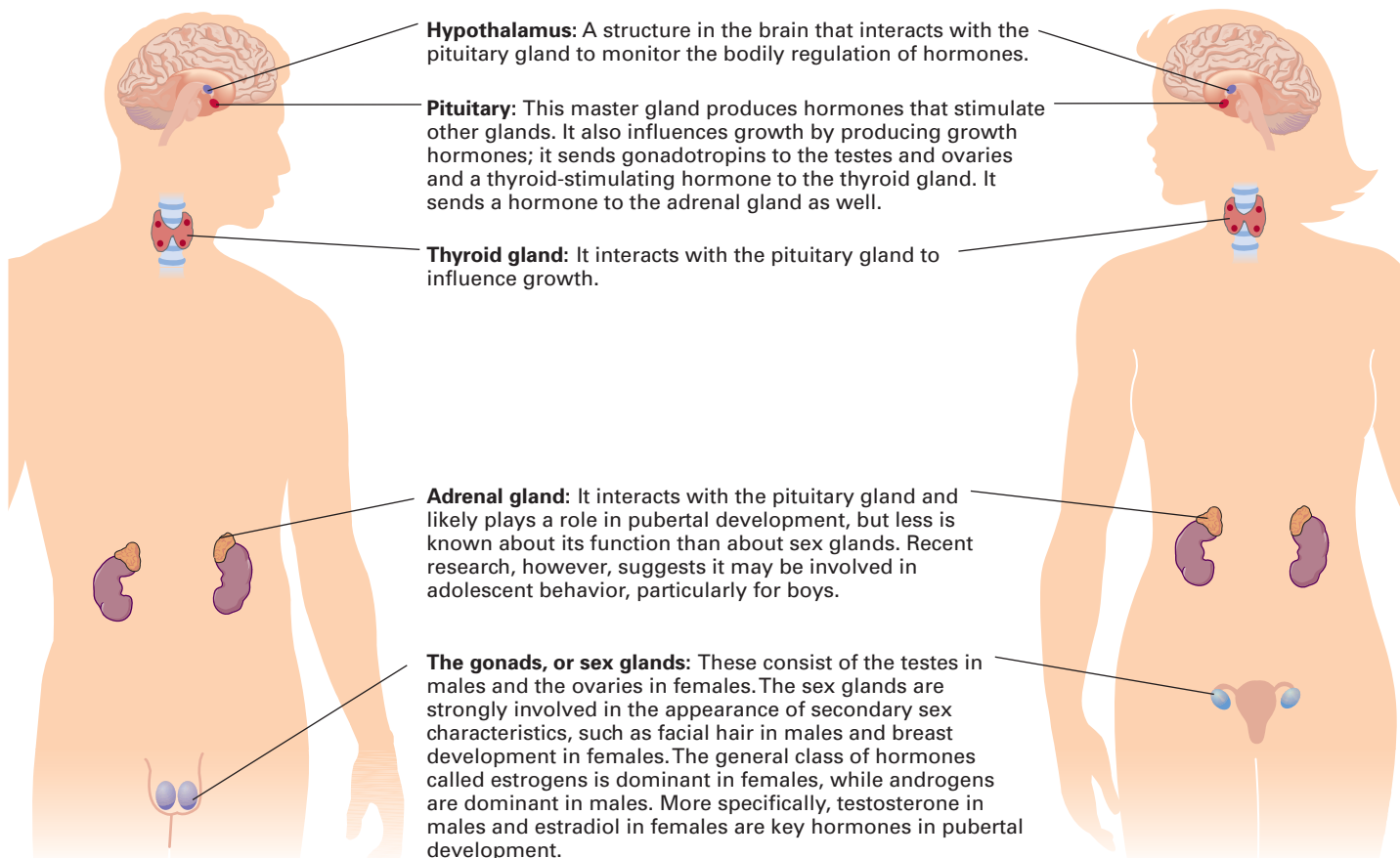


FIGURE 2.2 The Major Endocrine Glands Involved in Pubertal Change

of sex hormones. If the level of sex hormones falls too low, the hypothalamus and pituitary gland increase their production of the sex hormones.

Figure 2.3 shows how the feedback system works. In males, the pituitary gland's production of LH stimulates the testes to produce testosterone. When testosterone levels rise too high, the hypothalamus decreases its production of GnRH, which reduces the pituitary's production of LH. When the level of testosterone falls as a result, the hypothalamus produces more GnRH and the cycle starts again. The negative feedback system operates in a similar way in females, except that LH and GnRH regulate the ovaries and the production of estrogen.

This negative feedback system in the endocrine system can be compared to a thermostat and furnace. If a room becomes cold, the thermostat signals the furnace to turn on. The action of the furnace warms the air in the room, which eventually triggers the thermostat to turn off the furnace. The room temperature gradually begins to fall again until the thermostat once again signals the furnace to turn on, repeating the cycle. This type of system is called a *negative* feedback loop because a *rise* in temperature turns *off* the furnace, while a *decrease* in temperature turns *on* the furnace.

The level of sex hormones is low in childhood but increases in puberty. It is as if the thermostat is set at 50°F in childhood and now becomes set at 80°F in puberty. At the higher setting, the gonads have to produce more sex hormones, and that is what happens during puberty.

Growth Hormones We have seen that the pituitary gland releases gonadotropins that stimulate the testes and ovaries. In addition, through interaction with the hypothalamus, the pituitary gland also secretes hormones that lead to growth and skeletal maturation either directly or through interaction with the *thyroid gland*, located in the neck region (see Figure 2.2).

At the beginning of puberty, growth hormone is secreted at night. Later in puberty, it also is secreted during the day, although daytime levels are usually very low (Susman, Dorn, & Schiefelbein, 2003). Cortisol, a hormone that is secreted by the adrenal cortex, also influences growth as do testosterone and estrogen (Guercio & others, 2003).

Adrenarche and Gonadarche Two phases of puberty are linked with hormonal changes: adrenarche and gonadarche (Susman & Rogol, 2004). **Adrenarche** involves hormonal changes in the adrenal glands, located just above the kidneys. These changes occur surprisingly early, from about 6 to 9 years of age in girls and about one year later in boys, before what is generally considered the beginning of puberty (Dorn & others, 2006). During adrenarche and continuing through puberty, the adrenal glands secrete adrenal androgens, such as dehydroepiandrosterone (DHEA) (Blogowska, Rzepka-Gorska, & Krzyzanowska-Swiniarska, 2005). Adrenarche is still not well understood (Dorn & others, 2006).

Gonadarche, which follows adrenarche by about two years, is the period most people think of as puberty (Archibald, Graber, & Brooks-Gunn, 2003). Gonadarche involves the maturation of primary sexual characteristics (ovaries in females, testes in males) and secondary sexual characteristics (pubic hair, breast, and genital development) (Dorn & others, 2006). "The hallmark of gonadarche is reactivation of the hypothalamic-pituitary-gonadal axis (HPG). . . . The initial activation of the HPG axis was during the fetal and neonatal period" (Dorn & others, 2006, p. 35).

In the United States, the gonadarche period begins at approximately 9 to 10 years of age in non-Latino White girls, and 8 to 9 years in African American girls (Herman-Giddens, Kaplowitz, & Wasserman, 2004). In boys, gonadarche begins at about 10 to 11 years of age. **Menarche**, the first menstrual period, occurs in mid to late gonadarche in girls. In boys, **spermarche**, a boy's first ejaculation of semen, occurs in early to mid gonadarche. Robert, Angie, Ann, and Jim, the adolescents we described in *Images of Adolescent Development*, are each in various phases of adrenarche and gonadarche.

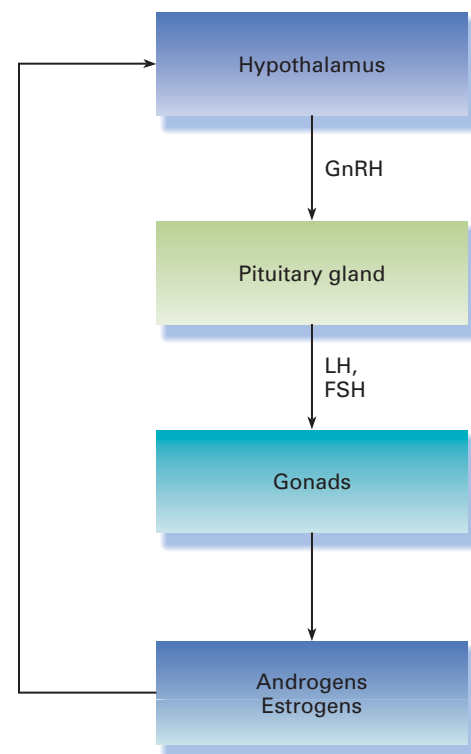


FIGURE 2.3 The Feedback System of Sex Hormones

adrenarche Puberty phase involving hormonal changes in the adrenal glands, located just above the kidneys. These changes occur from about 6 to 9 years of age in girls and about one year later in boys, before what is generally considered the beginning of puberty.

gonadarche Puberty phase involving the maturation of primary sexual characteristic (ovaries in females, testes in males) and secondary sexual characteristics (pubic hair, breast, and genital development). This period follows adrenarche by about two years and is what most people think of as puberty.

menarche A girl's first menstrual period.

spermarche A boy's first ejaculation of semen.



What are some of the differences in the ways girls and boys experience pubertal growth?

Weight, Body Fat, and Leptin Some researchers believe that a child must reach a critical body mass before puberty, especially *menarche*, emerges (Ackerman & others, 2006; Blogowski, Rzepka-Gorska, & Krzyzanowska-Swiniarska, 2005). A number of studies have found that higher weight, especially obesity, is linked to earlier pubertal development (Dunger, Ahmed, & Ong, 2006). Some have even proposed that a body weight of 106 \pm 3 pounds triggers menarche and the end of the pubertal growth spurt (Friesch, 1984). However, this specific weight target is not well documented (Susman, 2001).

Other scientists have hypothesized that the onset of menarche is influenced by the percentage of body fat in relation to total body weight. For menarche to occur, they say that a minimum of 17 percent of a girl's body weight must be comprised of body fat. As with the weight target, this percentage has not been consistently verified. However, both anorexic adolescents whose weight drops dramatically and females who participate in certain sports (such as gymnastics and swimming) may not menstruate (Fujii & Demura, 2003). In boys, undernutrition may delay puberty (Susman, Dorn, and Schiefelbein, 2003).

The hormone *leptin* may signal the beginning and progression of puberty (Blogowski, Rzepka-Gorska, & Krzyzanowska-Swiniarska, 2005). Leptin concentrations, which are higher in girls than in boys, are related to the amounts of fat in girls and androgen in boys (Cervero & others, 2006). Thus, a rise in leptin may indicate adequate fat stores for reproduction and the maintenance of pregnancy (Kelesidis & Mantzoros, 2006; Zeinoldini, Swarts, & Van de Heijning, 2006). Changes in leptin levels have not yet been studied in relation to adolescent behavior, however. Further, leptin is thought to be a necessary but not sufficient cause for puberty (Dorn, 2006).

Weight at Birth and in Infancy Might puberty's onset and characteristics be influenced by birth weight and weight gain during infancy? There is increasing research evidence for this link (van Weissenbruch & Delemarre-van de Waal, 2006). Low birth weight girls experience menarche approximately 5 to 10 months earlier than normal birth weight girls, and low birth weight boys are at risk for small testicular volume during adolescence (Ibanez & de Zegher, 2006). Researchers also have



How might birth weight and weight gain in infancy be linked to pubertal onset?

found that rapid weight gain in infancy is related to earlier pubertal onset (Dunger, Ahmed, & Ong, 2006).

Sociocultural and Environmental Factors Might sociocultural and environmental factors be linked to pubertal timing? Recent research indicates that cultural variations and early experiences may be related to earlier pubertal onset. Adolescents in developed countries and large urban areas reach puberty earlier than their counterparts in less developed countries and rural areas (Graham, 2005). Children who have been adopted from developing countries to developed countries often enter puberty earlier than their counterparts who continue to live in developing countries (Teilmann & others, 2002). African American females enter puberty earlier than non-Latino females, and African American males enter puberty earlier than non-Latino males (Biro & others, 2006; Herman-Giddens, 2006). Later in this chapter, we further examine variations in puberty in developed and developing countries.

Early experiences that are linked to earlier pubertal onset include father absence, low socioeconomic status, family conflict, and child maltreatment (Bogaert, 2005; Ellis, 2004; Maestripieri, & others, 2004; Romans & others, 2003). In many cases, puberty comes several months earlier in these situations. How can these links be explained? Researchers conclude that high rates of conflict and stress in these social contexts are the most likely explanation (Ellis, 2004).

There also has been interest in whether certain pollutants might influence the onset of puberty (Massart & others, 2006). Some studies have reported earlier menarche in girls exposed to polychlorinated biphenyls (PCBs), but other studies have not confirmed this link (Den Hond & Schoeters, 2006). PCBs are chemical compounds that no longer are manufactured in the United States but are still present in the environment; one source of PCBs are fish who live in contaminated water.

Growth Spurt

Growth slows throughout childhood, so puberty brings forth the most rapid increases in growth since infancy. Figure 2.4 shows that the growth spurt associated with puberty occurs approximately two years earlier for girls than for boys. For girls, the mean beginning of the growth spurt is 9 years of age; for boys, it is 11 years of age. The peak of pubertal change occurs at 11½ years for girls and 13½ years for boys. During their growth spurt, girls increase in height about 3½ inches per year; boys, about 4 inches.

Boys and girls who are shorter or taller than their peers before adolescence are likely to remain so during adolescence. At the beginning of adolescence, girls tend to be as tall as or taller than boys of their age, but by the end of the middle school years most boys have caught up with them, or in many cases even surpassed them in height. Though height in elementary school is a good predictor of height later in adolescence, as much as 30 percent of an individual's height in late adolescence is unexplained by the child's height in elementary school.

The rate at which adolescents gain weight follows approximately the same developmental timetable as the rate at which they gain height. Marked weight gains coincide with the onset of puberty (Susman & Rogol, 2004). Fifty percent of adult body weight is gained during adolescence (Rogol, Roemmich, & Clark, 1998). At the peak of this weight gain, girls gain an average of 18 pounds in one year at roughly 12 years of age (approximately six months after their peak height increase). Boys' peak weight gain per year (20 pounds) occurs at about the same time as their peak increase in height, about 13 to 14 years of age. During early adolescence, girls tend to outweigh boys, but just as with height, by about 14 years of age, boys begin to surpass girls in weight.

In addition to increases in height and weight, puberty brings changes in hip and shoulder width. Girls experience a spurt in hip width, whereas boys undergo an increase in shoulder width. In girls, increased hip width is linked with an increase in estrogen. In boys, increased shoulder width is associated with an increase in testosterone (Susman & Rogol, 2004).

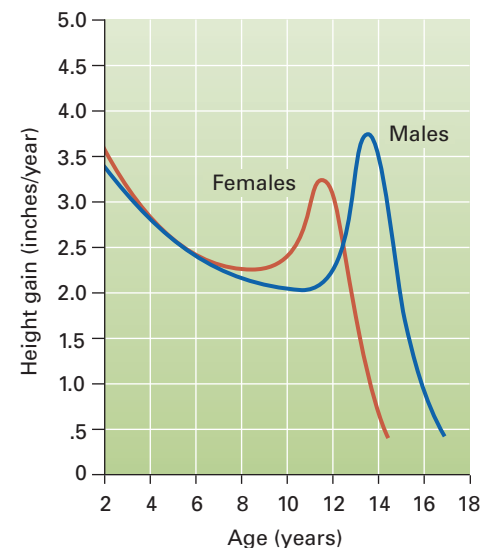
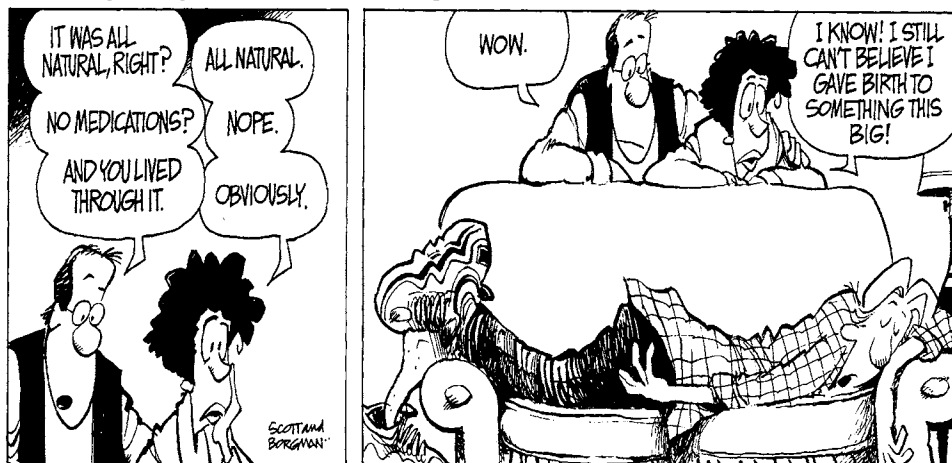


FIGURE 2.4 Pubertal Growth Spurt On the average, the peak of the growth spurt that characterizes pubertal changes occurs two years earlier for girls (11½) than for boys (13½).

ZITS By Jerry Scott and Jim Borgman



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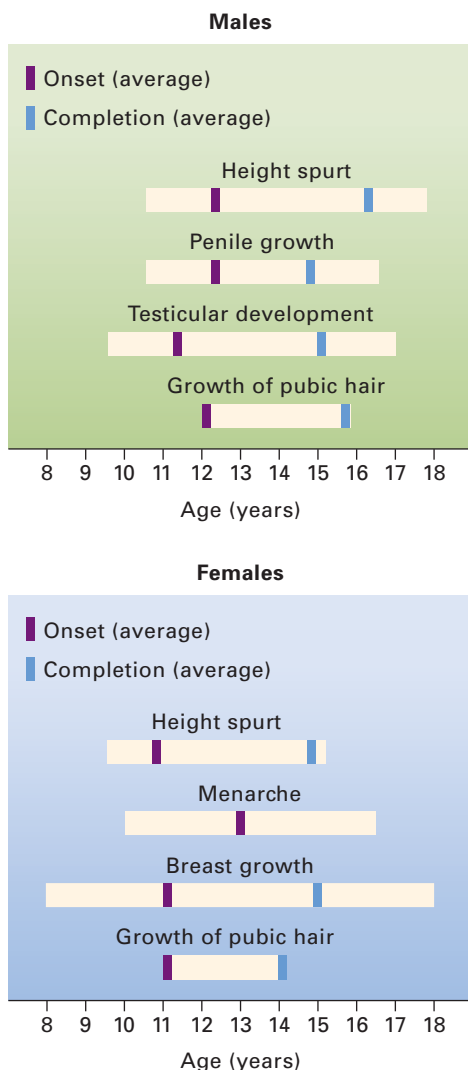


FIGURE 2.5 Normal Range and Average Development of Sexual Characteristics in Males and Females Adapted from "Growing Up" by J. M. Tanner. Copyright © 1973 by Scientific American, Inc. All rights reserved.

Finally, the later growth spurt of boys produces a greater leg length in boys than in girls. In many cases, boys' facial structure becomes more angular during puberty, whereas girls' facial structure becomes rounder and softer.

Sexual Maturation

Think back to the onset of your puberty. Of the striking changes that were taking place in your body, what was the first that occurred? Researchers have found that male pubertal characteristics develop in this order: increased penis and testicle size; appearance of straight pubic hair; minor voice change; first ejaculation (spermarche—this usually occurs through masturbation or a wet dream); appearance of kinky pubic hair; onset of maximum growth; growth of hair in armpits; more detectable voice changes; and growth of facial hair. Three of the most noticeable signs of sexual maturation in boys are penis elongation, testes development, and growth of facial hair. The normal range and average age of development for these sexual characteristics, along with height spurt, are shown in Figure 2.5. Figure 2.6 illustrates the typical course of male sexual development during puberty. The five numbers in these figures reflect the five stages of secondary sexual characteristics known as the Tanner stages (Tanner, 1962).

What is the order of appearance of physical changes in females? First, either the breasts enlarge or pubic hair appears. Later, hair appears in the armpits. As these changes occur, the female grows in height, and her hips become wider than her shoulders. Her first menstruation (menarche) occurs rather late in the pubertal cycle. Initially, her menstrual cycles may be highly irregular and for the first several years, she might not ovulate every cycle. In some instances, a female does not become fertile until two years after her period begins. No voice changes occur that are comparable to those in pubertal males. By the end of puberty, the female's breasts have become more fully rounded. Two of the most noticeable aspects of female pubertal change are pubic hair and breast development. Figure 2.5 shows the normal range and average development for two of these female sexual characteristics. The figure also provides information about menarche and height gain. Figure 2.6 illustrates the typical course of female sexual development during puberty.

Note that there may be wide individual variations in the onset and progression of puberty. For boys, the pubertal sequence may begin as early as 10 years of age or as late as 13½. It may end as early as 13 years or as late as 17. The normal range is wide enough that given two boys of the same chronological age, one might complete the pubertal sequence before the other one has begun it. For girls, the normal age range for menarche is even wider, between 9 and 15 years of age.

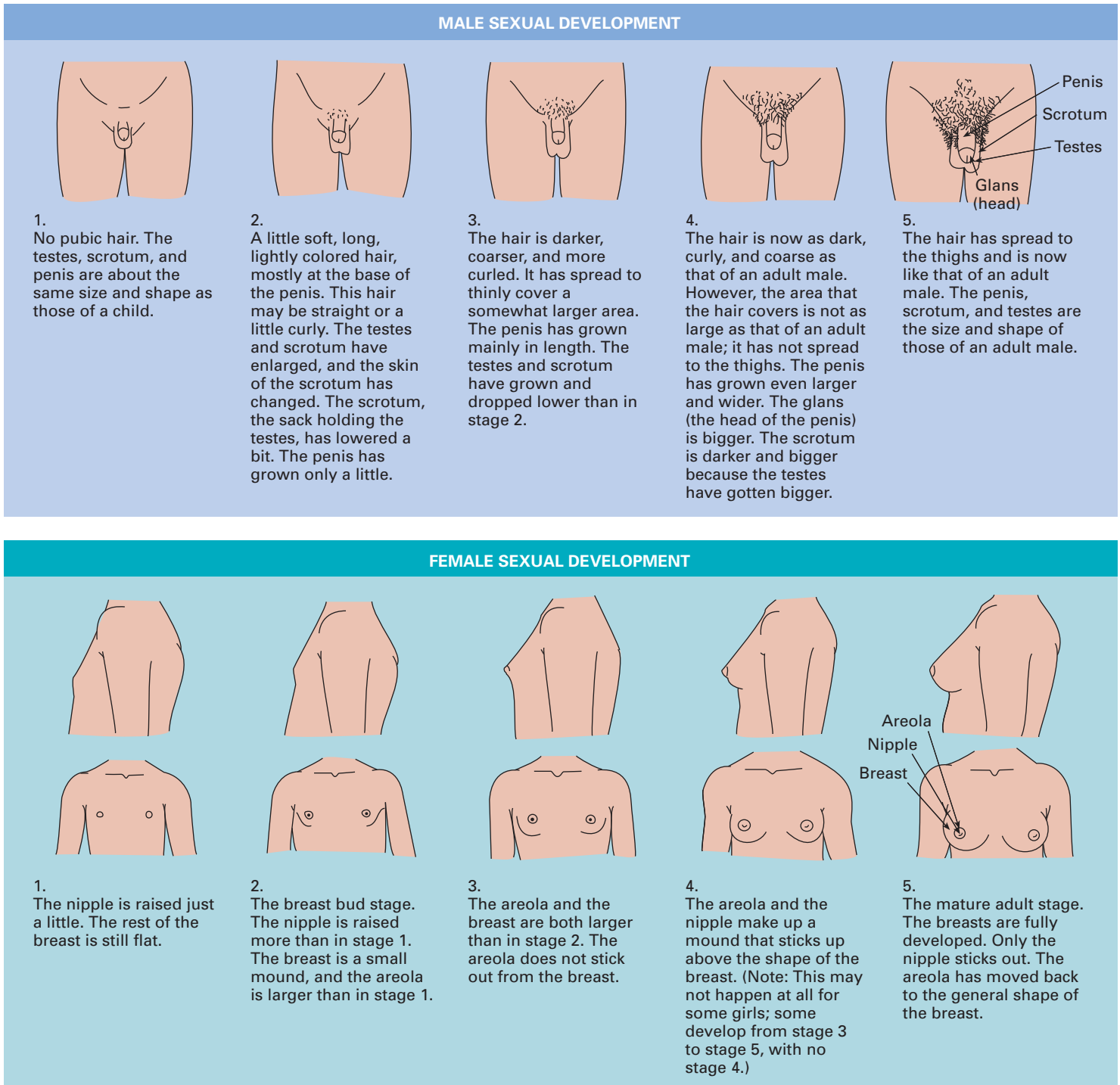


FIGURE 2.6 The Five Pubertal Stages of Male and Female Sexual Development

Secular Trends in Puberty

Imagine a toddler displaying all the features of puberty—a 3-year-old girl with fully developed breasts, or a boy just slightly older, with a deep male voice. That is what we would see by the year 2250 if the age at which puberty arrives continued to drop at the rate at which it occurred for much of the twentieth century. However, we are unlikely to ever see pubescent toddlers because of genetic limits on how early puberty can occur.

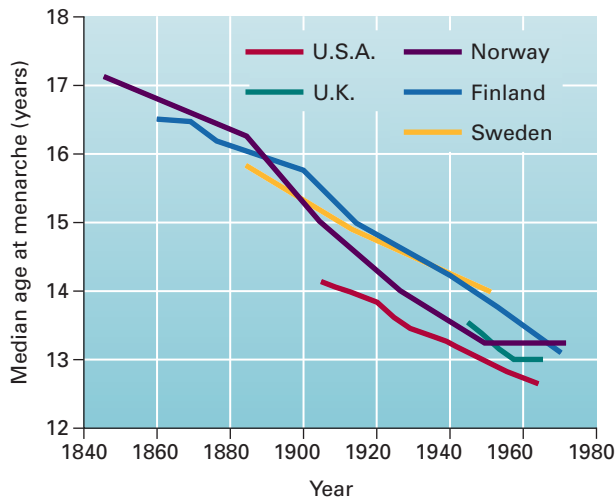


FIGURE 2.7 Median Ages at Menarche in Selected Northern European Countries and the United States from 1845 to 1969 Notice the steep decline in the age at which girls experienced menarche in five different countries. Recently the age at which girls experience menarche has been leveling off.

secular trends Patterns of the onset of puberty over historical time, especially across generations.

Through the Eyes of Adolescents

ATTRACTIVE BLOND FEMALES AND TALL MUSCULAR MALES

When columnist Bob Greene (1988) called Connections in Chicago, a chatline for teenagers, to find out what young adolescents were saying to each other, the first things the boys and girls asked—after first names—were physical descriptions. The idealism of the callers was apparent. Most of the girls described themselves as having long blond hair, being 5 feet 5 inches tall, and weighing 110 pounds. Most of the boys said that they had brown hair, lifted weights, were 6 feet tall, and weighed 170 pounds.

The term **secular trends** refers to patterns of pubertal onset over historical time, especially across generations. For example, in Norway, menarche now occurs at just over 13 years of age, compared with 17 years of age in the 1840s (de Muineck Keizer-Schramm & Mul, 2001; Ong, Ahmed, & Dunger, 2006; Petersen, 1979). In the United States, where children mature physically up to a year earlier than in European countries, menarche now occurs at about 12½ years of age compared with over 14 years of age a century ago (see Figure 2.7). An increasing number of U.S. girls are beginning puberty at 8 and 9 years of age, with African American girls developing earlier than non-Latino white girls (Hermann-Giddens, 2006, 2007; Himes, 2006).

The earlier onset of puberty in the twentieth century was likely due to improved health and nutrition. An increase in obesity also is likely responsible (Biro, Khoury, & Morrison, 2006; Rudra & Williams, 2006).

So far, we have been concerned mainly with the physical dimensions of puberty. As we see next, the psychological dimensions of puberty are also important.

Psychological Dimension of Puberty

A host of psychological changes accompanies an adolescent's pubertal development. Try to remember when you were entering puberty. Not only did you think of yourself differently, but your parents and peers also began treating you differently. Maybe you were proud of your changing body, even though it perplexed you. Perhaps your parents felt they could no longer sit in bed and watch television with you or even kiss you good night.

Far less research has been conducted on the psychosocial aspects of male pubertal transitions than on female pubertal transitions, possibly because of the difficulty in detecting when the male transitions occur. Wet dreams are one marker, yet there has been little research on the topic (Susman & others, 1995).

Body Image One psychological aspect of puberty is certain for both boys and girls: adolescents are preoccupied with their bodies (Nishina & others, 2006; Nollen & others, 2006). In puberty, adolescents develop individual images of their bodies. Perhaps you looked in the mirror on a daily—and sometimes even hourly—basis to see if you could detect anything different in your changing body. Preoccupation with one's body image is strong throughout adolescence, but it is especially acute during puberty.

Gender Differences Gender differences characterize adolescents' perceptions of their bodies. In general, girls are less happy with their bodies and have more negative body images than boys throughout puberty (Bearman & others, 2006; Brooks-Gunn & Paikoff, 1997). As pubertal change proceeds, girls often become more dissatisfied with their bodies, probably because their body fat increases. In contrast, boys become more satisfied as they move through puberty, probably because their muscle mass increases (Bearman & others, 2006). Here is a sampling of recent research on body image in adolescence:

- **Ethnicity.** Although there were more similarities than differences in body image across ethnic groups in early adolescence, in one study, African American girls were more dissatisfied with their body image than girls from other ethnic backgrounds (Nishina & others, 2006). In this study, higher levels of body dissatisfaction were linked to maladjustment in both girls and boys.

A meta-analysis (a statistical analysis that combines the results of many studies) found that during adolescence and college, non-Latino White females had more negative body images than African American females, but during adulthood there were no differences in their body images (Grabe & Hyde, 2006). The researchers concluded that in adolescence, girls are bombarded by media images of tall, thin, non-Latino White women. By the time they are in their late twenties, many of these women may be less likely to compare themselves with media images of tall, thin women. Another revealed that the more TV non-Latino White girls watch, the more their body images subsequently worsen. Watching TV with mainly non-Latino White casts was not linked to African American girls' body images, but when these girls watched TV shows with mainly African American casts, their body images improved (Schooler & others, 2004). Why? Possibly because a wider range of female body sizes and shapes are reflected in the cast of African American females on TV shows.

- *Appearance.* Adolescent males who evaluated their appearance more positively and who said appearance was very important to them were more likely to engage in risky sexy behavior, whereas adolescent females who evaluated their appearance more positively were less likely to engage in risky behavior (Gillen, Lefkowitz, & Shearer, 2006).
- *Developmental changes.* A longitudinal study of 428 boys and girls revealed that girls' body dissatisfaction increased, whereas boys' body dissatisfaction decreased as they went through early adolescence (Bearman & others, 2006). In this study, for both boys and girls, lack of parental support and dietary restraint preceded future increases in body satisfaction.
- *Mental health problems.* A study indicated that 12- to 17-year-old girls who were patients in psychiatric hospitals who had a negative body image were more depressed, anxiety-prone, and suicidal than same-aged patients who were less concerned about their body image (Dyl, Kittler, & Hunt, 2006).
- *Health.* A longitudinal study of more than 2,500 adolescents found that lower body satisfaction placed them at risk for poorer overall health (Neumark-Sztainer & others, 2006).
- *Perceived best and worst aspects of being a boy or a girl.* The negative aspects of puberty for girls appeared in a recent study that explored 400 middle school



Adolescents show a strong preoccupation with their changing bodies and develop images of what their bodies are like. *Why might adolescent males have more positive body images than adolescent females?*

boys' and girls' perceptions of the best and worst aspects of being a boy or a girl (Zittleman, 2006). In the views of the middle school students, at the top of the list of the worst things about being a girl was the biology of being female, which included such matters as childbirth, PMS, periods, and breast cancer. The middle school students said differential discipline (getting into trouble, being disciplined, and being blamed more than girls even when they were not at fault) is the worst thing about being a boy.

However, another aspect of physical development was at the top of the students' list of the best things about being a girl—appearance (which included choosing clothes, hair/styles, and beauty treatments). Students said the best thing about being a boy was playing sports.



Body Art, such as tattoos and body piercing, is increasing in adolescence and emerging adulthood. *Why do youth engage in such body modification?*

Body Art An increasing number of adolescents and college students are obtaining tattoos and getting parts of their body pierced (Armstrong, Caliendo, & Roberts, 2006; Beznos & Coates, 2007; Koch & others, 2005). Many of these youth engage in such body modification to be different, to stamp their identity as unique. In one study of adolescents, 60 percent of the students with tattoos had academic grades of As and Bs (Armstrong, 1995). In this study, the average age at which the adolescents got their first tattoo was 14 years of age. Some studies indicate that tattoos and body piercings are markers for risk taking in adolescence (Carroll & others, 2002; Deschesnes, Fines, & Demers, 2006; Roberts, & Ryan, 2004). A recent study revealed that having multiple body piercings is especially a marker for risk-taking behavior (Suris & others, 2007). However, other researchers argue that body art is increasingly used to express individuality and self-expression rather than rebellion (Armstrong & others, 2004).

A recent study of college students indicated that both students with body art and those without body art reported a positive image for body art (Armstrong & others, 2004). In this study, friends rather than parents provided the main support for body art. Students who had body art said that being unique was important to them.

Hormones and Behavior Are concentrations of hormones linked to adolescent behavior? Hormonal factors are thought to account for at least part of the increase in negative and variable emotions that characterize adolescents (Archibald, Graber, & Brooks-Gunn, 2003; Dorn, Williams, & Ryan, 2002). Researchers have found that in boys higher levels of androgens are associated with violence and acting-out problems (Van Goozen & others, 1998). There is also some indication that increased estrogen levels are linked to depression in adolescent girls (Angold, Costello, & Worthman, 1999). Further, high levels of adrenal androgens are associated with negative affect in girls (Susman & Rogol, 2004). One recent study found that early-maturing girls with high levels of adrenal androgens had higher emotional arousal and depressive affect than other girls (Graber, Brooks-Gunn, & Warren, 2006).

However, hormonal factors alone are not responsible for adolescent behavior (DeRose & Brooks-Gunn, 2006; DeRose, Wright, & Brooks-Gunn, 2006; Graber, Brooks-Gunn, & Warren, 2006). For example, one study found that social factors accounted for two to four times as much variance as hormonal factors in young adolescent girls' depression and anger (Brooks-Gunn & Warren, 1989). Another study found little direct connection between adolescent males' and females' testosterone levels and risk behavior or depression (Booth & others, 2003). In contrast, a link with risk behavior depended on the quality of parent-adolescent relations. When relationship quality decreased, testosterone-linked risk-taking behavior and symptoms of depression increased. And in a recent study, negative life events mediate links between hormones (estradiol and an adrenal hormone) and aggression in 10- to 14-year-old girls (Graber, Brooks-Gunn, & Warren, 2006). Thus, hormones do not function

independently with hormonal activity being influenced by many environmental factors, including parent-adolescent relationships. Stress, eating patterns, sexual activity, and depression can also activate or suppress various aspects of the hormone system (Archibald, Graber, & Brooks-Gunn, 2003).

Menarche and the Menstrual Cycle In most historical accounts of adolescence, the onset of puberty and menarche have been treated as a “main event” (Erikson, 1968; Freud, 1917/1958; Hall, 1904). Basically, the idea is that pubertal changes and events such as menarche produce a different body that requires considerable change in one’s self-conception, possibly resulting in an identity crisis. Only recently has empirical research been directed at understanding the female adolescent’s adaptation to menarche and the menstrual cycle (Brooks-Gunn, Graber, & Paikoff, 1994; El-Khoury & Mellner, 2004; Yeung, So-kum Tang, & Lee, 2005).

One study of 639 girls revealed a wide range of reactions to menarche (Brooks-Gunn & Ruble, 1982). Most were quite mild: girls described their first period as a little upsetting, a little surprising, or a little exciting. In this study, 120 fifth- and sixth-grade girls were telephoned to obtain personal, detailed information about their experience with menarche. The most frequent theme of the responses was positive—namely, that menarche was an index of their maturity. Other positive reports indicated that the girls could now have children, were experiencing something that made them more like adult women, and now were more like their friends. The most frequently reported negatives were the hassle of having to carry around supplies and messiness. A minority of the girls reported physical discomfort, behavioral limitations, and emotional changes.

The researchers asked questions about the extent to which the girls communicated with others about their menarche; the extent to which they were prepared for it; and its relation to early or late maturation. Virtually all the girls told their mothers immediately, but most did not tell anyone else; only one in five informed a friend. After two or three periods, most girls had talked with their girlfriends about menstruation, however. Girls who were not prepared for menarche reported more negative feelings than those who were more prepared for it. In addition, girls who matured early had more negative reactions than average- or late-maturing girls. In sum, menarche may be disruptive at first, especially for unprepared and early-maturing girls, but it typically does not provoke the tumultuous, conflicting reactions described by some early theoreticians.

For many girls, menarche occurs on time, but for others it can come early or late. Next, we examine the effects of early and late maturation on both boys and girls.

Early and Late Maturation Some of you entered puberty early, others late; still others entered on time. When adolescents mature earlier or later than their peers, do they perceive themselves differently? In the Berkeley Longitudinal Study conducted in the middle of the twentieth century, early-maturing boys perceived themselves more positively and had more successful peer relations than their late-maturing counterparts (Jones, 1965). For early-maturing girls, the findings were similar but not as strong as for boys. When the late-maturing boys were studied in their thirties, however, they had developed a stronger sense of identity than the early-maturing boys (Peskin, 1967). Late-maturing boys may have had more time to explore a wide variety of options. They may have focused on how career development and achievement would serve them better in life than the emphasis on physical status by their early-maturing counterparts. However, another study indicated that early maturing boys were more successful and less likely to drink alcohol or smoke cigarettes than late-maturing boys 39 years later in middle adulthood (Taga, Markey, & Friedman, 2006).

Recent research confirms that at least during adolescence, it is advantageous to be an early-maturing rather than a late-maturing boy (Graber, Brooks-Gunn, & Warren, 2006; Petersen, 1987). Roberta Simmons and Dale Blyth (1987) studied more than 450 male and female adolescents for five years, beginning in the sixth grade and

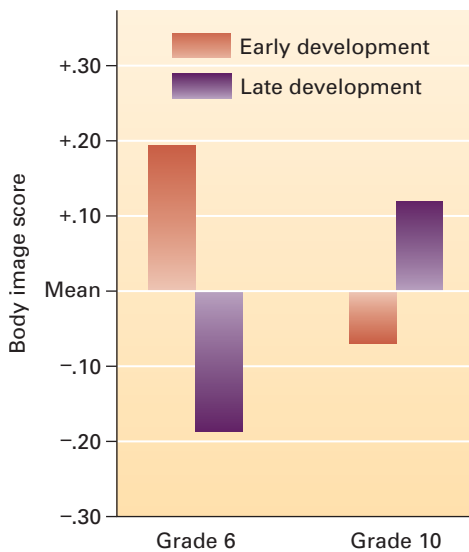
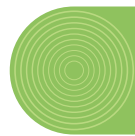


FIGURE 2.8 Early- and Late-Maturing Adolescent Girls' Perceptions of Body Image in Early and Late Adolescence

continuing through the tenth grade, in Milwaukee, Wisconsin. They interviewed students and obtained their achievement test scores and grade point averages. The presence or absence of menstruation and the relative onset of menses were used to classify girls as early, middle, or late maturers. The peak of growth in height was used to classify boys in the same categories.

In the Milwaukee study, more mixed and complex findings emerged for girls (Simmons & Blyth, 1987). Early-maturing girls had more problems in school, were more independent, and were more popular with boys than late-maturing girls were. The time at which maturation was assessed also was a factor. In the sixth grade, early-maturing girls were more satisfied with their body image than late-maturing girls were, but by the tenth grade, late-maturing girls were more satisfied (see Figure 2.8). Why? Because by late adolescence, early-maturing girls are shorter and stockier, while late-maturing girls are taller and thinner. The late-maturing girls in late adolescence have body images that more closely approximate the current American ideal of feminine beauty—tall and thin.

In recent years, an increasing number of researchers have found that early maturation increases girls' vulnerability to a number of problems (Deardorff & others, 2007; Graber, 2007; Graber, Brooks-Gunn, & Warren, 2006; McCabe & Ricciardelli, 2003; Mendle, Turkheimer, & Emery, 2007; Waylen & Wolke, 2004). Early-maturing girls are more likely to smoke, drink, be depressed, have an eating disorder, request earlier independence from their parents, and have older friends; and their bodies are likely to elicit responses from males that lead to earlier dating and earlier sexual experiences. In one study, the early-maturing girls had lower educational and occupational attainment in adulthood (Stattin & Magnusson, 1990). In one study, early-maturing females had a higher incidence of mental disorders than late-maturing females (Graber & others, 2004). Apparently as a result of their social and cognitive immaturity, combined with early physical development, early-maturing girls are easily lured into problem behaviors, not recognizing the possible long-term effects of these on their development. To read further about early and late maturation, see the *Health and Well-Being* interlude.



Health and Well-Being

HEALTH-CARE CONSULTATION FOR EARLY AND LATE MATURERS

What can be done to identify early and late maturers who are at risk for health problems? Adolescents whose development is extremely early or late, such as a boy who has not had a growth spurt by age 16 or a girl who has not menstruated by age 15, are likely to come to the attention of a physician. Girls and boys who are early or late maturers, but are still well within the normal range, are less likely to be seen by a physician. Nonetheless, these boys and girls may have doubts and fears about being normal that they will not raise unless a physician, counselor, or other health-care provider does. A brief discussion of the usual sequence and timing of events, and the large individual variations in them, may be all that is required to reassure many adolescents who are maturing very early or late.

Health-care providers may want to discuss an adolescent's early or late development with parents as well. Information about peer pressures can be helpful, especially the peer pressures to date on early-maturing girls and engage in adultlike behavior. For girls and boys who are in the midst of puberty, the transition to middle school, junior high school, or high school may be more stressful (Wigfield & others, 2006).

If pubertal development is extremely late, a physician may recommend hormonal treatment. This approach may or may not be helpful (Carel, 2006; Richmond & Rogol, 2007; Spiliotis, 2006). In one study of extended pubertal delay in boys, hormonal treatment

helped to increase height, dating interest, and peer relations in several boys but brought little or no improvement in other boys (Lewis, Money, & Bobrow, 1977).

In sum, most early- and late-maturing individuals manage to weather puberty's challenges and stresses. For those who do not, discussions with sensitive and knowledgeable health-care providers and parents can improve the adolescent's coping abilities.

Are Puberty's Effects Exaggerated? Some researchers have begun to question whether puberty's effects are as strong as was once believed. Have the effects of puberty been exaggerated? Puberty affects some adolescents more strongly than others, and some behaviors more strongly than others. Body image, interest in dating, and sexual behavior are quite clearly affected by pubertal change. In one study, early-maturing boys and girls reported more sexual activity and delinquency than late maturers (Flannery, Rowe, & Gulley, 1993). Yet, if we look at overall development and adjustment over the human life span, puberty and its variations have less dramatic effects than is commonly thought for most individuals. For some young adolescents, the path through puberty is stormy, but for most it is not. Each period of the human life span has its stresses and puberty is no different. Although it poses new challenges, the vast majority of adolescents weather the stresses effectively. Besides the biological influences on adolescent development, cognitive and social or environmental influences also shape who we become (Sarigiani & Petersen, 2000; Susman & Rogol, 2004). Singling out biological changes as the dominant influence during adolescence may not be wise.

Although extremely early and late maturation may be risk factors in development, we have seen that the overall effects of early or late maturation often are not great. Not all early maturers will date, smoke, and drink, and not all late maturers will have difficulty in peer relations. In some instances, the effects of an adolescent's grade in school are stronger than maturational timing (Petersen & Crockett, 1985). Because the adolescent's social world is organized by grade rather than physical development, this finding is not surprising. However, that does not mean that age of maturation has no influence on development. Rather, we need to evaluate puberty's effects within the larger framework of interacting biological, cognitive, and socioemotional contexts (Brooks-Gunn, 1992; Sarigiani & Petersen, 2000).

Anne Petersen has made numerous contributions to our understanding of puberty and adolescent development. To read about her work and career, see the *Careers in Adolescent Development* profile.

Careers in ADOLESCENT DEVELOPMENT

Anne Petersen

Researcher and Administrator

Anne Petersen has had a distinguished career as a researcher and administrator with a main focus on adolescent development. Anne obtained three degrees (B.A., M.A., and Ph.D.) from the University of Chicago in math and statistics. Her first job after she obtained her Ph.D. was as a research associate/professor involving statistical consultation, and it was on this job that she was introduced to the field of adolescent development, which became the focus of her subsequent work.

Anne moved from the University of Chicago to Pennsylvania State University, where she became a leading researcher in adolescent development. Her research included a focus on puberty and gender. Anne also has held numerous administrative positions. In the mid-1990s, Anne became deputy director of the National Science Foundation and from 1996 to 2006 was senior vice-president for programs at the W. K. Kellogg Foundation. In 2006, Anne Petersen became the deputy director of the Center for Advanced Study in the Behavioral Sciences at Stanford University and also assumed the position of professor of psychology at Stanford.

Anne says that what inspired her to enter the field of adolescent development and take her current position at the Kellogg Foundation was her desire to make a difference for people, especially youth. In her position at Kellogg, Anne is responsible for all programming and services provided by the foundation for adolescents. Her goal is to make a difference for youth in this country and around the world. She believes that too often adolescents have been neglected.



Anne Petersen, interacting with adolescents.

REVIEW AND REFLECT ◆ LEARNING GOAL 1

1 Discuss the determinants, characteristics, and psychological dimensions of puberty.

Review

- What are puberty's main determinants?
- What characterizes the growth spurt in puberty?
- How does sexual maturation develop in puberty?
- What are some secular trends in puberty?
- What are some important psychological dimensions of puberty?

Reflect

- Think back to when you entered puberty. How strong was your curiosity about the pubertal changes that were taking place? What misconceptions did you have about those changes?

2 HEALTH

Adolescence: A Critical Juncture in Health

Nutrition

Sleep

Emerging Adults' Health

Exercise and Sports

Why might adolescence be a critical juncture in health? What characterizes emerging adults' health? What are some concerns about adolescents' eating habits? How much do adolescents exercise, and what role do sports play in their lives? Do adolescents get enough sleep? These are among the questions we explore in this section.

Adolescence: A Critical Juncture in Health

Adolescence is a critical juncture in the adoption of behaviors that are relevant to health (Neumark-Sztainer & others, 2006; Patton & Viner, 2007; Patton & others, 2006; Shribman, 2007). Many of the behaviors that are linked to poor health habits and early death in adults begin during adolescence. Conversely, the early formation of healthy behavior patterns, such as regular exercise and a preference for foods low in fat and cholesterol, not only has immediate health benefits but helps in adulthood to delay or prevent disability and mortality from heart disease, stroke, diabetes, and cancer (Anderson & others, 2006; Insel & Roth, 2008).

Unfortunately, even though the United States has become a health-conscious nation, many adolescents (and adults) still smoke, have poor nutritional habits, and spend too much of their lives as couch potatoes (Insel & Roth, 2006). Why is this so? In adolescence, many individuals reach a level of health, strength, and energy that they will never match during the remainder of their lives. They also have a sense of uniqueness and invulnerability that convinces them that they will never suffer from poor health, or if they do, they will quickly recover. Given this combination of physical strength and cognitive deception, it is not surprising that many adolescents develop poor health habits.

Many health experts conclude that improving adolescents' health involves far more than taking them to the doctor's office when they are sick. Increasingly, experts recognize that whether or not adolescents develop health problems depends

primarily on their behavior (Foraker & others, 2005; Richer, 2006; Turbin & others, 2006). These experts' goals are to (1) reduce adolescents' *health-compromising behaviors*, such as drug abuse, violence, unprotected sexual intercourse, and dangerous driving; and (2) increase adolescents' *health-enhancing behaviors*, such as exercising, eating nutritiously, wearing seat belts, and getting adequate sleep.

A recent study found these activities, resources, and relationships to promote adolescents' health-enhancing behaviors (Youngblade & Curry, 2006): (1) participation in school-related organized activities, such as sports; (2) availability of positive community resources, such as boys and girls clubs, and volunteering; and (3) and secure attachment to parents. In this study, health-enhancing behavior was assessed by asking adolescents the extent to which they engaged in such behaviors as wearing a seat belt and engaging in physical activities in and out of school.

Risk-Taking Behavior One type of health-compromising behavior that increases in adolescence is risk taking (Baskin-Sommers & Sommers, 2006; Steinberg, 2007; Viner & others, 2006). For example, beginning in early adolescence, individuals

seek experiences that create high intensity feelings. . . . Adolescents *like* intensity, excitement, and arousal. They are drawn to music videos that shock and bombard the senses. Teenagers flock to horror and slasher movies. They dominate queues waiting to ride the high-adrenaline rides at amusement parks. Adolescence is a time when sex, drugs, *very* loud music, and other high-stimulation experiences take on great appeal. It is a developmental period when an appetite for adventure, a predilection for risks, and a desire for novelty and thrills seem to reach naturally high levels. While these patterns of emotional changes are evident to some degree in most adolescents, it is important to acknowledge the wide range of individual differences during this period of development. (Dahl, 2004, p. 6)

Researchers also have found that the more resources there are in the community, such as youth activities and adults as role models, the less likely adolescents are to engage in risky behavior (Jessor, 1998). A recent study found that a higher level of what was labeled *social capital* (in this study, number of schools, number of churches/temples/synagogues, and number of high school diplomas) was linked with lower levels of adolescent risky behavior (in this study, gunshot wounds, pregnancy, alcohol and drug treatment, and sexually transmitted infections) (Youngblade & Curry, 2006). Another recent study revealed that "hanging out" with peers in unstructured



What are some characteristics of adolescents' risk-taking behavior?

contexts was linked with an increase in adolescents' risk-taking behavior (Youngblade & Curry, 2006). Also in this study, risk taking by siblings was related to the likelihood that an adolescent would engage in risk taking. Further, adolescents who had better grades were less likely to engage in risk taking than their counterparts with lower grades.

What can be done to help adolescents satisfy their motivation for risk taking without compromising their health? One strategy is to increase the social capital of a community as was recommended in the study just described (Youngblade & others, 2006). Also, as Laurence Steinberg (2004, p. 58) argues, another strategy is to limit

opportunities for immature judgment to have harmful consequences. . . . Thus, strategies such as raising the price of cigarettes, more vigilantly enforcing laws governing the sale of alcohol, expanding access to mental health and contraceptive services, and raising the driving age would likely be more effective in limiting adolescent smoking, substance abuse, suicide, pregnancy, and automobile fatalities than strategies aimed at making adolescents wiser, less impulsive, and less short-sighted.

It also is important for parents, teachers, mentors, and other responsible adults to effectively monitor adolescents' behavior (Dahl, 2006). In many cases, adults decrease their monitoring of adolescents too early, leaving them to cope with tempting situations alone or with friends and peers (Masten, 2004). When adolescents are in tempting and dangerous situations with minimal adult supervision, their inclination to engage in risk-taking behavior combined with their lack of self-regulatory skills can make them vulnerable to a host of negative outcomes.

Health Services Though adolescents suffer from a greater number of acute health conditions than adults, they see private physicians less often than any other age group (Edelman, 1996). Adolescents also underutilize other health-care systems (Marcell & Halpern-Felsher, 2005). Health services are especially unlikely to meet the needs of younger adolescents, ethnic minority adolescents, and adolescents living in poverty.

In the National Longitudinal Study of Adolescent Health, more than 12,000 adolescents were interviewed about the extent to which they needed but did not receive health care (Ford, Bearman, & Moody, 1999). Approximately 19 percent of those interviewed reported forgoing health care in the preceding year. Among those who especially needed health care but did not seek it were adolescents who smoked cigarettes on a daily basis, drank alcohol frequently, and engaged in sexual intercourse.

Of special concern is the decrease in use of health services by older adolescent males (Wilson, Pritchard, & Revalee, 2005). A national study in the United States found that 16- to 20-year-old males have significantly less contact with health-care services than 11- to 15-year-old males (Marcell & others, 2002). In contrast, 16- to 20-year-old females have more contact with health-care services than younger females.

Among the chief barriers to better health care for adolescents are cost, poor organization and availability of health services, lack of confidentiality, and reluctance on the part of health-care providers to communicate with adolescents about sensitive health issues. Few health-care providers receive any special training in working with adolescents. Many say they feel unprepared to provide services such as contraceptive counseling or to evaluate what constitutes abnormal behavior in adolescents (Irwin, 1993). Health-care providers may transmit to their patients their discomfort in discussing topics such as sexuality and drugs, causing adolescents to avoid discussing sensitive issues with them (Marcell & Millstein, 2001). In one study, parents of urban adolescents reported that they want health-care providers to talk with their adolescents about sensitive health issues such as sexually transmitted infections, contraception, drug use, depression, nutrition, and



What is the pattern of adolescent's use of health services?

stress (Cohall & others, 2004). However, the health-care providers rarely communicated with adolescents about these issues.

Leading Causes of Death Medical improvements have increased the life expectancy of today’s adolescents and emerging adults compared with their counterparts in the early twentieth century. Still, life-threatening factors do exist in adolescents’ and emerging adults’ lives.

The three leading causes of death in adolescence and emerging adults are unintentional injuries, homicide, and suicide (National Center for Health Statistics, 2005). More than half of all deaths from 15 to 24 years of age are due to unintentional injuries, approximately three-fourths of them involving motor vehicles. Risky driving habits, such as speeding, tailgating, and driving under the influence of alcohol or other drugs, may be more important contributors to these accidents than lack of driving experience. In about 50 percent of motor vehicle fatalities involving adolescents, the driver has a blood alcohol level of 0.10 percent—twice the level needed to be designated as “under the influence” in some states. A high rate of intoxication is also found in adolescents who die as pedestrians, or while using recreational vehicles.

Homicide also is another leading cause of death in adolescence and emerging adults, especially among African American males, who are three times more likely to be killed by guns than by natural causes. Suicide is the third leading cause of death in adolescence and emerging adulthood. Since the 1950s, the adolescent and emerging adult suicide rate has tripled, although it has declined in recent years (Rueter & Kwon, 2005). We further discuss suicide in adolescence and emerging adulthood in Chapter 13, “Problems in Adolescence and Emerging Adulthood.”

Emerging adults have more than twice the mortality rate of adolescents (Park & others, 2006) (see Figure 2.9). As indicated in Figure 2.9, males are mainly responsible for the higher mortality rate of emerging adults.

Emerging Adults’ Health

Although emerging adults have a higher death rate than adolescents, emerging adults have few chronic health problems, and they have fewer colds and respiratory problems than when they were children (Rimsza & Kirk, 2005). Most college students know what it takes to prevent illness and promote health. In one study, college students’ ranking of health-protective activities—nutrition, sleep, exercise, watching one’s weight, and so on—virtually matched that of licensed nurses (Turk, Rudy, & Salovey, 1984).

Although most college students know what it takes to prevent illness and promote health, they don’t fare very well when it comes to applying this information to themselves (Lenz, 2004). In one study, college students reported that they probably would never have a heart attack or drinking problem, but that other college students would (Weinstein, 1984). The college students also said there was no relation between their risk of heart attack and how much they exercise, smoke, or eat meat or other high-cholesterol food such as eggs, even though they correctly recognized that factors such as family history influence risk. Many college students, it seems, have unrealistic, overly optimistic beliefs about their future health risks.

Few emerging adults stop to think about how their personal lifestyles will affect their health later in their adult lives (Sakamaki & others, 2005). As emerging adults, many of us develop a pattern of not eating breakfast, not eating regular meals, and relying on snacks as our main food source during the day, eating excessively to the point where we exceed the normal weight for our age, smoking moderately or excessively, drinking moderately or excessively, failing to exercise, and getting by with only a few hours of sleep at night (Cousineau, Goldstein, & Franco, 2005).



A makeshift memorial for Mehlville High School student Megan Landholt, stands on Lemay Ferry Road in South St. Louis County, MO, Friday, March 7, 2003. Car crashes resulting in eight teenage deaths in south S. Louis County in the past year and a half led police to hold a meeting at Oakville Senior High School Friday to talk about ways to reduce fatalities.

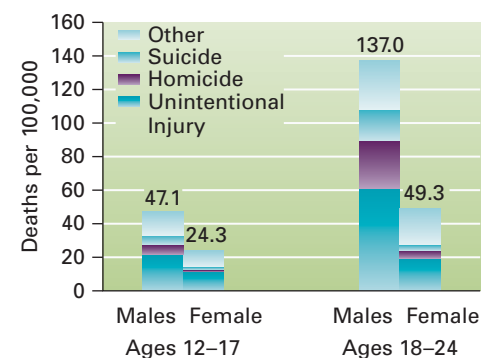


FIGURE 2.9 Mortality Rates of U.S. Adolescents and Emerging Adults

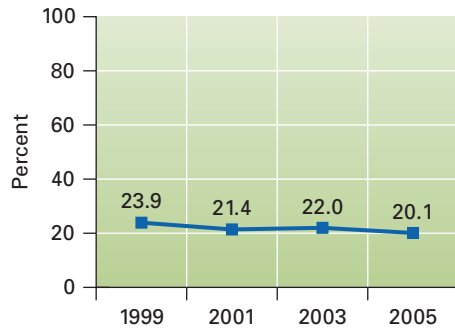


FIGURE 2.10 Percentage of U.S. High School Students Who Ate Fruits and Vegetables Five or More Times a Day, 1999 to 2005

Note: The slide shows the percentage of high school students over time who had eaten fruits and vegetables (100% fruit juice, fruit, green salad, potatoes—excluding french fries, fried potatoes, or potato chips—carrots, or other vegetables) five or more times per day during the seven days preceding the National Youth Risk Survey (2005).

These lifestyles are associated with poor health (Belloc & Breslow, 1972; Krahn & others, 2005; Rimsza & Moses, 2005). In the Berkeley Longitudinal Study—in which individuals were evaluated over a period of 40 years—physical health at age 30 predicted life satisfaction at age 70, more so for men than for women (Mussen, Honzik, & Eichorn, 1982).

There are some hidden dangers in the peaks of performance and health in early adulthood. Young adults can draw on physical resources for a great deal of pleasure, often bouncing back easily from physical stress and abuse. However, this can lead them to push their bodies too far. The negative effects of abusing one's body might not show up in emerging adulthood, but they probably will surface later in early adulthood or in middle adulthood (Csikszentmihalyi & Rathunde, 1998; Rathunde & Csikszentmihalyi, 2006).

Nutrition

Nutrition is an important aspect of health-compromising and health-enhancing behaviors. The eating habits of many adolescents are health-compromising, and an increasing number of adolescents have an eating disorder (Casazza & Ciccazzo, 2006; Stevenson & others, 2007).

Concern is often expressed over adolescents' tendency to eat between meals. However, their choice of foods is much more important than the time or place of eating. Fresh vegetables and fruits as well as whole-grain products are needed to complement the foods adolescents commonly choose, which tend to be high in protein and energy value. U.S. adolescents are decreasing their intake of fruits and vegetables. The National Youth Risk Survey found that U.S. high school students decreased their intake of fruits and vegetables from 1999 through 2005 (MMWR, 2006) (see Figure 2.10).

A special concern in American culture is the amount of fat in our diet (Brom, 2006; Sizer & Whitney, 2006). Many of today's adolescents virtually live on fast-food meals, which contributes to the high fat levels in their diet (Ebbeling & others, 2004). One study found that from the late 1970s through the late 1990s, U.S. children, adolescents, and adults increasingly ate away from home and when they ate, they were more likely to consume salty snacks, soft drinks, and pizza (Nielssen, Siega-Riz, & Popkin, 2002).

We have much more to say about nutrition in Chapter 13, "Problems in Adolescence and Emerging Adulthood." There we examine three eating disorders: obesity, anorexia, and bulimia nervosa.

Exercise and Sports

Do American adolescents and emerging adults get enough exercise? How extensive is the role of sports in their lives? The answers to these questions have an impact on their health.

Exercise Researchers have found that individuals become less active as they reach and progress through adolescence (Hills, King, & Armstrong, 2007; Merrick & others, 2005; Pate & others, 2007). A recent study of more than 3,000 U.S. adolescents found that 34 percent were in the lowest fitness category (Carnethon, Gulati, & Greenland, 2005). Also, the National Youth Risk Survey revealed that in 2005 only 36 percent of adolescents had engaged in physical activity that made their heart and breathing rates difficult for at least 60 minutes a day on five or more of the seven days (currently recommended level of exercise) preceding the survey (MMWR, 2006). Boys attained this recommended level of exercise more than girls (44 percent versus 28 percent). Ten percent of the adolescents did not engage in even moderate exercise. A recent research study also revealed that



What are some characteristics of adolescents' exercise patterns?

physical fitness in adolescence was linked to physical fitness in adulthood (Mikkelsen & others, 2006). In this study, distance running in adolescence was most predictive for adult fitness in males, whereas sit-ups were the most predictive for females.

Researchers have found that exercise in adolescence has declined in recent years and that it also declines from early through late adolescence. In 1987, 31 percent of 12- to 17-year-olds said they exercised frequently, a figure that declined to only 18 percent in 2001 (American Sports Data, 2001). In a recent study, physical activity declined from 12 to 17 years of age (Duncan & others, 2007). In this study, having physically active friends was linked to higher physical activity levels for adolescents.

Ethnic differences in exercise participation rates are noteworthy, and they reflect the trend of decreasing exercise from early through late adolescence. A recent study found that Latino and African American 7- to 14-year-olds had lower aerobic fitness levels than their non-Latino White counterparts (Shaibi, Ball, & Goran, 2006). Also, as indicated in Figure 2.11, in the National Youth Risk Survey, non-Latino White boys exercised the most, African American girls the least (MMWR, 2006). Another study revealed that physical activity declined more in African American than non-Latino White girls as they went through adolescence (Kimm & Obarzanek, 2002).

Low levels of exercise by adolescents not only appears in general exercise data but also in participation in physical education (PE) classes (Dwyer & others, 2006). Participation in PE classes was especially low for African American and Latino adolescents. Adolescents are less likely to take a PE class in high school than in middle school (MMWR, 2006). The percentage of high school students who take a daily physical education class decreased from 42 percent in 1991 to 33 percent in 2005 (MMWR, 2006).

Do U.S. adolescents exercise less than their counterparts in other countries? A comparison of adolescents in 28 countries found that U.S. adolescents exercised less and ate more junk food than adolescents in most of the other countries (World Health Organization, 2000). Just two-thirds of U.S. adolescents exercised at least twice a week compared with 80 percent or more of adolescents in Ireland, Austria, Germany, and the Slovak Republic. U.S. adolescents were more likely to eat fried food and less likely to eat fruits and vegetables than adolescents in most other countries studied. U.S. adolescents' eating choices were similar to those of adolescents in England.

Some health experts blame television for the poor physical condition of American adolescents. One study found that adolescents who watched little television were much more physically fit than those who watched heavily (Tucker, 1987). The more television adolescents watch, the more likely they are to be overweight. No one is sure whether their obesity results from spending their leisure time in front of a television set or from eating the junk food they see advertised on television. It may be that less physically fit youth simply find physical activity less reinforcing than watching television.

Some of the blame for the poor physical condition of U.S. children and adolescents falls on U.S. schools, many of which fail to provide physical education class on a daily basis (Buck & others, 2007). One extensive investigation of physical education classes at four different schools revealed how little vigorous exercise takes place in these classes (Parcel & others, 1987). Boys and girls moved through space only 50 percent of the time they were in the classes and moved continuously an average of only 2.2 minutes. More recent research confirms just how little adolescents exercise when they are in physical education classes (Cawley, Meyerhoefer, & Newhouse, 2006). In sum, not only does the adolescent's school week include inadequate physical education, but the majority of adolescents do not exercise vigorously even when they are in physical education. Furthermore, while much is made of the exercise revolution among adults, most children and adolescents report that

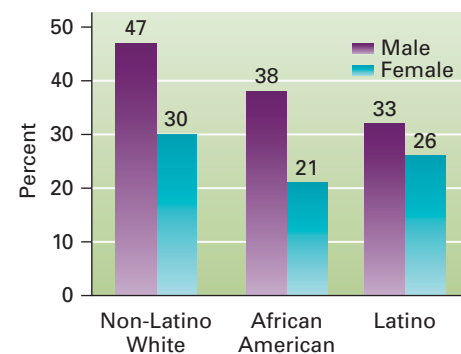


FIGURE 2.11 Exercise Rates of U.S. High School Students: Gender and Ethnicity

Note: Data are for high school students who were physically active doing any kind of physical activity that increased their heart rate and made them breathe hard some of the time for a total of at least 60 minutes per day on five or more of the seven days preceding the survey.



What roles might schools play in improving the exercise habits of adolescents?

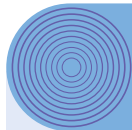
their parents are poor role models when it comes to vigorous physical exercise (Feist & Brannon, 1989).

Does pushing children and adolescents to exercise more vigorously in school make a difference? In one study, sedentary adolescent females were assigned to one of two groups: (1) a special physical education class that met five times a week with about 40 minutes of activity (aerobic dance, basketball, swimming, or Tae Bo) a day for four of the five days and a lecture/discussion on the importance of physical activity and ways to become more physically active on the fifth day; or (2) a control group that did not take a physical education class (Jamner & others, 2004). After four months, the participants in the physical education class had improved their cardiovascular fitness and lifestyle activity (such as walking instead of taking the stairs and walking instead of driving short distances). Other research studies have found positive benefits for programs designed to improve the physical fitness of students (Timperio, Salmon, & Ball, 2004; Veugelers & Fitzgerald, 2005).

An exciting possibility is that physical exercise might act as a buffer against the stress adolescents experience and improve their mental health and life satisfaction (Dishman & others, 2006). Consider these studies that support this possibility:

- In one investigation of 364 girls in grades 7 through 11, the negative impact of stressful events on girls' health declined as their exercise levels rose (Brown & Siegel, 1988).
- In another investigation, adolescents who exercised regularly coped more effectively with stress and had more positive identities than adolescents who engaged in little exercise (Grimes & Mattimore, 1989).
- In another study, high school seniors who exercised frequently had higher grade point averages, used drugs less frequently, were less depressed, and got along better with their parents than those who rarely exercised (Field, Diego, & Sanders, 2001).
- And in a study of almost 5,000 adolescents, a low level of exercise and not participating on sports teams were linked with reduced life satisfaction (Valois & others, 2004).

In the fourth century B.C., Aristotle commented that the quality of life is determined by its activities. Today, we know that exercise is one of the principal activities that improves the quality of life, both in adolescence and adulthood (Asbury, Chandruangphen, & Collins, 2006; Cleland & others, 2005).



Through the Eyes of Adolescents

IN PITIFUL SHAPE

A lot of kids in my class are in pitiful physical shape. They never exercise, except in gym class, and even then they hardly break a sweat. During lunch hour, I see some of the same loafers hanging out and smoking a bunch of cigarettes. Don't they know what they are doing to their bodies? All I can say is that I'm glad I'm not like them. I'm on the basketball team, and during the season, the coach runs us until we are exhausted. In the summer, I still play basketball and swim often. I don't know what I would do without exercise. I couldn't stand to be out of shape.

—Brian, age 14

Sports Sports play an important role in the lives of many adolescents (Beets & Pitetti, 2005; Stubbe, Boomsma, & De Geus, 2005). Some estimates indicate that as many as 40 to 70 percent of American youth participate in various organized sports (Ferguson, 1999).

Sports can have both positive and negative influences on adolescent development (Endresen & Olweus, 2005). Many sports activities can improve adolescents' physical health and well-being, self-confidence, motivation to excel, and ability to work with others (Cornock, Bowker, & Gadbois, 2001). Adolescents who spend considerable time in sports are less likely than others to engage in risk-taking behaviors, such as taking drugs. Three recent studies confirmed the positive benefits of organized sports for adolescents:

- Adolescents who participated in sports were less likely to engage in such risk-taking activities as truancy, cigarette smoking, sexual intercourse, and delinquency than non-sports participants (Nelson & Gordon-Larsen, 2006).

- Adolescents who participated in sports were 40 percent less likely to end up in a negative peer group and 40 percent less likely to be depressed than their counterparts who did not participate in sports; the sports participants also had a 26 percent greater likelihood of being in a positive peer group, a 25 percent greater probability of being in the high self-esteem group, and a 53 percent greater likelihood of being in the high connectedness to school group (Simpkins & others, 2006).
- Eleventh-grade students who participated in organized sports were more likely to be successful academically and less likely to take drugs than their counterparts who did not participate in organized sports (Fredricks & Eccles, 2006).

The downside of the extensive participation in sports by American adolescents includes pressure by parents and coaches to win at all costs. Researchers have found that adolescents' participation in competitive sports is linked with competition anxiety and self-centeredness (Smith & Smoll, 1997). Furthermore, some adolescents spend so much time in sports that their academic skills suffer. Increasingly, adolescents are pushing their bodies beyond their capabilities, stretching the duration, intensity, and frequency of their training to the point that they cause overuse injuries (Brenner & the American Academy of Pediatrics Council on Sports Medicine and Fitness, 2007; DiFiori, 2006; Patel & Baker, 2006). Another problem that has surfaced is the use of performance-enhancing drugs, such as steroids, by adolescent athletes (Elliot & others, 2007; vandenBerg & others, 2007).

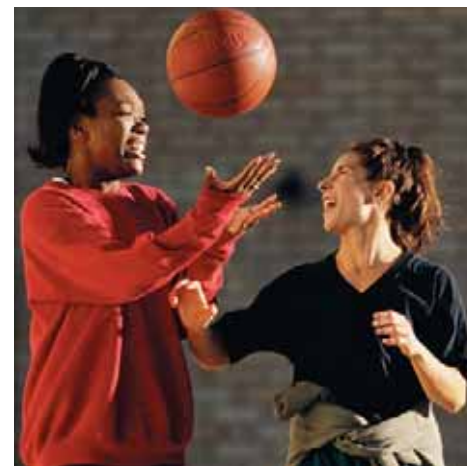
Some of the problems adolescents experience in sports involve their coaches. Many youth coaches create a performance-oriented motivational climate that is focused on winning, public recognition, and performance relative to others. But other coaches place more emphasis on mastery motivation that focuses adolescents' attention on the development of their skills and self-determined standards of success. Researchers have found that athletes who have a mastery focus are more likely than others to see the benefits of practice, to persist in the face of difficulty, and to show significant skill development over the course of a season (Roberts, Treasure, & Kavussanu, 1997).

A final topic involving sports that needs to be examined is the **female athlete triad**, which involves a combination of disordered eating (weight loss), amenorrhea (absent or irregular menstrual periods), and osteoporosis (thinning and weakening of bones) (Beals & Meyer, 2007; Stafford, 2005). Once menstrual periods have become somewhat regular in adolescent girls, not having a menstrual period for more than three or four months can reduce bone strength. Fatigue and stress fractures may develop. The female athlete triad often goes unnoticed (Birch, 2005). Recent research studies suggest that the incidence of the female athlete triad is low but that a significant number of female adolescents and college students have one of the characteristics of the disorder, such as disordered eating or osteoporosis (Beals & Hill, 2006; DiPietro & Stachenfeld, 2006; Nichols & others, 2006).

Sleep

Might changing sleep patterns in adolescence contribute to adolescents' health-compromising behaviors? Recently there has been a surge of interest in adolescent sleep patterns (Carskadon, 2005, 2006; Carskadon, Mindell, & Drake, 2006; Chen, Wang, & Yeng, 2006; Dahl, 2006; Fuligni & Hardway, 2006; Yang & others, 2005).

The National Sleep Foundation (2006) conducted a U.S. survey of 1,602 caregivers and their 11- to 17-year-olds. Forty-five percent of the adolescents got inadequate sleep on school nights (less than eight hours). Older adolescents (ninth- to twelfth-graders) got markedly less sleep on school nights than younger adolescents (sixth- to eighth-graders)—62 percent of the older adolescents got inadequate sleep compared to 21 percent of the younger adolescents. Adolescents who got inadequate sleep (8 hours or less) on school nights were more likely to feel more tired or sleepy, more cranky and irritable, fall asleep in school, be in a depressed mood, and drink



What are some positive and negative aspects of sports participation in adolescence?

female athlete triad A combination of disordered eating, amenorrhea, and osteoporosis that may develop in female adolescents and college students.



In Mary Carskadon's sleep laboratory at Brown University, an adolescent girl's brain activity is being monitored. Carskadon (2005) says that in the morning, sleep-deprived adolescents' "brains are telling them it's night time . . . and the rest of the world is saying it's time to go to school" (p. 19).

caffeinated beverages than their counterparts who got optimal sleep (nine or more hours). Another recent study of more than 600 13- to 18-year-old boys and girls found that 54 percent said they regularly got less than six to eight hours of sleep a night on school nights (Chen, Wang, & Jeng, 2006). In this study, getting less than 6 to 8 hours of sleep per night during adolescence was linked to lower levels of exercise, less effective stress management, and adopting an unhealthy diet. In another recent study of 750 14- to 15-year-olds, getting less sleep at night was linked to higher levels of anxiety, depression, and fatigue the next day (Fuligni & Hardway, 2006).

Many adolescents stay up later at night and sleep longer in the morning than they did when they were children, and this changing timetable has physiological underpinnings (Yang & others, 2005). These findings have implications for the hours during which adolescents learn most effectively in school (Carskadon, Mindell, & Drake, 2006; Hansen & others, 2005).

Mary Carskadon and her colleagues (2002, 2004, 2005, 2006; Carskadon, Acebo, & Jenni, 2004; Carskadon, Mindell, & Drake, 2006) have conducted a number of research studies on adolescent sleep patterns. They found that when given the opportunity adolescents will sleep an average of nine hours and 25 minutes a night. Most get considerably less than nine hours of sleep, especially during the week. This shortfall creates a sleep deficit, which adolescents often attempt to make up on the weekend. The researchers also found that older adolescents tend to be more sleepy during the day than younger adolescents. They theorized that this sleepiness was not due to academic work or social pressures. Rather, their research suggests that adolescents' biological clocks undergo a shift as they get older, delaying their period of wakefulness by about one hour. A delay in the nightly release of the sleep-inducing hormone melatonin, which is produced in the brain's pineal gland, seems to underlie this shift. Melatonin is secreted at about 9:30 p.m. in younger adolescents and approximately an hour later in older adolescents.

Carskadon has suggested that early school starting times may cause grogginess, inattention in class, and poor performance on tests. Based on her research, school officials in Edina, Minnesota, decided to start classes at 8:30 a.m. rather than the usual 7:25 a.m. Since then there have been fewer referrals for discipline problems, and the number of students who report being ill or depressed has decreased. The school system reports that test scores have improved for high school students, but not for middle school students. This finding supports Carskadon's suspicion that early start times are likely to be more stressful for older than for younger adolescents.

REVIEW AND REFLECT ◆ LEARNING GOAL 2

2 Summarize the nature of adolescents' and emerging adults' health.

Review

- Why is adolescence a critical juncture in health? How extensive is risk taking in adolescence? How good are adolescents at using health services? What are the leading causes of death in adolescence?
- What characterizes emerging adults' health?
- What are some concerns about adolescents' eating habits?
- What roles do exercise and sports play in adolescents' lives?
- What are some concerns about adolescent sleep patterns?

Reflect

- What were your health habits like from the time you entered puberty to the time you completed high school? Describe your health-compromising and health-enhancing behaviors during this time. Since high school, have you reduced your health-compromising behaviors? Explain.

3 EVOLUTION, HEREDITY, AND ENVIRONMENT

The Evolutionary Perspective

The Genetic Process

Heredity-Environment
Interaction

The size and complexity of the adolescent's brain emerged over the long course of evolution. Let's explore the evolutionary perspective on adolescent development and then examine how heredity and environment interact to influence adolescent development.

The Evolutionary Perspective

In terms of evolutionary time, humans are relative newcomers to the earth. If we think of the broad expanse of time as a calendar year, then humans arrived on earth in the last moments of December (Sagan, 1977). As our earliest ancestors left the forest to feed on the savannahs, and finally to form hunting societies on the open plains, their minds and behaviors changed. How did this evolution come about?

Natural Selection and Adaptive Behavior *Natural selection* is the evolutionary process that favors those individuals of a species who are best adapted to survive and reproduce. To understand natural selection, let's return to the middle of the nineteenth century, when the British naturalist Charles Darwin was traveling the world, observing many different species of animals in their natural habitats. In his groundbreaking book, *On the Origin of Species* (1859), Darwin noted that most species reproduce at rates that would cause enormous increases in their population and yet populations remained nearly constant. He reasoned that an intense struggle for food, water, and resources must occur among the many young born in each generation, because many of them do not survive. Darwin believed that those who do survive to reproduce and pass on their genes to the next generation are probably superior to others in a number of ways. In other words, the survivors are better adapted to their world than the nonsurvivors (Johnson, 2008; Mader, 2007). Over the course of many generations, Darwin reasoned, organisms with the characteristics needed for survival would compose a larger and larger percentage of the population, producing a gradual modification of the species. If environmental conditions changed, however, other characteristics might be favored by natural selection, moving the evolutionary process in a different direction.

To understand the role of evolution in behavior, we need to understand the concept of adaptive behavior (Enger, 2007). In evolutionary conceptions of psychology, **adaptive behavior** is a modification of behavior that promotes an organism's survival in the natural habitat (Finn, 2006). All organisms must adapt to particular places, climates, food sources, and ways of life in order to survive. In humans, attachment ensures an infant's closeness to the caregiver for feeding and protection from danger. This behavioral characteristic promotes survival just as an eagle's claw, which facilitates predation, ensures the eagle's survival.

Evolutionary Psychology Although Darwin introduced the theory of evolution by natural selection in 1859, his ideas only recently have been used to explain behavior. The field of **evolutionary psychology** emphasizes the importance of adaptation, reproduction, and "survival of the fittest" in explaining behavior. Because evolution favors organisms that are best adapted to survive and reproduce in a particular environment, evolutionary psychology focuses on the conditions that allow individuals to survive or perish. In this view, the process of natural selection favors those behaviors that increase organisms' reproductive success and their ability to pass their genes on to the next generation (Freeman & Herron, 2007; Rose & Mueller, 2006).

adaptive behavior A modification of behavior that promotes an organism's survival in the natural habitat.

evolutionary psychology An approach that emphasizes the importance of adaptation, reproduction, and "survival of the fittest" in explaining behavior.

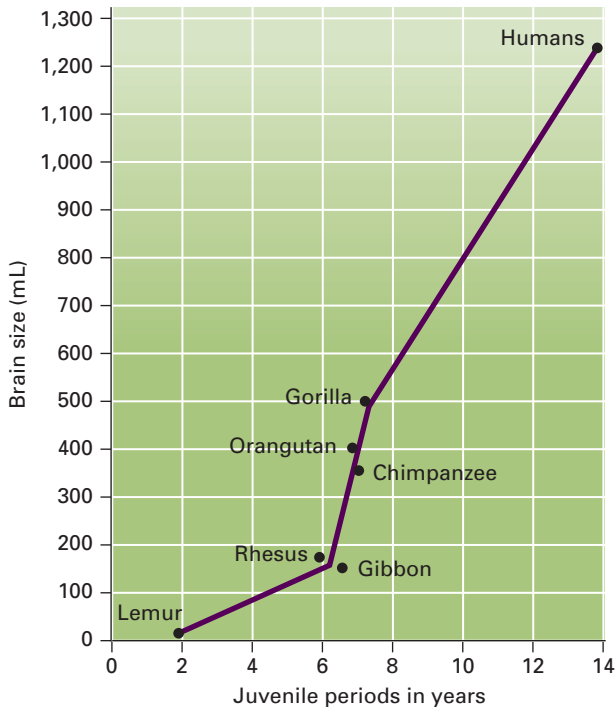


FIGURE 2.12 The Brain Sizes of Various Primates and Humans in Relation to the Length of the Juvenile Period

David Buss' (1995, 1999, 2000, 2004, 2008; Larsen & Buss, 2005) ideas on evolutionary psychology have produced a wave of interest in how evolution can explain human behavior. Buss argues that just as evolution shapes our physical features, such as our body shape and height, it also influences our decision making, our aggressive behavior, our fears, and our mating patterns.

Evolutionary Developmental Psychology Recently, interest has grown in using the concepts of evolutionary psychology to understand human development (Bjorklund, 2006, 2007; Geary, 2006). Here are a few ideas proposed by evolutionary developmental psychologists (Bjorklund & Pellegrini, 2002, pp. 336–340):

- *An extended juvenile period evolved because humans require time to develop a large brain and learn the complexity of human social communities.* Humans take longer to become reproductively mature than any other mammal (see Figure 2.12). During this juvenile period, they develop a large brain and the experiences required for mastering the complexities of human society such as reading, writing, math skills, and communicating effectively with other humans.
- *Many evolved psychological mechanisms are domain-specific.* That is, the mechanisms apply only to a specific aspect of a person's makeup. According to evolutionary psychology, information processing is one example. In this view, the mind is not a general-purpose device that can be applied equally to a vast array of problems.

Instead, as our ancestors dealt with certain recurring problems, specialized modules evolved that process information related to those problems, such as a module for physical knowledge, a module for mathematical knowledge, and a module for language. In Chapter 3, “The Brain and Cognitive Development,” we examine the issue of whether intelligence is a general ability or consists of a number of specific intelligences.

- *Evolved mechanisms are not always adaptive in contemporary society.* Some behaviors that were adaptive for our prehistoric ancestors may not serve us well today. For example, the food-scarce environment of our ancestors likely led to humans' propensity to gorge when food is available and to crave high-calorie foods, a trait that that might lead to an epidemic of obesity when food is plentiful.

Evaluating Evolutionary Psychology Albert Bandura (1998), whose social cognitive theory was described in Chapter 1, has criticized the “biologizing” of psychology. Bandura acknowledges the influence of evolution on human adaptation and change. However, he rejects what he calls “one-sided evolutionism,” in which social behavior is seen as the product of evolved biology. Bandura stresses that evolutionary pressures favored biological adaptations that encouraged the use of tools, allowing humans to manipulate, alter, and construct new environmental conditions. In time, humans' increasingly complex environmental innovations produced new pressures that favored the evolution of specialized brain systems to support consciousness, thought, and language.

In other words, evolution gave humans body structures and biological potentialities, not behavioral dictates. Having evolved our advanced biological capacities, we can use them to produce diverse cultures—aggressive or pacific, egalitarian or autocratic. As American scientist Stephen Jay Gould (1981) concluded, in most domains, human biology allows a broad range of cultural possibilities. The sheer pace of social change, Bandura (1998) notes, underscores the range of possibilities biology permits.

chromosomes Threadlike structures that contain deoxyribonucleic acid, or DNA.

DNA A complex molecule that contains genetic information.

genes The units of hereditary information, which are short segments composed of DNA.

The Genetic Process

Every species has a mechanism for transmitting characteristics from one generation to the next. This mechanism is explained by the principles of genetics (Hartwell, 2008). Each of us carries a “genetic code” that we inherited from our parents, and it is a distinctly human code. Because it carries this human code, a fertilized human egg cannot grow into an egret, eagle, or elephant.

Each of us began life as a single cell weighing about one twenty-millionth of an ounce! This tiny piece of matter housed our entire genetic code—instructions that orchestrated growth from that single cell to a person made of trillions of cells, each containing a perfect replica of the original genetic code. That code is carried by our genes. What are they and what do they do?

DNA and the Collaborative Gene The nucleus of each human cell contains **chromosomes**, which are threadlike structures that contain the remarkable substance deoxyribonucleic acid, or DNA. **DNA** is a complex molecule that contains genetic information. It has a double helix shape, like a spiral staircase. **Genes**, the units of hereditary information, are short segments composed of DNA, as you can see in Figure 2.13. They direct cells to reproduce themselves and to assemble proteins. Proteins, in turn, serve as the building blocks of cells, as well as the regulators that direct the body’s processes (Hartwell, 2008; Nester & others, 2007).

Each gene has its own function, and each gene has its own location, its own designated place on a particular chromosome. Today, there is a great deal of enthusiasm about efforts to discover the specific locations of genes that are linked to certain functions (Lewis, 2007; Weaver, 2008). An important step in this direction was accomplished when the Human Genome Project and the Celera Corporation completed a preliminary map of the human *genome*—the complete set of instructions for making a human organism (U.S. Department of Energy, 2001).

One of the big surprises of the Human Genome Project was a report indicating that humans have only about 30,000 genes (U.S. Department of Energy, 2001). More recently, the number of human genes has been revised further downward to the exacting figure of 21,774 (Ensembl Human, 2007). Scientists had thought that humans had as many as 100,000 or more genes. They had also believed that each gene programmed just one protein. In fact, humans appear to have far more proteins than they have genes, so there cannot be a one-to-one correspondence between them (Commoner, 2002; Moore, 2001). Each segment of DNA is not translated, in automation-like fashion, into one and only one protein. It does not act independently, as developmental psychologist David Moore (2001) emphasized by titling his book *The Dependent Gene*.

Rather than being an independent source of developmental information, DNA collaborates with other sources of information to specify our characteristics. The collaboration operates at many points. Small pieces of DNA are mixed, matched, and linked by the cellular machinery. That machinery is sensitive to its context—that is, it is influenced by what is going on around it. Whether a gene is turned “on,” working to assemble proteins, is also a matter of collaboration. The activity of genes (*genetic expression*) is affected by their environment (Gottlieb, 2007). For example, hormones that circulate in the blood make their way into the cell where they can turn genes “on” and “off.” And the flow of hormones can be affected by environmental conditions, such as light, day length, nutrition, and behavior. Numerous studies have shown that external events outside of the cell and the person, and internal events inside of the cell, can excite or inhibit gene expression (Gottlieb, Wahlsten, & Lickliter, 2006). For example, one recent study revealed that an increase in the concentration of stress hormones such as cortisol produced a five-fold increase in DNA damage (Flint & others, 2007).

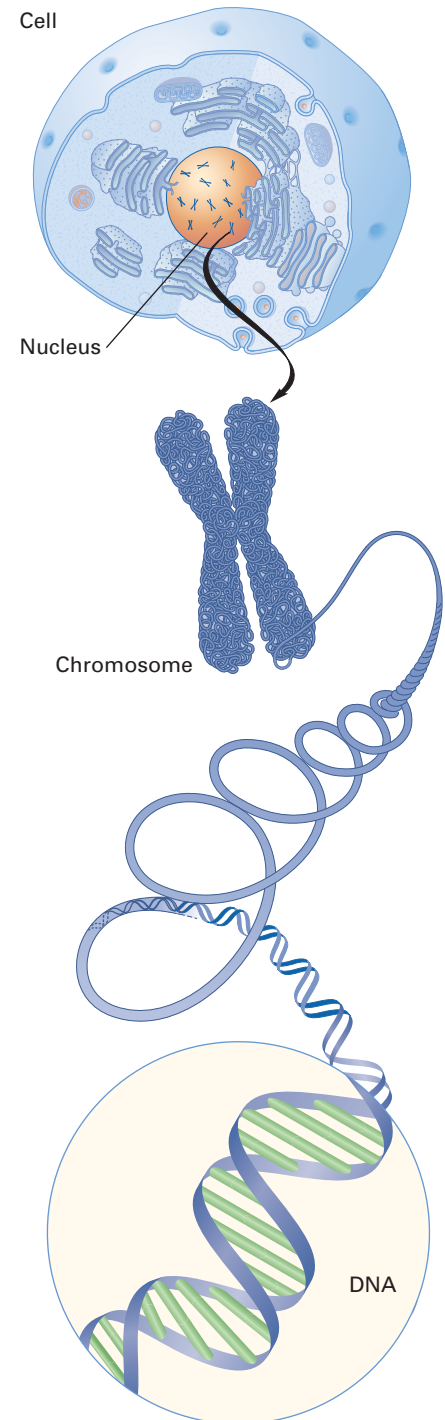
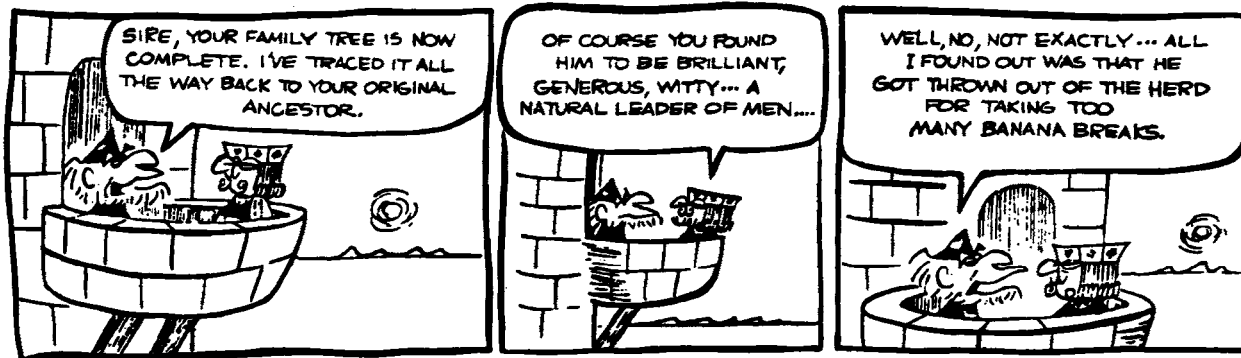


FIGURE 2.13 Cells, Chromosomes, Genes, and DNA (Left) The body contains trillions of cells, which are the basic structural units of life. Each cell contains a central structure, the nucleus. (Middle) Chromosomes and genes are located in the nucleus of the cell. Chromosomes are made up of threadlike structures composed of DNA molecules. (Right) A gene, a segment of DNA that contains the hereditary code. The structure of DNA is a spiraled double chain.

THE WIZARD OF ID



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In short, a single gene is rarely the source of a protein's genetic information, much less of an inherited trait (Gottlieb, 2007; Moore, 2001). Rather than being a group of independent genes, the human genome consists of many collaborative genes.

Genotype and Phenotype No one possesses all the characteristics that his or her genetic structure makes possible. A person's genetic heritage—the actual genetic material—is called a **genotype**. Not all of this genetic material is apparent in our observed and measurable characteristics. The way an individual's genotype is expressed in observed and measurable characteristics is called a **phenotype**. Phenotypes include physical traits, such as height, weight, eye color, and skin pigmentation, as well as psychological characteristics, such as intelligence, creativity, personality, and social tendencies.

For each genotype, a range of phenotypes can be expressed (Brooker & others, 2008; Talaro, 2008). Imagine that we could identify all the genes that would make an adolescent introverted or extraverted. Could we predict measured introversion or extraversion in a particular person from our knowledge of those genes? The answer is no, because even if our genetic model was adequate, introversion and extraversion are characteristics that are shaped by experience throughout life. For example, a parent might push an introverted child into social situations, encouraging the child to become more gregarious. Or the parent might support the child's preference for solitary play.

Heredity-Environment Interaction

So far, we have described genes and how they work, and one theme is apparent: heredity and environment interact to produce development (Gottlieb, Wahlsten, & Lickliter, 2006; Kagan & Fox, 2006). Whether we are studying how genes produce proteins or their influence on how tall a person is, we end up discussing heredity-environment interactions. Is it possible, though, to untangle the influence of heredity from that of environment and discover the role of each in producing individual differences in development? When heredity and environment interact, how does heredity influence the environment, and vice versa?

genotype A person's genetic heritage; the actual genetic material.

phenotype The way an individual's genotype is expressed in observed and measurable characteristics.

behavior genetics The field that seeks to discover the influence of heredity and environment on individual differences in human traits and development.

Behavior Genetics **Behavior genetics** is the field that seeks to discover the influence of heredity and environment on individual differences in human traits and development (Plomin, DeFries, & Fulker, 2007; Gelhorn & others, 2006). If you think about all of the people you know, you have probably realized that people differ in terms of their level of introversion/extraversion. What behavior geneticists

try to do is to figure out what is responsible for those differences—that is, to what extent do people differ because of differences in genes, environment, or a combination of these?

To study the influence of heredity on behavior, behavior geneticists often use either twins or adoption situations. In the most common **twin study**, the behavioral similarity of identical twins is compared with the behavioral similarity of fraternal twins. *Identical twins* (called monozygotic twins) develop from a single fertilized egg that splits into two genetically identical replicas, each of which becomes a person. *Fraternal twins* (called dizygotic twins) develop from separate eggs and separate sperm, making them genetically no more similar than ordinary siblings. Although fraternal twins share the same womb, they are no more alike genetically than are nontwin brothers and sisters, and they may be of different sexes.

By comparing groups of identical and fraternal twins, behavior geneticists capitalize on the basic knowledge that identical twins are more similar genetically than are fraternal twins (Bishop & others, 2006; Whitfield & others, 2007). In one twin study, the extraversion and neuroticism (psychological instability) of 7,000 pairs of Finnish identical and fraternal twins were compared (Rose & others, 1988). On both of these personality traits, the identical twins were much more similar than the fraternal twins were, suggesting an important role for heredity in both traits. However, several issues complicate interpretation of twin studies (Derks, Dolan, & Boomsma, 2006). For example, perhaps the environments of identical twins are more similar than the environments of fraternal twins. Adults might stress the similarities of identical twins more than those of fraternal twins, and identical twins might perceive themselves as a “set” and play together more than fraternal twins do. If so, observed similarities in identical twins could be more strongly influenced by the environment than the results suggested.

In an **adoption study**, investigators seek to discover whether the behavior and psychological characteristics of adopted children are more like those of their adoptive parents, who have provided a home environment, or more like those of their biological parents, who have contributed their heredity (Haugaard & Hazen, 2004; Loehlin, Horn, & Ernst, 2007). Another form of the adoption study involves comparing adoptive and biological siblings.

Heredity-Environment Correlations The difficulties that researchers encounter when they interpret the results of twin studies and adoption studies reflect the complexities of heredity-environment interaction. Some of these interactions are *heredity-environment correlations*, which means that individuals’ genes influence the types of environments to which they are exposed. In a sense, individuals “inherit” environments that are related or linked to genetic propensities (Plomin & McGuffin, 2002). Behavior geneticist Sandra Scarr (1993) described three ways that heredity and environment are correlated (see Figure 2.14):

- **Passive genotype-environment correlations** occur because biological parents, who are genetically related to the child, provide a rearing environment for the child. For example, the parents might have a genetic predisposition to be intelligent and read skillfully. Because they read well and enjoy reading, they provide their children with books to read. The likely outcome is that their children, given their own inherited predispositions from their parents, will become skilled readers.
- **Evocative genotype-environment correlations** occur because an adolescent’s genetically shaped characteristics elicit certain types of physical and social environments. For example, active, smiling children receive more social stimulation than passive, quiet children do. Cooperative, attentive adolescents evoke more pleasant and instructional responses from the adults around them than uncooperative, distractible adolescents do. Athletically inclined youth tend to elicit encouragement to engage in school sports. As a consequence,



What is the nature of the twin study method?

twin study A study in which the behavioral similarity of identical twins is compared with the behavioral similarity of fraternal twins.

adoption study A study in which investigators seek to discover whether the behavior and psychological characteristics of adopted children are more like their adoptive parents, who have provided a home environment, or more like those of their biological parents, who have contributed their heredity. Another form of adoption study involves comparing adoptive and biological siblings.

passive genotype-environment correlations Correlations that occur because biological parents, who are genetically related to the child, provide a rearing environment for the child.

evocative genotype-environment correlations Correlations that occur because an adolescent’s genetically shaped characteristics elicit certain types of physical and social environments.

Heredity-Environment Correlation	Description	Examples
Passive	Children inherit genetic tendencies from their parents and parents also provide an environment that matches their own genetic tendencies.	Musically inclined parents usually have musically inclined children and they are likely to provide an environment rich in music for their children.
Evocative	The child's genetic tendencies elicit stimulation from the environment that supports a particular trait. Thus genes evoke environmental support.	A happy, outgoing child elicits smiles and friendly responses from others.
Active (niche-picking)	Children actively seek out "niches" in their environment that reflect their own interests and talents and are thus in accord with their genotype.	Libraries, sports fields, and a store with musical instruments are examples of environmental niches children might seek out if they have intellectual interests in books, talent in sports, or musical talents, respectively.

FIGURE 2.14 Exploring Heredity-Environment Correlations

these adolescents tend to be the ones who try out for sport teams and go on to participate in athletically oriented activities.

- **Active (niche-picking) genotype-environment correlations** occur when children seek out environments that they find compatible and stimulating. *Niche-picking* refers to finding a setting that is suited to one's abilities. Adolescents select from their surrounding environment some aspect that they respond to, learn about, or ignore. Their active selections of environments are related to their particular genotype. For example, attractive adolescents tend to seek out attractive peers. Adolescents who are musically inclined are likely to select musical environments in which they can successfully perform their skills.

Scarr concludes that the relative importance of the three genotype-environment correlations changes as children develop from infancy through adolescence. In infancy, much of the environment that children experience is provided by adults. Thus, passive genotype-environment correlations are more common in the lives of infants and young children than they are for older children and adolescents who can extend their experiences beyond the family's influence and create their environments to a greater degree.

Critics argue that the concept of heredity-environment correlation gives heredity too much influence in determining development (Gottlieb, 2004). Heredity-environment correlation stresses that heredity determines the types of environments children experience. Next, we examine a view that emphasizes the importance of the nonshared environment of siblings and their heredity as important influences on their development.

Shared and Nonshared Environmental Experiences Behavior geneticists emphasize that another way of analyzing the environment's role in heredity-environment interaction is to consider experiences that adolescents share in common with other adolescents living in the same home, as well as experiences that are not shared (Bricker & others, 2006; Young & others, 2006).

Shared environmental experiences are siblings' common experiences, such as their parents' personalities or intellectual orientation, the family's socioeconomic status, and the neighborhood in which they live. By contrast, **nonshared environmental experiences** are an adolescent's unique experiences, both within the family and outside the family; these are not shared with a sibling. Even experiences occurring within the family can be part of the "nonshared environment." For example, parents often interact differently with each sibling, and siblings interact differently with parents (Hetherington, Reiss, & Plomin, 1994; Reiss & others, 2000). Siblings

active (niche-picking) genotype-environment correlations Correlations that occur when children seek out environments that they find compatible and stimulating.

shared environmental experiences Siblings' common experiences such as their parents' personalities and intellectual orientation, the family's socioeconomic status, and the neighborhood in which they live.

nonshared environmental experiences The adolescent's own unique experiences, both within a family and outside the family, that are not shared by a sibling.

often have different peer groups, different friends, and different teachers at school.

Behavior geneticist Robert Plomin (1993) has found that common rearing, or shared environment, accounts for little of the variation in adolescents' personality or interests. In other words, even though two adolescents live under the same roof with the same parents, their personalities are often very different. Further, behavior geneticists argue that heredity influences the nonshared environments of siblings in the manner we described earlier in the concept of heredity-environment correlations (Plomin & others, 2001). For example, an adolescent who has inherited a genetic tendency to be athletic is likely to spend more time in environments related to sports, whereas an adolescent who has inherited a tendency to be musically inclined is more likely to spend time in environments related to music.

The Epigenetic View The heredity-environment correlation view emphasizes how heredity directs the kind of environmental experiences individuals have. However, earlier we described how DNA is collaborative, not determining an individual's traits in an independent matter, but rather in an interactive manner with the environment. In line with the concept of a collaborative gene, the **epigenetic view** emphasizes that development is the result of an ongoing, bidirectional interchange between heredity and the environment (Gottlieb, 2004, 2007; Gottlieb, Wahlsten, & Lickliter, 2006). Figure 2.15 compares the heredity-environment correlation and epigenetic views of development.

Conclusions About Heredity-Environment Interaction Heredity and environment operate together—or cooperate—to produce a person's intelligence, temperament, height, weight, ability to pitch a baseball, ability to read, and so on (Gottlieb, Wahlsten, & Lickliter, 2006). If an attractive, popular, intelligent girl is elected president of her senior class in high school, is her success due to heredity or to environment? Of course, the answer is both.

The relative contributions of heredity and environment are not additive. That is, we can't say that such-and-such a percentage of nature and such-and-such a percentage of experience make us who we are. Nor is it accurate to say that full genetic expression happens once, around conception or birth, after which we carry our genetic legacy into the world to see how far it takes us. Genes produce proteins throughout the life span, in many different environments. Or they don't produce these proteins, depending in part on how harsh or nourishing those environments are.

The emerging view is that many complex behaviors likely have some *genetic loading* that gives people a propensity for a particular developmental trajectory (Maes & others, 2006; Plomin, DeFries, & Fulker, 2007). However, the actual development requires more: an environment. And that environment is complex, just like the mixture of genes we inherit (Grusec & Hastings, 2007; Maccoby, 2007). Environmental influences range from the things we lump together under "nurture" (such as parenting, family dynamics, schooling, and neighborhood quality) to biological encounters (such as viruses, birth complications, and even biological events in cells) (Greenough, 1997, 1999; Greenough & others, 2001).

Imagine for a moment that there is a cluster of genes somehow associated with youth violence (this example is hypothetical because we don't know of any such combination). The adolescent who carries this genetic mixture might experience a world of loving parents, regular nutritious meals, lots of books, and a series of masterful teachers. Or the adolescent's world might include parental neglect, a



Tennis stars Venus and Serena Williams. What might be some shared and nonshared environmental experiences they had while they were growing up that contributed to their tennis stardom?

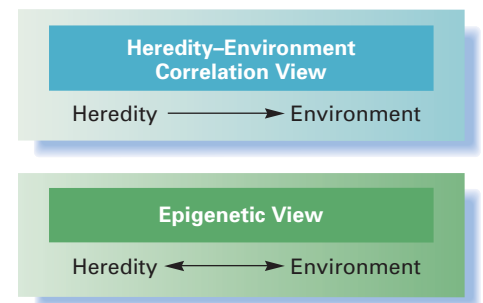


FIGURE 2.15 Comparison of the Heredity-Environment Correlation and Epigenetic Views

epigenetic view Emphasizes that development is the result of an ongoing bidirectional interchange between heredity and environment.

The interaction of heredity and environment is so extensive that to ask which is more important, nature or nurture, is like asking which is more important to a rectangle, height or width.

—WILLIAM GREENOUGH
Contemporary Psychologist, University of Illinois

neighborhood in which gunshots and crime are everyday occurrences, and inadequate schooling. In which of these environments are the adolescent's genes likely to manufacture the biological underpinnings of criminality?

A controversy erupted when Judith Harris (1998) published *The Nurture Assumption*. In this provocative book, she argued that what parents do does not make a difference in their children's and adolescents' behavior. Yell at them. Hug them. Read to them. Ignore them. Harris says it won't influence how they turn out. She argues that genes and peers are far more important than parents in children's and adolescents' development.

Genes and peers do matter, but Harris' descriptions of peer influences do not take into account the complexity of peer contexts and developmental trajectories (Hartup, 1999). In addition, Harris is wrong in saying that parents don't matter. For example, in the early child years parents play an important role in selecting children's peers and indirectly influencing children's development (Baumrind, 1999). Many research studies document the importance of parents in children's and adolescents' development (Collins & Steinberg, 2006; Parke & Buriel, 2006). We discuss parents' important roles throughout this book.

REVIEW AND REFLECT ◆ LEARNING GOAL 3

3 Explain the contributions of evolution, heredity, and environment to adolescent development.

Review

- What role has evolution played in adolescent development? How do the fields of evolutionary psychology and evolutionary developmental psychology describe evolution's contribution to understanding adolescence?
- What is the genetic process?
- What is the nature of heredity–environment interaction?

Reflect

- Someone tells you that she has analyzed her genetic background and environmental experiences and reached the conclusion that environment definitely has had little influence on her intelligence. What would you say to this person about her ability to make this self-diagnosis?

REACH YOUR LEARNING GOALS

1 PUBERTY *Discuss the determinants, characteristics, and psychological dimensions of puberty.*

Determinants of Puberty

Puberty is a period of rapid physical maturation involving hormonal and bodily changes that take place primarily in early adolescence. Puberty's determinants include heredity, hormones, and possibly weight, percentage of body fat, and leptin. Two classes of hormones that are involved in pubertal change and have significantly different concentrations in males and females are androgens and estrogens. The endocrine system's role in puberty involves the interaction of the hypothalamus, pituitary gland, and gonads. FSH and LH, which are secreted by the pituitary gland, are important aspects of this system. So is GnRH, which is produced by the hypothalamus. The sex hormone system is a negative feedback system. Growth hormone also contributes to pubertal change. Low birth weight and rapid weight gain in infancy are linked to earlier pubertal onset. Puberty has two phases: adrenarche and gonadarche. The culmination of gonadarche in boys is spermarche; in girls, it is menarche.

Growth Spurt

The onset of pubertal growth occurs on the average at 9 years of age for girls and 11 years for boys. The peak of pubertal change for girls is 11½ years; for boys it is 13½ years. Girls grow an average of 3½ inches per year during puberty; boys grow an average of 4 inches.

Sexual Maturation

Sexual maturation is a key feature of pubertal change. Individual variation in puberty is extensive and is considered to be normal within a wide age range.

Secular Trends in Puberty

Secular trends in puberty took place in the twentieth century with puberty coming earlier. Recently, there has been a slowdown in how early puberty occurs.

Psychological Dimensions of Puberty

Adolescents show heightened interest in their bodies and body images. Younger adolescents are more preoccupied with these images than older adolescents. Adolescent girls often have a more negative body image than adolescent boys. Adolescents and college students increasingly have tattoos and body piercings (body art). Some scholars conclude that body art is a sign of rebellion and is linked to risk taking, whereas others argue that increasingly body art is used to express uniqueness and self-expression rather than rebellion. Researchers have found connections between hormonal change during puberty and behavior, but environmental influences need to be taken into account. Menarche and the menstrual cycle produce a wide range of reactions in girls. Early maturation often favors boys, at least during early adolescence, but as adults, late-maturing boys have a more positive identity than early-maturing boys. Early-maturing girls are at risk for a number of developmental problems. Some scholars doubt that puberty's effects on development are as strong as once envisioned. Most early- and late-maturing adolescents weather the challenges of puberty successfully. For those who do not adapt well to pubertal changes, discussions with knowledgeable health-care providers and parents can improve the coping abilities of off-time adolescents. Puberty has important influences on development, but the significance of these influences needs to be considered in terms of the entire life span. Some scholars argue that too much emphasis has been given to the biological changes of puberty.

2 HEALTH *Summarize the nature of adolescents' and emerging adults' health.*

Adolescence: A Critical Juncture in Health

Many of the behaviors that are linked to poor health habits and early death in adults begin during adolescence. Engaging in healthy behavior patterns in adolescence, such as regular exercise, helps to delay disease in adulthood. Important goals are to reduce adolescents' health-compromising behaviors and increase their health-enhancing behaviors. Risk-taking behavior increases during adolescence and combined with a delay in developing self-regulation makes adolescents vulnerable to a number of problems. Among the strategies for keeping this increased motivation for risk taking from compromising adolescents' health are to limit their opportunities for harm and monitor their behavior. Adolescents underutilize health services. The three leading causes of death in adolescence are (1) accidents, (2) homicide, and (3) suicide.

Emerging Adults' Health

Although emerging adults have a higher death rate than adolescents, emerging adults have few chronic health problems. However, many emerging adults don't stop to think about how their personal lifestyles will affect their health later in their lives.

Nutrition

Special nutrition concerns in adolescence are eating between meals, the amount of fat in adolescents' diets, and increased reliance on fast-food meals.

Exercise and Sports

Recent research studies show that U.S. adolescents are getting less exercise today and are less likely to take a physical education class than their counterparts in the 1980s. African American girls especially have a low rate of exercise. A high rate of watching TV is associated with a low level of exercise. Special physical education programs in schools can improve students' physical fitness. Physical exercise in adolescence is linked with more effective coping with stress, better grades, lower depression, and higher life satisfaction. Sports play an important role in the lives of many adolescents. Sports can have positive (improve physical health and well-being, confidence, ability to work with others) or negative (intense pressure by parents and coaches to win at all costs, injuries) outcomes. Recently, the female athlete triad has become a concern.

Sleep

Adolescents like to go to bed later and get up later than children do. This may be linked to developmental changes in the brain. A special concern is the extent to which these changes in sleep patterns in adolescents affect academic behavior and achievement.

3 EVOLUTION, HEREDITY, AND ENVIRONMENT *Explain the contributions of evolution, heredity, and environment to adolescent development.*

The Evolutionary Perspective

Natural selection—the process that favors the individuals of a species that are best adapted to survive and reproduce—is a key aspect of the evolutionary perspective. Evolutionary psychology is the view that adaptation, reproduction, and “survival of the fittest” are important in explaining behavior. Evolutionary developmental psychology has promoted a number of ideas, including the view that an extended “juvenile” period is needed to develop a large brain and learn the complexity of human social communities. Critics argue that the evolutionary perspective does not give adequate attention to experience and humans as a culture-making species.

The Genetic Process

The nucleus of each human cell contains chromosomes, which contain DNA. Genes are short segments of DNA that direct cells to reproduce and manufacture proteins that maintain life. DNA does not act independently to produce a trait or behavior. Rather, it acts collaboratively. Genotype refers to the unique configuration of genes, whereas phenotype involves observed and measurable characteristics.

Heredity-Environment Interaction

Behavior genetics is the field concerned with the degree and nature of behavior’s hereditary basis. Methods used by behavior geneticists include twin studies and adoption studies. In Scarr’s heredity-environment correlations view, heredity directs the types of environments that children experience. She describes three genotype-environment correlations: passive, evocative, and active (niche-picking). Scarr argues that the relative importance of these three genotype-environment correlations changes as children develop. Shared environmental experiences refer to siblings’ common experiences, such as their parents’ personalities and intellectual orientation, the family’s socioeconomic status, and the neighborhood in which they live. Nonshared environmental experiences involve the adolescent’s unique experiences, both within a family and outside a family, that are not shared with a sibling. Many behavior geneticists argue that differences in the development of siblings are due to nonshared environmental experiences (and heredity) rather than shared environmental experiences. The epigenetic view emphasizes that development is the result of an ongoing, bidirectional interchange between heredity and environment. Many complex behaviors have some genetic loading that gives people a propensity for a particular developmental trajectory. However, actual development also requires an environment, and that environment is complex. The interaction of heredity and environment is extensive. Much remains to be discovered about the specific ways that heredity and environment interact to influence development.

KEY TERMS

- | | | | |
|-------------------------|----------------------------|---|--|
| puberty 54 | adaptive behavior 77 | adoption study 81 | shared environmental experiences 82 |
| hormones 55 | evolutionary psychology 77 | passive genotype-environment correlations 81 | nonshared environmental experiences 82 |
| androgens 55 | chromosomes 78 | evocative genotype-environment correlations 81 | epigenetic view 83 |
| estrogens 55 | DNA 78 | active (niche-picking) genotype-environment correlations 82 | |
| adrenarche 57 | genes 78 | | |
| gonadarche 57 | genotype 80 | | |
| menarche 57 | phenotype 80 | | |
| spermarche 57 | behavior | | |
| secular trends 62 | genetics 80 | | |
| female athlete triad 75 | twin study 81 | | |

KEY PEOPLE

- | | | | |
|-----------------------------------|------------------------------------|-------------------------------------|-------------------------------------|
| Roberta Simmons and Dale Blyth 65 | Mary Carskadon 76
David Buss 78 | Albert Bandura 78
David Moore 79 | Sandra Scarr 81
Robert Plomin 83 |
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RESOURCES FOR IMPROVING THE LIVES OF ADOLESCENTS

The Society for Adolescent Medicine

www.adolescenthealth.com

This organization is a valuable source of information about competent physicians who specialize in treating adolescents. It maintains a list of recommended adolescent specialists across the United States. The society also publishes the *Journal of Adolescent Health*, which contains articles on a wide range of health-related and medical issues involving adolescents.

Journal of School Health www.blackwellpublishing.com

This journal publishes articles that pertain to the school-related aspects of children's and adolescents' health, including a number of health education programs.

E-LEARNING TOOLS

To help you master the material in this chapter, visit the Online Learning Center for *Adolescence*, twelfth edition (www.mhhe.com/santrocka12), where you will find these additional resources:

Taking It to the Net

1. A friend believes her younger sister is entering puberty much earlier than is “normal” and asks for your opinion. You tell your friend about the secular trend (puberty occurring at an earlier age across generations). Your friend asks what causes this. Which theory do you think best explains the secular trend and why?
2. Adolescents do not fall asleep until later than children, and most adolescents need more sleep than they are getting. There are significant negative consequences of sleep deprivation for adolescents. What can be done to solve this problem?
3. Research suggests that career choice is due to a variety of interacting factors. Your parents think you picked your current career plans just to spite them. You disagree. How can each of the three ways that heredity and environment

interact (passive, evocative, and active) influence career choices of adolescents?

Self-Assessment

The Online Learning Center includes the following self-assessments for further exploration:

- Is My Lifestyle Good for My Health?
- My Health Habits
- Do I Get Enough Sleep?

Health and Well-Being, Parenting, and Education

To practice your decision-making skills, complete the health and well-being, parenting, and education exercises on the Online Learning Center.

Video Clips

The Online Learning Center includes the following video for this chapter:

- Girls' Views on Body Image