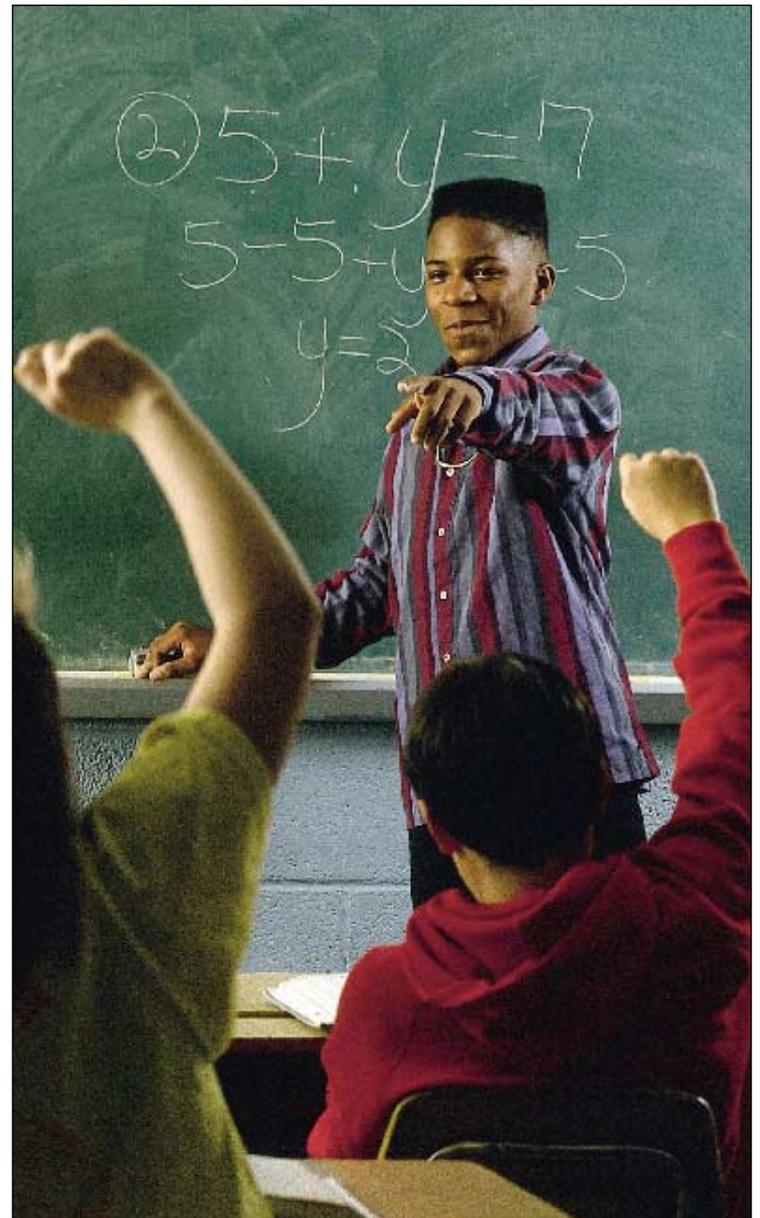


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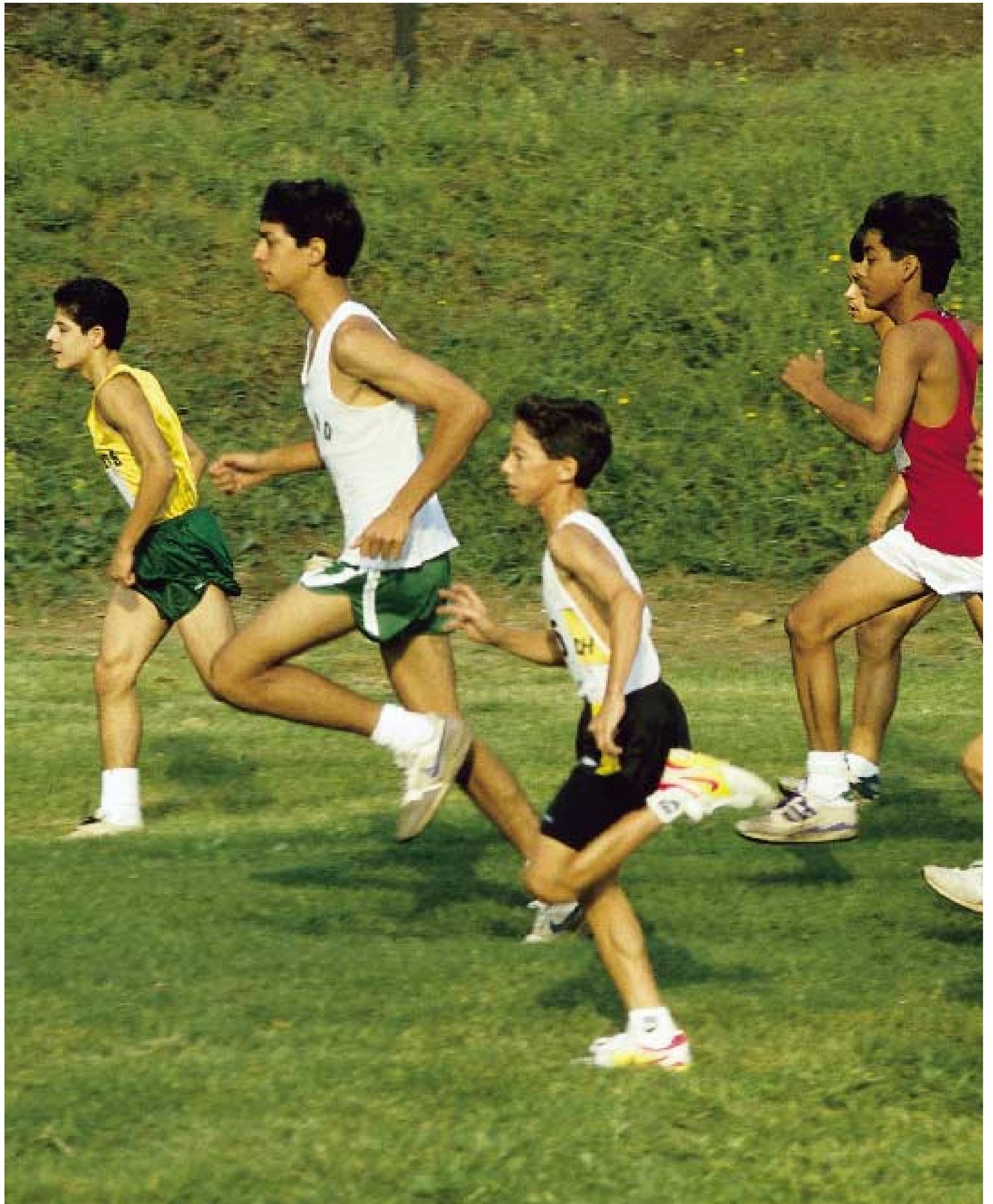
The Fundamental Changes of Adolescence



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Chapter 1

Biological Transitions

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According to an old joke, there are only two things in life that one can be sure of—death and taxes. To this brief list one might add puberty—the physical changes of adolescence—for, of all the developments that take place during the second decade of life, the only truly inevitable one is physical maturation. Not all adolescents experience identity crises, rebel against their parents, or fall head over heels in love, but virtually all undergo the biological transitions associated with maturation into adult reproductive capability.

Puberty, however, is considerably affected by the context in which it occurs. Physical development is influenced by a host of environmental factors, and the timing and rate of pubertal growth vary across regions of the world, socioeconomic classes, ethnic groups, and historical eras. In contemporary America, the average girl reaches **menarche**—the time of first menstruation—between her twelfth and thirteenth birthdays. However, among the Lumi people of New Guinea, the typical girl does not reach menarche until after 18 years of age (Eveleth & Tanner, 1990). Imagine how great a difference those five years make in transforming the nature of adolescence. Picture how different American high schools would be if sexual maturation did not occur until after graduation.

Physical and sexual maturation profoundly affect the way in which adolescents view themselves and the way in which they are viewed and treated by others. Yet the so-

cial environment exerts a tremendous impact on the meaning of puberty and on its psychological and social consequences; indeed, as you will read in this chapter, the social environment even affects the *timing* of puberty (i.e., whether a person matures early or late). In some societies, pubertal maturation brings with it a series of complex initiation rites that mark the passage of the young person into adulthood socially as well as physically. In other societies, recognition of the physical transformation from child into adult takes more subtle forms. Parents may merely remark, “Our little boy has become a man,” when they discover that he needs to shave. Early or late maturation may be cause for celebration or cause for concern, depending on what is admired or derogated in a given peer group at a given point in time. In the fifth grade, developing breasts may be a source of embarrassment; but in the ninth grade, it may be just as embarrassing *not* to have developed breasts.

In sum, even the most universal aspect of adolescence—puberty—is hardly universal in its impact on the young person. In this chapter, we will examine just how and why the environment in which adolescents develop exerts its influence even on something as fundamental as puberty. ●

PUBERTY: AN OVERVIEW

Puberty derives from the Latin word *pubertas*, which means “adult.” Technically, the term refers to the period during which an individual becomes capable of sexual reproduction; that is, it denotes the series of biological changes leading up to reproductive capability. More broadly speaking, however, puberty encompasses all the physical changes that occur in the growing girl or boy as the individual passes from childhood into adulthood.

The following are the five chief physical manifestations of puberty (Marshall, 1978):

1. *A rapid acceleration in growth*, resulting in dramatic increases in both height and weight
2. *The development of primary sex characteristics*, including the further development of the gonads, or sex glands, which are the testes in males and the ovaries in females



▲ Although puberty is a universal feature of adolescence, individuals develop physically at different ages and at different rates. (David Young Wolff/PhotoEdit)

3. The *development of secondary sex characteristics*, which involves changes in the genitals and breasts; the growth of pubic, facial, and body hair; and the further development of the sex organs.
4. *Changes in body composition*—specifically, in the quantity and distribution of fat and muscle
5. *Changes in the circulatory and respiratory systems*, which lead to increased strength and tolerance for exercise

Each of these sets of changes is the result of developments in the endocrine and central nervous systems, many of which begin years before the external signs of puberty are evident—some occur even before birth.

RECAP

The term puberty refers to the physical changes that occur in the growing girl or boy as the individual passes from childhood into adulthood. The chief physical manifestations are the growth spurt, the further development of the gonads, the development of secondary sex characteristics, changes in body composition, and changes in circulation and respiration.

The Endocrine System

The **endocrine system** produces, circulates, and regulates levels of hormones in the body. **Hormones** are highly specialized substances secreted by one or more endocrine glands. **Glands** are organs that stimulate particular parts of the body to respond in specific ways. Just as specialized hormones carry messages to particular cells in the body, so are the body's cells designed to receive hormonal messages selectively. For example, one of the many effects of the hormone adrenaline, secreted by the adrenal gland, is to stimulate the heart to increase its activity. The heart responds to adrenaline but not to all other hormones.

Puberty may appear to be rather sudden, judging from its external signs, but, in fact, it is part of a gradual process that begins at conception (Petersen & Taylor, 1980). You may be surprised to learn that no new hormones are produced and no new bodily systems develop at puberty. Rather, some hormones that have been present since before birth increase, and others decrease.

The endocrine system receives its instructions to increase or decrease circulating levels of particular hormones from the central nervous system—chiefly, the brain. The system works somewhat like a thermostat.

Hormonal levels are set at a certain point, just as you might set a thermostat at a certain temperature. By setting your room's thermostat at 60°F, you are instructing your heating system to go into action when the temperature falls below this level. Similarly, when a particular hormonal level in your body dips below the endocrine system's **set point** for that hormone, secretion of the hormone increases; when the level reaches the set point, secretion temporarily stops. And, as is the case with a thermostat, the setting level, or set point, for a particular hormone can be adjusted up or down, depending on environmental or internal bodily conditions.

Such a **feedback loop** becomes increasingly important at the onset of puberty. Long before early adolescence—in fact, during infancy—a feedback loop develops involving the **pituitary gland** (which controls hormone levels in general), the **hypothalamus** (the part of the brain that controls the pituitary gland), and the **gonads** (in males, the testes; in females, the ovaries), a feedback loop known as the **HPG axis** (for *hypothalamus, pituitary, gonads*). The gonads release the sex hormones—**androgens** and **estrogens** (see figure 1.1). Although one typically thinks of androgens as “male” hormones and estrogens as “female” hormones, both types of hormones are produced by each sex, and both are present in males and females at birth. During adolescence, however, the average male produces more androgens than estrogens, and the average female produces more estrogens than androgens (Petersen & Taylor, 1980).

The hypothalamus responds to the levels of sex hormones circulating in the body. Your HPG axis is set to maintain certain levels of androgens and estrogens. When these levels fall below the set points, the hypothalamus no longer inhibits the pituitary, thus permitting it to stimulate the release of sex hormones by the gonads and other, puberty-related hormones by the adrenal gland. When sex-hormone levels reach the set point, the hypothalamus responds by inhibiting its stimulation of the pituitary gland.

Hormones play two very different roles in adolescent development; they perform both an **organizational role** and an **activational role** (Coe, Hayashi, & Levine, 1988; Collaer & Hines, 1995). Long before adolescence—in fact, prenatally—hormones shape, or *organize*, the brain in ways that may not be manifested in behavior until childhood or even adolescence. Generally speaking, until about eight weeks after conception, the human brain is “feminine” unless and until it is exposed to certain “masculinizing” hormones, such as testosterone. Because levels of testosterone are higher among males

than females while the brain is developing, males, in general, end up with a more “masculinized” brain than females. This sex difference in brain organization pre-determines certain patterns of behavior, many of which may not actually appear until much later (Collaer & Hines, 1995). Studies of sex differences in aggression, for example, show that, even though some of these differences may not appear until adolescence, they likely result from the impact of prenatal hormones, rather than from hormonal changes at puberty.

In other words, the presence or absence of certain hormones early in life may program the brain and nervous system to develop in certain ways later on. Because we may not see the resulting changes in behavior until adolescence, it is easy to conclude mistakenly that the behaviors result from hormonal changes specific to puberty. In reality, however, exposure to certain hormones before birth may set a sort of alarm clock, which does not go off until adolescence. Just because the alarm clock rings at the same time that puberty begins does not mean that puberty caused the alarm to go off.

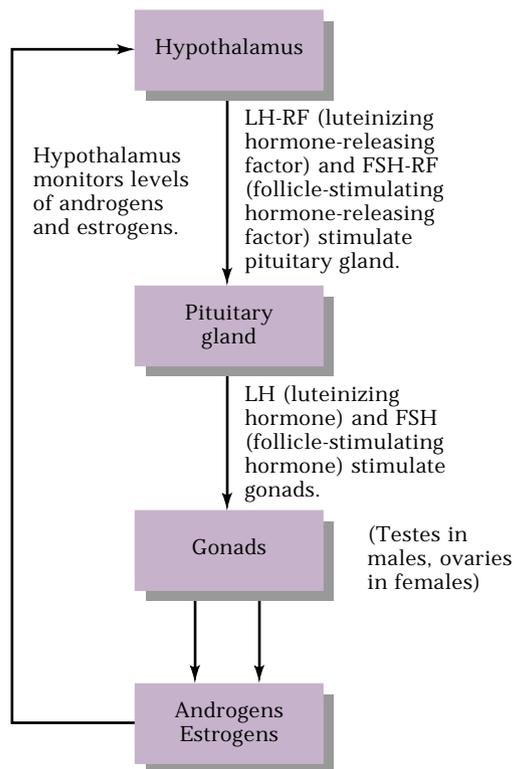


Figure 1.1 Levels of sex hormones are regulated by a feedback system composed of the hypothalamus, pituitary gland, and gonads. (Grumbach, Roth, Kaplan, & Kelch, 1974)

Other changes in behavior at adolescence occur, however, because of changes in hormone levels at puberty; these hormonal changes are said to *activate* the changes in behavior. For instance, the increase in certain hormones at puberty is thought to stimulate the development of secondary sex characteristics, such as the growth of pubic hair. Other hormonal changes at adolescence, controlled by the adrenal gland, may stimulate an increase in individuals' sex drive (McClintock & Herdt, 1996).

Still other changes during puberty are likely to be results of an *interaction* between the organizational and activational effects of hormones (Collaer & Hines, 1995). Hormones that are present during the development of the fetus may organize a certain set of behaviors (for example, the brain may be set up to have us later engage in sexual behavior), but certain changes in those hormones at puberty may be needed to activate the pattern; that is, individuals may not become motivated to engage in sex until puberty.

What Triggers Puberty?

Although the HPG axis is active long before adolescence—before birth, in fact—it is relatively quiet during much of childhood. Something happens during middle childhood, though, that reawakens the HPG axis and signals it that the body is ready for puberty.



▲ The timing of puberty is affected by experience as well as heredity. Exercise can affect the onset of puberty. (Li-Hua Lan/The Image Works)

Although scientists are not entirely certain, there is increasing evidence that rising levels of a protein produced by fat cells, **leptin**, may be the most important signal (Spear, 2000). This idea is consistent with observations that individuals may not go through puberty until they have accumulated a certain amount of body fat and is consistent with research showing that stress, illness, nutritional deficiencies, excessive exercise, and excessive thinness can all delay the onset of puberty (Frisch, 1983; McClintock, 1980). The signal carried by rising levels of leptin instructs the hypothalamus both to stop doing things that have been inhibiting puberty and to start doing things that set it in motion (Spear, 2000). As a result of both of these processes, the hypothalamus initiates a cascade of hormonal events that ultimately result in the sexual maturation of the individual.

During and just before puberty, the pituitary also secretes hormones that act on the thyroid and on the adrenal cortex, as well as hormones that stimulate overall bodily growth. The release of these substances is also under the control of the hypothalamus. The thyroid and adrenal cortex, in turn, secrete hormones that cause various physical (somatic) changes to take place at puberty. Research also indicates that early feelings of sexual attraction to others—most individuals report that their first sexual attraction took place around age 10, before they went through puberty—may be stimulated by maturation of the adrenal glands, called **adrenarche** (McClintock & Herdt, 1996). Changes at puberty in the brain system that regulates the adrenal gland are also important because this is the brain system that controls how we respond to stress (Spear, 2000).

RECAP

The onset of puberty is regulated by a feedback loop in the endocrine system, called the HPG axis, involving the hypothalamus, the pituitary, and the gonads—ovaries in females, testes in males. Increases in some hormones and decreases in others, as a result of activity along the HPG axis, result in the internal and external changes associated with puberty. Sex hormones play two roles in adolescent development: organizational and activational. Long before puberty, they organize the brain in ways that are not manifested until adolescence. And at puberty, they activate new patterns of behavior. There is increasing evidence that rising levels of a protein produced by fat cells, leptin, may signal the hypothalamus to set the hormonal changes of puberty in motion.



Food for Thought

In a study of monkeys that was done some years ago, it was found that male monkeys who had been castrated (i.e., had their testes removed) shortly after birth still showed the onset of many of the changes in sexual behavior at adolescence normally observed among males of this species (Coe et al., 1988). How does the distinction between the organizational and activational effects of hormones help account for this?

SOMATIC DEVELOPMENT

The effects of the endocrinological changes of puberty on the adolescent's body are remarkable. Consider the dramatic changes in physical appearance that occur during the short span of early adolescence. One enters puberty looking like a child but within four years or so has the physical appearance of a young adult. During this relatively brief period of time, the average individual grows nearly 12 inches taller, matures sexually, and develops an adult-proportioned body.

Changes in Stature and the Dimensions of the Body

The simultaneous release of growth hormone, thyroid hormones, and androgens stimulates rapid acceleration in height and weight. This dramatic increase in stature is referred to as the **adolescent growth spurt**. What is most incredible about the adolescent growth spurt is not so much the absolute gain of height and weight that typically occurs but the speed with which the increases take place. Think for a moment of how quickly very young children grow. At the time of **peak height velocity**—the time at which the adolescent is growing most rapidly—he or she is growing at the same rate as a toddler. For boys, peak height velocity averages about 4.1 inches (10.5 centimeters) per year; for girls, it averages about 3.5 inches (9.0 centimeters) (J. Tanner, 1972).

Figure 1.2 shows just how remarkable the growth spurt is in terms of height. The graph on the left presents information on absolute height and indicates that, as you would expect, the average individual increases in height throughout infancy, childhood, and adolescence. As you can see, there is little gain in

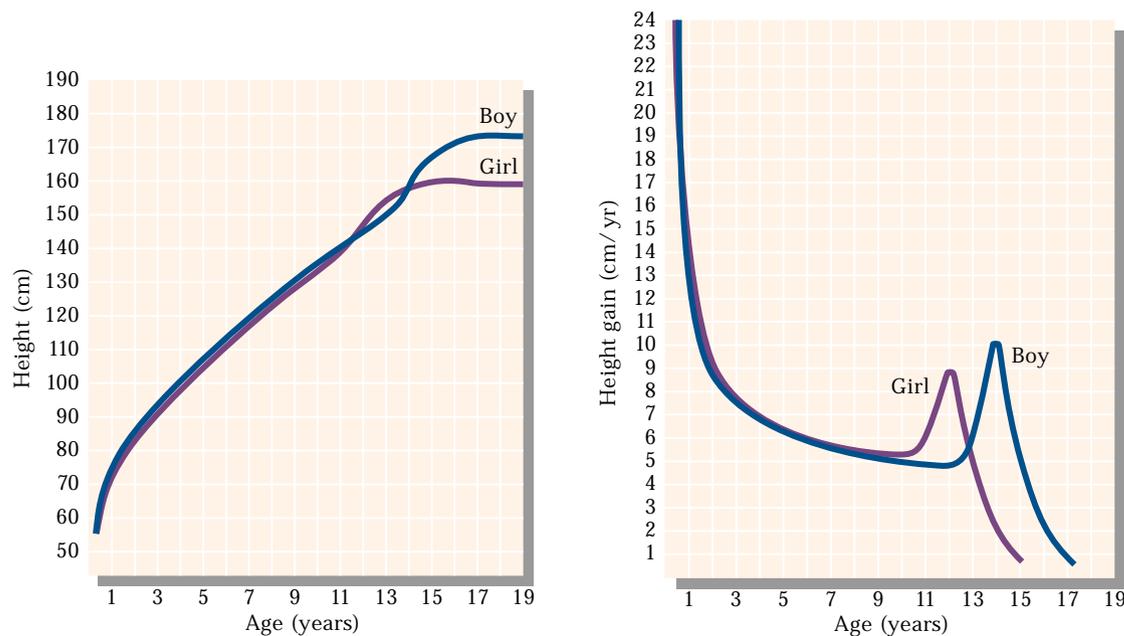


Figure 1.2 Left: height (in centimeters) at different ages for the average male and female youngster. Right: gain in height per year (in centimeters) for the average male and female youngster. Note the adolescent growth spurt. (Adapted from Marshall, 1978)

height after the age of 18. But look at the right-hand graph, which shows the *average increase in height per year* (i.e., the *rate of change*) over the same age span. Here you can see the acceleration in height at the time of peak height velocity.

Figure 1.2 also indicates quite clearly that the growth spurt occurs, on the average, about two years earlier among girls than among boys. In general, as you can see by comparing the two graphs, boys tend to be somewhat taller than girls before age 11; then girls tend to be taller than boys between ages 11 and 13; finally, boys tend to be taller than girls from about age 14 on. You may remember what this was like during fifth and sixth grades. Sex differences in height can be a concern for many young adolescents when they begin socializing with members of the opposite sex, especially if they are tall, early-maturing girls or short, late-maturing boys.

During puberty, the composition of the skeletal structure also changes; bones become harder, more dense, and more brittle. One marker of the conclusion of puberty is the closing of the ends of the long bones in the body, which terminates growth in height. Interestingly, there are ethnic differences in some of these skeletal changes, with bone density increasing significantly more during puberty among African American than among white youngsters. Some experts believe that this

ethnic difference in adolescence may account for the fact that, during adulthood, African American women are less likely than white women to develop osteoporosis, and they have fewer bone fractures (Gilsanz, Roe, Mora, Costin, & Goodman, 1991).

Much of the height gain during puberty results from an increase in torso length rather than in leg length. The sequence in which various parts of the body grow is fairly regular. Extremities—the head, hands, and feet—are the first to accelerate in growth. Then accelerated growth occurs in the arms and legs, followed by torso and shoulder growth. In concrete terms, “a boy stops growing out of his trousers (at least in length) a year before he stops growing out of his jackets” (J. Tanner, 1972, p. 5).

Young adolescents often appear to be out of proportion physically—as though their noses or legs were growing faster than the rest of them. It’s not an optical illusion. The parts of the body do not all grow at the same rate or at the same time during puberty. This **asynchronicity in growth** can lead to an appearance of awkwardness or gawkiness in the young adolescent, who may be embarrassed by the unmatched accelerated growth of various parts of the body. It is probably little consolation for the young adolescent to be told that an aesthetic balance probably will be restored within a few years; nevertheless, this is what usually happens.

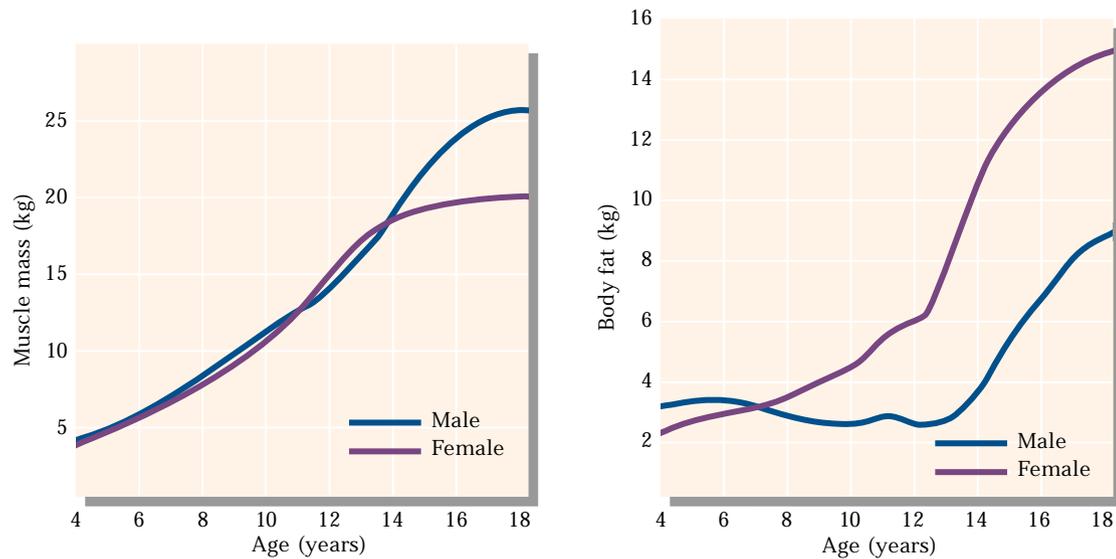


Figure 1.3 During preadolescence, important sex differences emerge in body composition that continue through adolescence. These graphs reflect muscle and body fat for individuals of average height at each age. Note the changes in muscle mass (left) and body fat (right). (Adapted from Gumbach et al., 1974)

The spurt in height during adolescence is accompanied by an increase in weight, which results from an increase in both muscle and fat. However, there are important sex differences along these latter two dimensions. In both sexes, muscular development is rapid and closely parallels skeletal growth, but muscle tissue grows faster in boys than in girls (see figure 1.3). Body fat increases for both sexes during puberty, but more so for females than for males and at a somewhat faster rate for girls, especially during the years just before puberty. For boys, there is actually a slight decline in body fat just before puberty. The result of these sex differences in growth is that boys finish adolescence with a muscle-to-fat ratio of about 3:1, but the comparable ratio for girls is approximately 5:4. This has important implications for understanding why sex differences in strength and athletic ability often appear for the first time during adolescence. According to one estimate, about half of the sex difference in physical performance during early adolescence results simply from the difference in body fat (Smoll & Schutz, 1990). Before puberty, there are relatively few sex differences in muscle development and only slight sex differences in body fat.

The rapid increase in body fat that occurs among females in early adolescence frequently prompts young girls to become overly concerned about their weight—even when their weight is within the normal range for their height and age (Smolak, Levine, & Gralen, 1993).

Although most girls diet unnecessarily during this time in response to the increase in body fat, the young women who are most susceptible to feelings of dissatisfaction with their bodies during this phase of development are those who mature early, begin dating early, and come from relatively more affluent families (Dornbusch et al., 1981; Smolak, Levine, & Gralen, 1993). African American females seem less vulnerable to these feelings of body dissatisfaction than other girls, and consequently they are less likely to diet, presumably because of ethnic differences in conceptions of the ideal body type. Even among African American youngsters, however, dieting is common in early adolescence (Halpern & Udry, 1994). Many studies point to adolescence as the period of greatest risk for the development of eating disorders, such as anorexia and bulimia.

Accompanying the gains in strength that occur during early adolescence are increases in the size and capacity of the heart and lungs and, consequently, in exercise tolerance. In all these areas, the rate and magnitude of the gains favor males over females. By the end of puberty, boys are stronger, have “larger hearts and lungs relative to their size, a higher systolic blood pressure, a lower resting heart rate, a greater capacity for carrying oxygen to the blood, . . . a greater power for neutralizing the chemical products of muscular exercise, such as lactic acid,” higher blood hemoglobin, and more red blood cells (Petersen & Taylor, 1980, p. 129).

It is tempting to attribute these sex differences purely to hormonal factors, because androgens, which are present at higher levels in the prenatal environments of males versus females, and which increase during puberty in males at a much faster rate than in females, are closely linked to growth along these physical dimensions. In addition, with age, such environmental factors as diet and exercise become increasingly important influences on sex differences in physical performance (Smoll & Schutz, 1990). As Petersen and Taylor (1980) point out, there are strong social pressures on girls to curtail “masculine” activities—including some forms of exercise—at adolescence, and studies show that girls are more likely than boys to markedly reduce their physical activity in preadolescence, with a very large proportion of adolescent girls failing to meet national guidelines for physical activity (Goran et al., 1998; Savage & Scott, 1998). Moreover, adolescent girls’ diets, especially those of African American girls, are generally less adequate nutritionally than the diets of boys, particularly in important minerals, such as iron (Johnson, Johnson, Wang, Smiciklas-Wright, & Guthrie, 1994). Both factors could result in sex differences in muscular development and exercise tolerance. Thus, sex differences in physical ability are influenced by a variety of factors, of which hormonal differences are but one part of an extremely complicated picture. Along with many other of the body’s organs, the brain changes in size, structure, and function at puberty, a series of developments that we will discuss in chapter 2.

RECAP

The dramatic increase in stature that occurs during puberty is referred to as the adolescent growth spurt. On average, girls experience the growth spurt about two years earlier than boys. Important changes also take place in the relative proportions of body fat and muscle, and these changes leave boys relatively more muscular and with a lower proportion of body fat. Many girls react to the increase in body fat at puberty by dieting unnecessarily.



Food for Thought

How are the somatic changes of puberty different for males and females? Why might some of these changes make adolescents feel awkward about or unhappy with their body? Why might body dissatisfaction be greater among adolescent girls than boys? Is this biological, cultural, or a combination of the two?

Sexual Maturation

Puberty brings with it a series of developments associated with sexual maturation. In both boys and girls, the development of the **secondary sex characteristics** is typically divided into five stages, often called **Tanner**

Table 1.1 The sequence of physical changes at puberty

Boys		Girls	
Characteristic	Age of First Appearance (Years)	Characteristic	Age of First Appearance (Years)
1. Growth of testes, scrotal sac	10–13½	1. Growth of breasts	7–13
2. Growth of pubic hair	10–15	2. Growth of pubic hair	7–14
3. Body growth	10½–16	3. Body growth	9½–14½
4. Growth of penis	11–14½	4. Menarche	10–16½
5. Change in voice (growth of larynx)	About the same time as penis growth	5. Underarm hair	About two years after pubic hair
6. Facial and underarm hair	About two years after pubic hair appears	6. Oil- and sweat-producing glands (acne occurs when glands are clogged)	About the same time underarm hair
7. Oil- and sweat-producing glands, acne	About the same time as underarm hair		

Source: Goldstein, B. (1976). *Introduction to human sexuality*. Belmont, CA: Star.

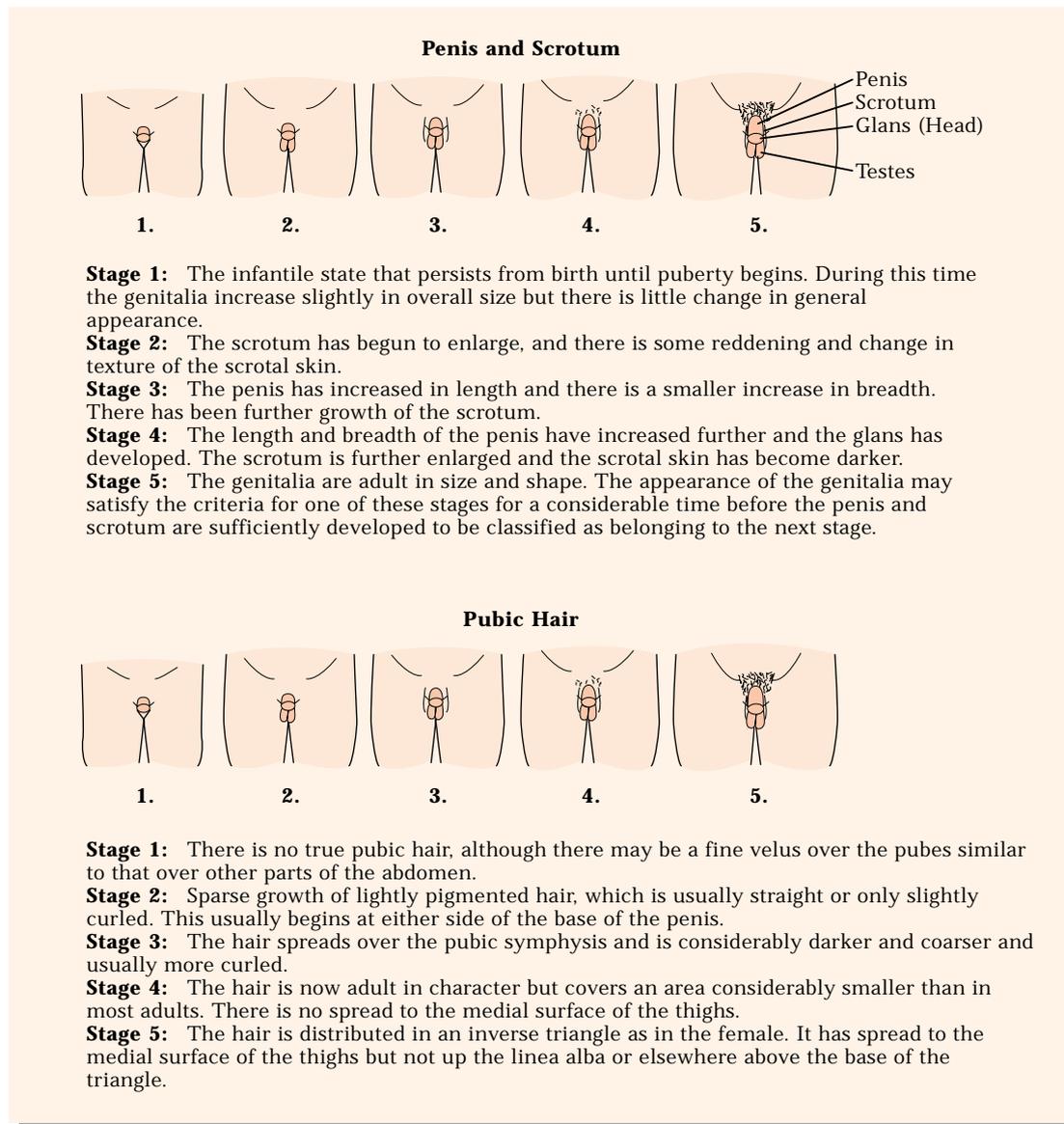


Figure 1.4 The five pubertal stages of penile and pubic hair growth. (Morris & Udry, 1980)

stages, after the British pediatrician who devised the categorization system.

● **Sexual Maturation in Boys** The sequence of developments in secondary sex characteristics among boys is fairly orderly (see table 1.1). Generally, the first stages of puberty involve growth of the testes and scrotum, accompanied by the first appearance of pubic hair. Approximately one year later, the growth

spurt in height begins, accompanied by growth of the penis and further development of pubic hair—now of a coarser texture and darker color. The five Tanner stages of penis and pubic hair growth in boys are shown in figure 1.4.

The emergence of facial hair—first at the corners of the upper lip, next across the upper lip, then at the upper parts of the cheeks and in the midline below the lower lip, and finally along the sides of the face and the

lower border of the chin—and body hair are relatively late developments in the pubertal process. The same is true for the deepening of the voice, which is gradual and generally does not occur until very late adolescence. During puberty, there are changes in the skin as well; the skin becomes rougher, especially around the upper arms and thighs, and there is increased development of the sweat glands, which often gives rise to acne, skin eruptions, and increased oiliness of the skin.

During puberty, there are slight changes in the male breast—to the consternation and embarrassment of many boys. Breast development is largely influenced by the estrogen hormones. Both estrogens and androgens are present in both sexes and increase in both sexes at puberty, although in differing amounts. In the male adolescent, the areola (the area around the nipple) increases in size, and the nipple becomes more prominent. Some boys show a slight enlargement of the breast, although in most cases this development is temporary.

Other, internal changes occur that are important elements of sexual maturation. At the time that the penis develops, the seminal vesicles, the prostate, and the bilbo-urethral glands also enlarge and develop. The first ejaculation of seminal fluid generally occurs about one year after the beginning of accelerated penis growth, although this is often determined culturally, rather than biologically, since for many boys first ejaculation occurs as a result of masturbation (J. Tanner, 1972). One interesting observation about the timing and sequence of pubertal changes in boys is that boys are generally fertile (i.e., capable of fathering a child) before they have developed an adultlike appearance. The opposite is true for girls.

● **Sexual Maturation in Girls** The sequence of development of secondary sex characteristics among girls (shown in Table 1.1) is somewhat less regular than it is among boys. Generally, the first sign of sexual maturation is the elevation of the breast—the emergence of the so-called breast bud. In about one-third of all adolescent girls, however, the appearance of pubic hair precedes breast development. The development of pubic hair follows a sequence similar to that in males—generally from sparse, downy, light-colored hair to more dense, curled, coarse, darker hair. Breast development often occurs concurrently and generally proceeds through several stages. In the bud stage, the areola widens, and the breast and nipple are elevated as a small mound. In the middle stages, the areola and nipple be-

come distinct from the breast and project beyond the breast contour. In the final stages, the areola is recessed to the contour of the breast, and only the nipple is elevated. The female breast undergoes these changes at puberty regardless of changes in breast size. Changes in the shape and definition of the areola and nipple are far better indicators of sexual maturation among adolescent girls than is breast growth alone. The five Tanner stages of breast and pubic hair growth in girls are shown in figure 1.5.

As is the case among boys, puberty brings important internal changes for adolescent girl that are associated with the development of reproductive capacity. In girls, these changes involve the development and growth of the uterus, vagina, and other aspects of the reproductive system. In addition, the labia and clitoris enlarge.

As is apparent in table 1.1, the growth spurt is likely to occur during the early and middle stages of breast and pubic hair development. Menarche, the beginning of menstruation, is a relatively late development, which reflects the culmination of a long series of hormonal changes (Dorn et al., 1999). Hence, it is incorrect to use menarche as a marker for the onset of puberty among girls. A great deal of pubertal development has taken place long before the adolescent girl begins to menstruate. Generally, full reproductive function does not occur until several years after menarche, and regular ovulation follows menarche by about two years (Hafetz, 1976). Unlike boys, therefore, girls generally appear physically mature before they are capable of becoming pregnant.

RECAP

One of the most important physical changes of puberty is the development of secondary sex characteristics—the changes in outward appearance that signal the onset of reproductive maturity. These changes include the growth of pubic hair, changes in the appearance of the sex organs, and breast development.



Food for Thought

Think about the changes in secondary sex characteristics that take place during puberty. Why might humans have evolved so that puberty occurs on the “outside” of the body as well as internally?

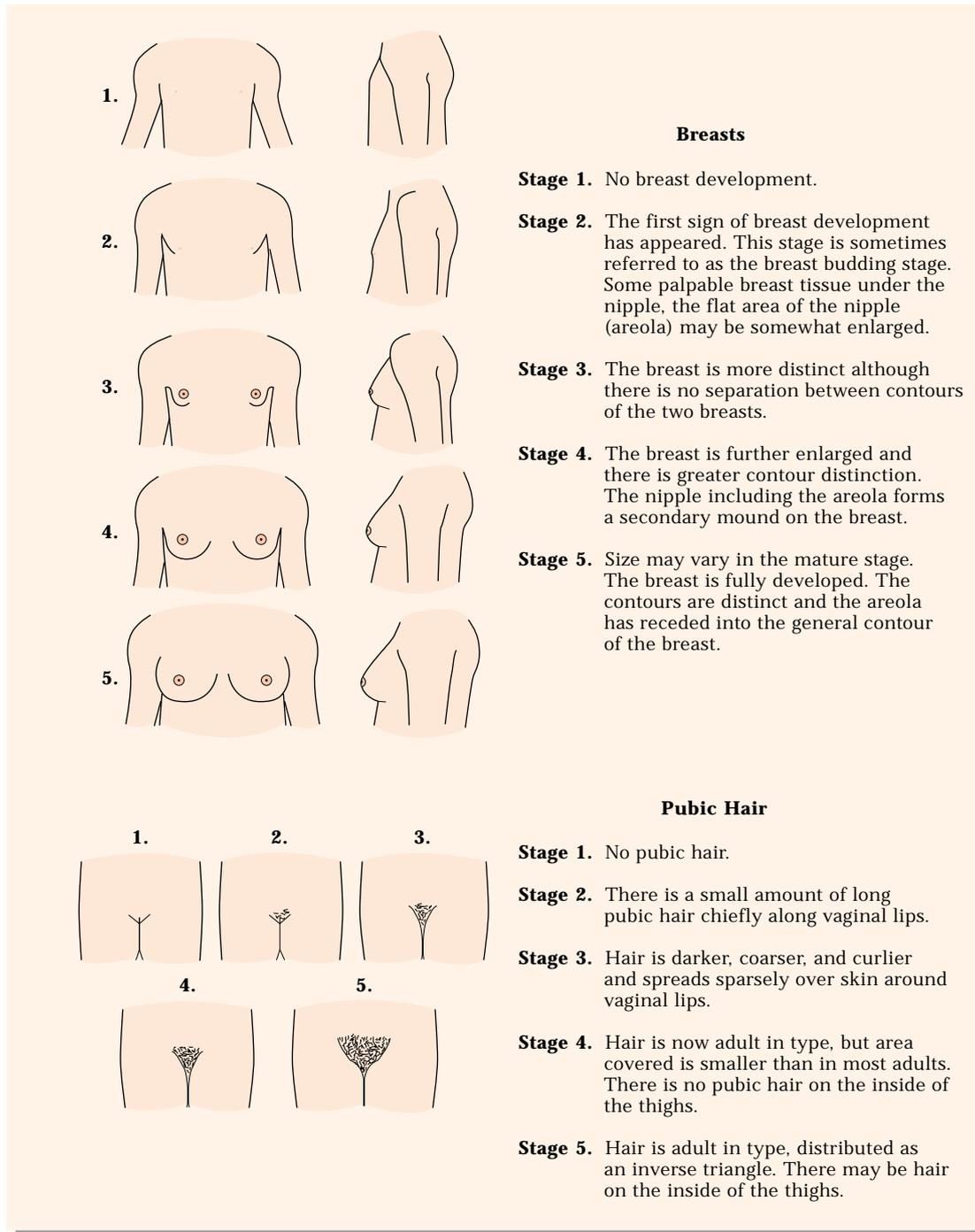


Figure 1.5 The five pubertal stages for breast and pubic hair growth. (Marshall & Tanner, 1969. Reprinted by permission of BMJ publishing Group)

THE TIMING AND TEMPO OF PUBERTY

You may have noted that, thus far, no mention has been made about the “normal” ages at which various pubertal changes are likely to take place. The truth is that the variations in the timing of puberty (the age at which puberty begins) and in the tempo of puberty (the rate at which maturation occurs) are so great that it is misleading to talk even about average ages.

The onset of puberty can occur as early as age 7 years in girls and 9½ in boys, or as late as 13 in girls and 13½ in boys. In girls, the interval between the first sign of puberty and complete physical maturation can be as short as a year and a half or as long as six years. In boys, the comparable interval ranges from about two years to five years (J. Tanner, 1972). Within a totally normal population of young adolescents, some individuals will have completed the entire sequence of pubertal changes before others have even begun. In more concrete terms, it is possible for an early-maturing, fast-maturing youngster to complete pubertal maturation by the age of 10 or 11—two years before a late-maturing youngster has even begun puberty and seven years before a late-maturing, slow-maturing youngster has matured completely.

There is no relation between the age at which puberty begins and the rate at which pubertal development proceeds. The timing of puberty may have a small

effect on the ultimate adult stature or bodily dimensions of the individual, with late maturers, on average, being taller than early maturers as adults, and early maturers, on average, being somewhat heavier—at least among females (St. George, Williams, & Silva, 1994). Adult height and weight are far more strongly correlated with height and weight before childhood than with the timing of puberty, however.

Many people believe that there are ethnic differences in the timing and rate of pubertal maturation, although the results of studies in this area have been inconclusive. One large-scale study of U.S. youngsters does indicate, however, that African American females may mature significantly earlier than their white counterparts (the study did not include enough youngsters from other ethnic groups to make statistical comparisons). For example, whereas the average age of menarche among white U.S. girls is closer to 13, among African American girls, it is closer to 12. And, as figure 1.6 shows, more than 27 percent of African American girls, but less than 7 percent of white girls, have entered puberty by age 7 (Herman-Giddens et al., 1997). Although the reasons for this ethnic difference are not known, one possibility is that African-American girls are more frequently exposed to chemicals in the environment, such as synthetic hormones, which may stimulate earlier puberty.

What factors underlie the tremendous variations in the timing and tempo of puberty? Why do some

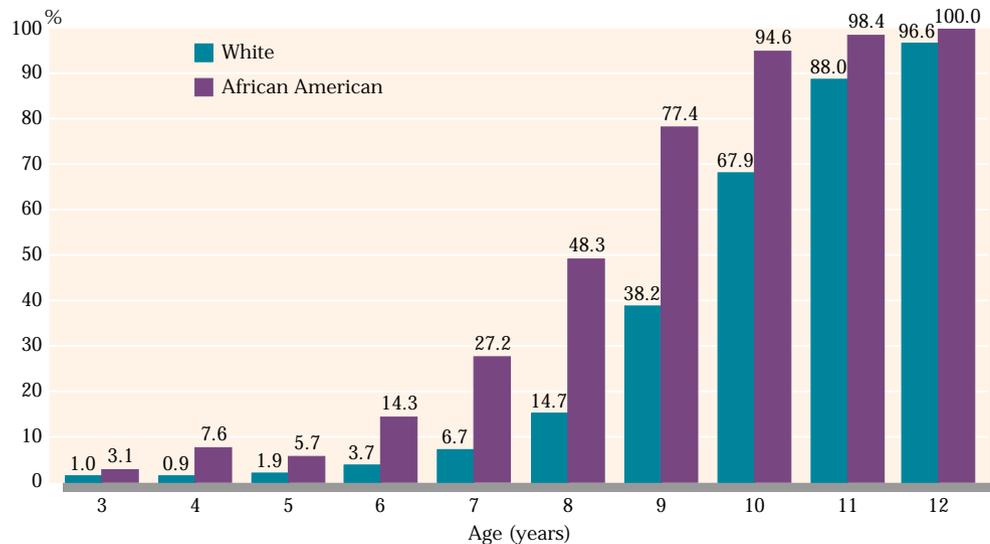


Figure 1.6 Prevalence of African American and white girls at different ages who show signs of either breast development or pubic hair. (Herman-Giddens et al., 1997)

individuals mature relatively early and others relatively late?

Researchers who study variability in the onset and timing of puberty approach the issue in two ways. One strategy involves the study of differences among individuals (that is, studying why one individual matures earlier or faster than another). The other involves the study of differences among groups of adolescents (that is, studying why puberty occurs earlier or more rapidly in certain populations than in others). Both sets of studies point to both genetic and environmental influences on the timing and tempo of puberty.

Individual Differences in Pubertal Maturation

Differences in the timing and rate of puberty among individuals growing up in the same general environment result chiefly, but not exclusively, from genetic factors. Comparisons between pairs individuals who are genetically identical (identical twins) and pairs who are not reveal patterns of similarity in pubertal maturation indicating that the timing and tempo of an individual's pubertal maturation are largely inherited (Marshall, 1978).

Despite this powerful influence of genetic factors, the environment plays an important role. In all likelihood, every individual inherits a predisposition to develop at a certain rate and to begin pubertal maturation at a certain time. But this predisposition is best thought of as upper and lower age limits, not a fixed absolute. Whether the genetic predisposition that each person has to mature around a given age is actually realized, and the time within the predisposed age boundaries at which he or she actually goes through puberty, are subject to the influence of the environment. In this respect, the timing and rate of pubertal maturation are the product of an interaction between nature and nurture, between one's genetic makeup and the environmental conditions under which one has developed.

By far the two most important environmental influences on pubertal maturation are nutrition and health. Puberty occurs earlier among individuals who are better nourished throughout their prenatal, infant, and childhood years. Not surprisingly, then, girls who are taller or heavier than their peers mature earlier (St. George et al., 1994). In contrast, delayed puberty is more likely to occur among individuals with a history of protein and/or caloric deficiency. Chronic illness during childhood and adolescence is also associated with delayed puberty, as is excessive exercise.

For example, girls in ballet companies or in other rigorous training programs often mature later than their peers (Frisch, 1983). Generally speaking, then, after genetic factors, an important determinant of the onset of puberty is the overall physical well-being of the individual from conception through preadolescence (Marshall, 1978).

Interestingly, a number of studies suggest that social as well as physical factors in the environment influence the onset of maturation, especially in girls. Several studies, for example, have found that puberty may occur somewhat earlier among girls who have grown up in less cohesive, or more conflict-ridden, family environments or in households in which a stepfather is present (e.g., Ellis & Garber, 2000; Ellis, McFadyen-Ketchum, Dodge, Pettit, & Bates, 1999; Graber, Brooks-Gunn, & Warren, 1995; Moffitt, Caspi, Belsky, & Silva, 1992; Steinberg, 1988; Surbey, 1990). One explanation for the finding that distant family relations may accelerate pubertal maturation is that distance in the family may induce a very small amount of stress, which, in turn, may affect hormonal secretions

▼ *The age at which adolescents mature physically varies around the world. On average, teenagers in highly industrialized countries, such as Japan, mature earlier than their counterparts in developing nations, where health and nutritional problems slow physical growth. (R. M. Collins, III/Image Works)*



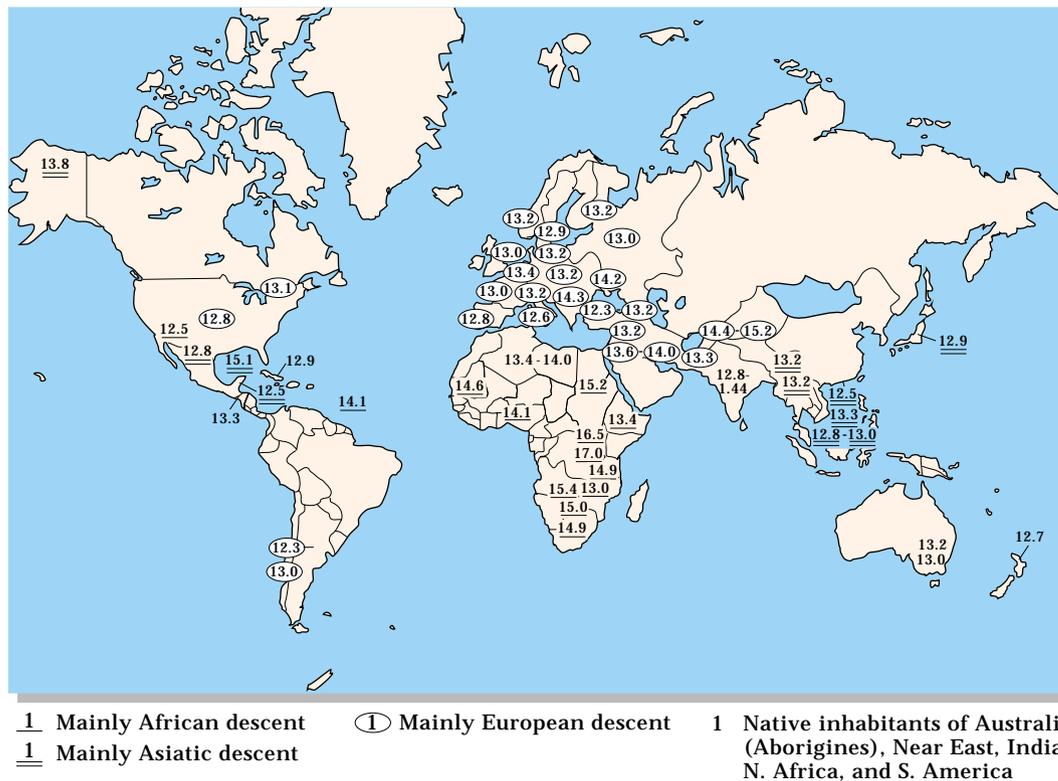


Figure 1.7 The average menarcheal age of adolescent girls varies in different regions of the world. (Adapted from Eveleth & Tanner, 1976)

in the adolescent (Graber et al., 1995). Puberty may be sped up by *small* amounts of stress; a great deal of stress, however, is likely to slow maturation (Ellis & Garber, 2000). In addition, the presence of a stepfather may expose the adolescent girl to **pheromones** (chemicals secreted by animals that stimulate certain behaviors in other members of the species) that stimulate pubertal maturation. In general, among humans and other mammals, living in proximity to one's close biological relatives appears to slow the process of pubertal maturation, whereas exposure to unrelated members of the opposite sex may accelerate it (Izard, 1990; Surbey, 1990).

Although it may seem surprising that something as biological as puberty can be influenced by factors in our social environment, scientists have long known that our social relationships can indeed affect our biological functioning. One of the best-known examples of this is that women who live together—such as dormitory roommates—find that their menstrual periods begin to synchronize over time (Graham, 1991; McClintock, 1980).

Group Differences in Pubertal Maturation

Researchers typically study group differences in puberty by comparing average ages of menarche in different regions. Most of these studies have indicated that genetic factors play an extremely small role in determining group differences in pubertal maturation (Eveleth & Tanner, 1990). Differences among countries in the average rate and timing of puberty are more likely to reflect differences in their environments than differences in their populations' gene pools (Morabia, Costanza, & World Health Organization, 1998).

The influence of the broader environment on the timing and tempo of puberty can be seen in more concrete terms by looking at three sorts of group comparisons: (1) comparisons of the average age of menarche across countries, (2) comparisons among socioeconomic groups within a country, and (3) comparisons within a population during different eras. (Although menarche does not signal the onset of puberty, researchers often use the average age of menarche when comparing the timing of puberty across different groups or regions.)

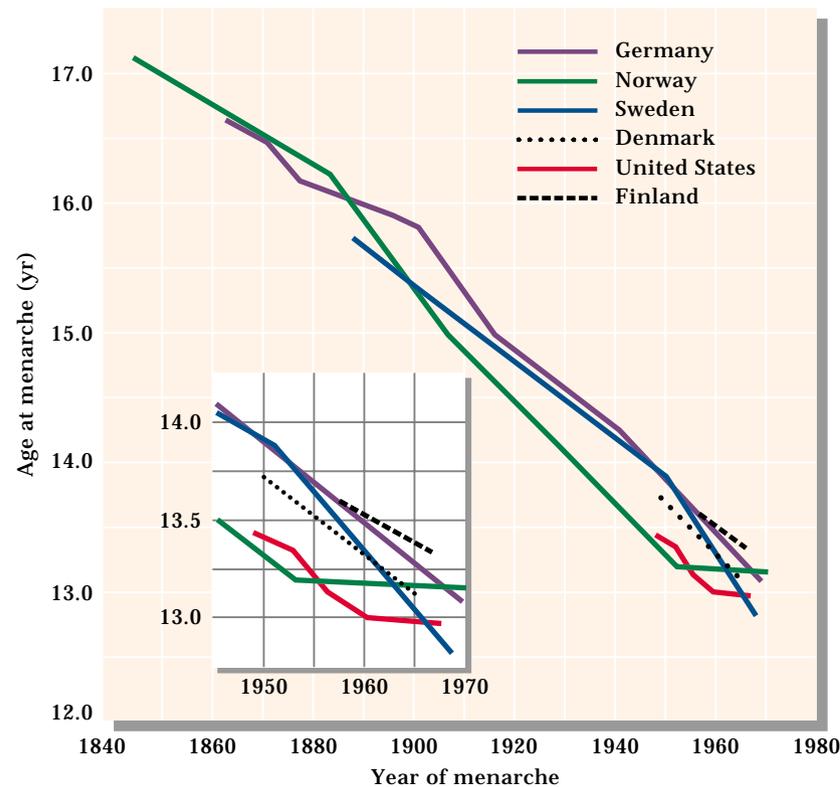


Figure 1.8 The age at menarche has declined considerably over the past 150 years. This decline is known as the secular trend. (Adapted from Eveleth & Tanner, 1976)

First, consider variations in the age of menarche across different regions of the world. Figure 1.7 presents median menarcheal ages throughout the world, across regions that vary considerably in typical dietary intake and health conditions. As you can see, the average age at menarche generally is lower in those countries where individuals are less likely to be malnourished or to suffer from chronic disease. For example, in Western Europe and in the United States, the median menarcheal age ranges from about 12.5 years to 13.5 years. In Africa, however, the median menarcheal age ranges from about 14 years to about 17 years. The range is much wider across the African continent because of the much greater variation in environmental conditions there.

When we look *within* a specific region, we find that, almost without exception, girls from affluent homes reach menarche before economically disadvantaged girls. In comparisons of affluent and poor youngsters from the United States, Hong Kong, Tunis, Baghdad, and South Africa, for example, differences in the average menarcheal ages of economically advantaged and disadvantaged youngsters within each

of these regions range from about 6 months to about 18 months.

Finally, we can examine environmental influences on the timing of puberty by looking at changes in the average age of menarche over the past two centuries. Because nutritional conditions have improved during the past 150 years, we would expect to find a decline in the average age at menarche over time. This is indeed the case, as can be seen in figure 1.8. Generally, “children have been getting larger and growing to maturity more rapidly” (Eveleth & Tanner, 1990, p. 205). This pattern, referred to as the **secular trend**, is attributable not only to improved nutrition but also to better sanitation and better control of infectious diseases. In most European countries, maturation has become earlier by about three to four months per decade. For example, in Norway 150 years ago, the average age of menarche may have been about 17 years. Today, it is between 12 and 13 years. Similar declines have been observed over the same time period in other industrialized nations and, more recently, in developing countries. The secular trend is less well documented among boys, in part be-

cause there is no easily measured indicator of puberty, such as menarche, in boys and in part because reproductive development is less sensitive to environmental stimuli among males than females. Although some data suggest that the secular trend in pubertal maturation appears to be leveling off in most industrialized nations, other studies indicate that the onset of puberty has continued to occur earlier, at least among girls. Today, a significant minority of American girls show one or more signs of puberty by age 7 (Herman-Giddens et al., 1997), and the average child reports first feeling sexually attracted to others at around age 10 (McClintock & Herdt, 1996).

RECAP

There is considerable variation in the timing and tempo of puberty. As a result, a group of adolescents of the same chronological age will contain youngsters whose physical maturity varies considerably. The most important influence on the timing of maturation is genetic. But, in addition, adolescents who have been well nourished and healthy during childhood go through puberty earlier than their peers. Because of improvements in nutrition and health care, young people mature earlier today than they did centuries ago, a phenomenon known as the secular trend.



Food for Thought

Data seem to indicate that the trend toward earlier puberty has been much greater among females than males.

Can you speculate on why this might be?

THE PSYCHOLOGICAL AND SOCIAL IMPACT OF PUBERTY

Puberty can affect the adolescent's behavior and psychological functioning in a number of ways (Brooks-Gunn, Graber, & Paikoff, 1994). First, puberty's biological changes can have a direct effect on behavior. Increases in testosterone at puberty are directly linked, for example, to an increase in sex drive and sexual activity among adolescent boys (Halpern, Udry, & Suchindran, 1996). (The impact of hormonal change on girls' sex drive and sexual activity is more complicated, as you will read in chapter 11.)

Second, the biological changes of puberty cause changes in the adolescent's self-image, which in turn may affect how he or she behaves. For example, a boy who has recently gone through puberty may seek more privacy at home when he is dressing or bathing. He closes his door more often and is more modest around his parents than he used to be. If they are responsive to his discomfort, his parents will change their routines around the house. Before entering his room, they will knock and wait to see if he is dressed—something they did not have to do before.

Finally, biological change at puberty transforms the adolescent's appearance, which in turn may elicit changes on how *others* react to the teenager. These changes in reactions may provoke changes in the adolescent's behavior. An adolescent girl who has recently matured physically may find herself suddenly receiving the attention of older boys, who had not previously paid her much heed. She may feel nervous about all the extra attention and may be confused about how she should respond to it. Moreover, she must now make decisions about how much time she wishes to devote to dating and how she should behave when out on a date.

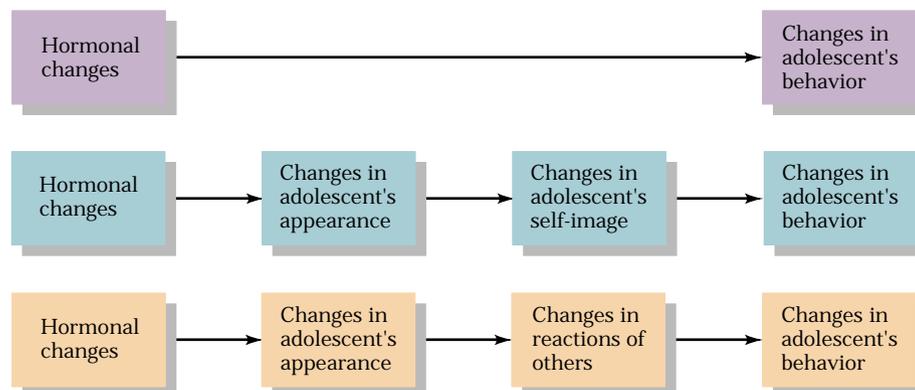


Figure 1.9 *The biological changes of puberty can affect the adolescent's behavior in at least three ways.*



▲ One sign that attitudes toward menstruation have changed in the past 50 years is that advertisements for tampons and sanitary napkins have become far more explicit and far mysterious. As a consequence, today's adolescent girls receive messages about the meaning of maturation that are very different from those of 40 or 50 years ago. Here are two excerpts from magazine advertisements for sanitary napkins—one from the 1950s, the other from the 1990s. (KOTEX is a registered trademark of Kimberly-Clark Corporation. These advertisements reprinted by permission. All rights reserved)

Young people's reactions to the changes brought on by puberty, and others' reactions to them, are influenced by the broader social environment, where messages about physical attractiveness, sexuality, and sexual maturation change, often markedly, from era to era. Although it is difficult to imagine an era in which adolescents, especially girls, did not obsess about their shape, size, and sexual allure, adolescent females' preoccupation with their body is a relatively recent phenomenon, created largely by marketers of clothing, undergarments, cosmetics, weight-loss programs, and "feminine" products (Brumberg, 1997). Contemporary society's views of puberty and physical maturation are expressed through television commercials, newspaper and magazine advertisements, and depictions of young adolescents in films and other media. People cannot help but be influenced by these images, and the expectations they associate with puberty as well as the meaning they give it determine the reactions puberty brings out in them. Consider, for example, the treatment of menstruation in each of the advertisements on page 000. What sorts of reactions might each of the ads foster?

Researchers have generally taken two approaches to studying the psychological and social consequences of

puberty. One approach is to look at individuals who are at various stages of puberty, either in a **cross-sectional study** (in which groups of individuals are compared at different stages of puberty) or in a **longitudinal study** (in which the same individuals are tracked over time as they move through the stages of puberty). Studies of this sort examine the immediate impact of puberty on young people's psychological development and social relations. Researchers might ask, for example, whether youngsters' self-esteem is higher or lower during puberty than before or after.

A second approach compares the psychological development of early and late maturers. The focus of these studies is not so much on the absolute impact of puberty but on the effects of differential timing of the changes. Here, a typical question might be whether early maturers are more popular in the peer group than late maturers are.

The Immediate Impact of Puberty

Studies of the psychological and social impact of puberty indicate that physical maturation, regardless of whether it occurs early or late, affects the adolescent's

self-image, mood, and relationships with parents. As you will read, however, the short-term consequences of puberty may be more taxing on the adolescent's family than on the adolescent.

● **Puberty and Self-Esteem** Research suggests that puberty is a potential stressor with temporary adverse psychological consequences for girls (but not boys), but only when it is coupled with other changes that necessitate adjustment (Simmons & Blyth, 1987). Indeed, studies suggest that the impact of puberty on adolescents' psychological functioning is, to a great extent, shaped by the social context in which puberty takes place (Brooks-Gunn & Reiter, 1990; Susman, 1997). Accordingly, the impact of puberty on mental health varies by gender and across ethnic groups, with girls more adversely affected than boys and with white girls, in particular, at greatest risk for developing a poor body image (Rosenblum & Lewis, 1999; Siegel, Yancey, Aneshensel, & Schuler, 1999). Given the premium placed in contemporary society on thinness, the increase in body dissatisfaction among white girls that takes place at puberty is, not surprisingly, linked to specific concerns girls have about their hips, thighs, waist, and weight (Rosenblum & Lewis, 1999). Interestingly, the way adolescents feel about their physical appearance when they begin adolescence remains remarkably stable over time, regardless of whether their actual attractiveness changes (Rosenblum & Lewis, 1999).

● **Adolescent Moodiness** Although an adolescent's self-image could be expected to be changed during a time of dramatic physical development, it could also be the case that self-esteem or self-image is a reasonably stable characteristic, with long and sturdy roots reaching back to childhood. For this reason, some researchers have turned their attention to the impact of puberty on more transient states, such as mood. One reason for this focus is that adolescents are thought to be moodier, on average, than either children or adults. One study, in which adolescents' moods were monitored repeatedly by electronic pagers, for example, showed that adolescents' moods fluctuate during the course of the day more than the moods of adults do (Csikszentmihalyi & Larson, 1984) (see figure 1.10).

Many adults assume that adolescent moodiness is directly related to the hormonal changes of puberty (Petersen, 1985). Is there any scientific evidence that the

hormonal changes of puberty cause adolescents to be moody or, for that matter, that these hormonal changes affect the adolescent's psychological functioning or behavior at all?

According to several comprehensive reviews of research on hormones and adolescent mood and behavior, the direct connection between hormones and mood, although apparent, is not very strong (Buchanan, Eccles, & Becker, 1992; Flannery, Torquati, & Lindemeier, 1994). When studies do find a connection between hormonal changes at puberty and adolescent mood or behavior, the effects are strongest early in puberty, when the system is being "turned on" and when hormonal levels are highly variable. For example, studies indicate that *rapid* increases in many of the hormones associated with puberty—such as testosterone, estrogen, and various adrenal androgens—especially when the increases take place very early in adolescence, may be associated with increased irritability, impulsivity, aggression (in boys), and depression (in girls). One interpretation of these findings is that it is not so much the absolute increases in these hormones during puberty but their rapid fluctuation early in puberty that may affect adolescents' moods. Once the hormone levels stabilize at higher levels, later in puberty, their negative effects appear to wane (Buchanan et al., 1992). There is also evidence, which is discussed in chapter 2, that important changes take place in early adolescence in the regions of the brain that play major roles in the processing of emotion (Spear, 2000).

Even still, most researchers agree that the impact of hormonal change on mood and behavior in adolescence is greatly influenced by environmental factors (Susman, 1997). An excellent illustration of the way in which hormones and environment interact at puberty comes from the work of psychologist Jeanne Brooks-Gunn and her colleagues (Brooks-Gunn, 1987, 1989; Brooks-Gunn, Graber, & Paikoff, 1994; Brooks-Gunn & Warren, 1989), who have been studying the development of psychological problems, such as depression and aggression, in young girls around the time of puberty. Although rapid increases in hormones early in puberty are associated with depressed mood in girls, it turns out that stressful life events, such as problems in the family, in school, or with friends, play a far greater role in the development of depression than do hormonal changes. Moreover, as she and others point out, it is possible that changes in the environment—in levels of stress, for instance—

Table 1.2 Five patterns of adolescent moodiness

Pattern	Size of Mood Change	Rate of Mood Change	Typical Mood	Intensity of Mood
I	Very large	Very fast	Positive	Very high
II	Small	Average	Positive	Low
III	Small	Slow	Negative	Very low
IV	Very large	Average	Negative	High
V	Average	Slow	Very negative	High

Source: Bence, 1992.

affect hormonal activity, which in turn may affect adolescents' mood.

Interestingly, not only is there little evidence that adolescents' moodiness results from the storm and stress of raging hormones, but there is also research that questions the very idea that adolescents are inherently moodier than children. Psychologists Mihaly Csikszentmihalyi and Reed Larson (1984; Larson & Lampman-Petratis, 1989) had teenagers carry electronic pagers similar to the ones physicians carry, and the researchers paged them periodically throughout the day. When the adolescents were paged, they filled out forms noting how they were feeling, what they were doing, where they were, and whom they were with. By looking at changes in mood across activities and settings, the researchers were able to determine the correlates of adolescent moodiness.

Their findings suggest that adolescent mood swings parallel their changes in activities. Over the course of a day, a teenager may shift from elation to boredom, back again to happiness, and then to anger. But this shifting appears to have more to do with shifts in activities—elated when seeing a girlfriend, bored in social studies class, happy when having lunch with friends, and angry when assigned extra work at the fast-food restaurant—than with internal, biological changes. More important, comparisons of youngsters between the ages of 9 and 15 did not show increases in moodiness during the transition into adolescence. Although adolescents may be moodier than adults, it is probably because they change activities and contexts more often than adults do.

How can we reconcile these scientific studies, which provide little support for the notion that adolescents are especially prone to mood swings, with the popular portrayals of teenagers as exceedingly moody? One suggestion is that there is a great deal of variability within the adolescent population in

moodiness. In one study of adolescents, for example, five distinct patterns of mood change were identified (Bence, 1992) (see table 1.2). One group showed considerable fluctuation in mood over the course of a week, but members typically were in a positive mood (these youngsters bounced back up to positive moods quickly after being in a bad mood). A second group was, on average, equally positive as the first but showed much less mood fluctuation. The third group was similar to the second, in that members showed little fluctuation in mood; however, in contrast to the second group, the third group was generally in a slightly bad mood. The fourth group, like the first, showed considerable fluctuation in mood but was generally in a bad mood (that is, members dropped back down to negative moods quickly after being in a positive mood). Finally, the fifth group was composed of youngsters whose mood did not fluctuate greatly but who were in an extremely negative mood most of the time.

● **Changes in Sleep Patterns** One fascinating finding on hormones and behavior in adolescence concerns adolescents' sleep preferences. Many parents complain that their teenage children go to bed too late in the evening and sleep too late in the morning. It now appears that the emergence of this pattern—called a **delayed phase preference**—is directly related to the biological changes of puberty (Carskadon, Acebo, Richardson, Tate, & Seifer, 1997). Thus, physically mature teenagers who are forced to maintain a sleep schedule similar to that of prepubertal individuals have biological reasons to feel energetic when it is time to go to bed and lethargic in the morning. When allowed to regulate their own sleep schedules (as on weekends), most teenagers will stay up until around 1 A.M. and sleep until about 10 A.M. It is therefore ironic that many school districts ask

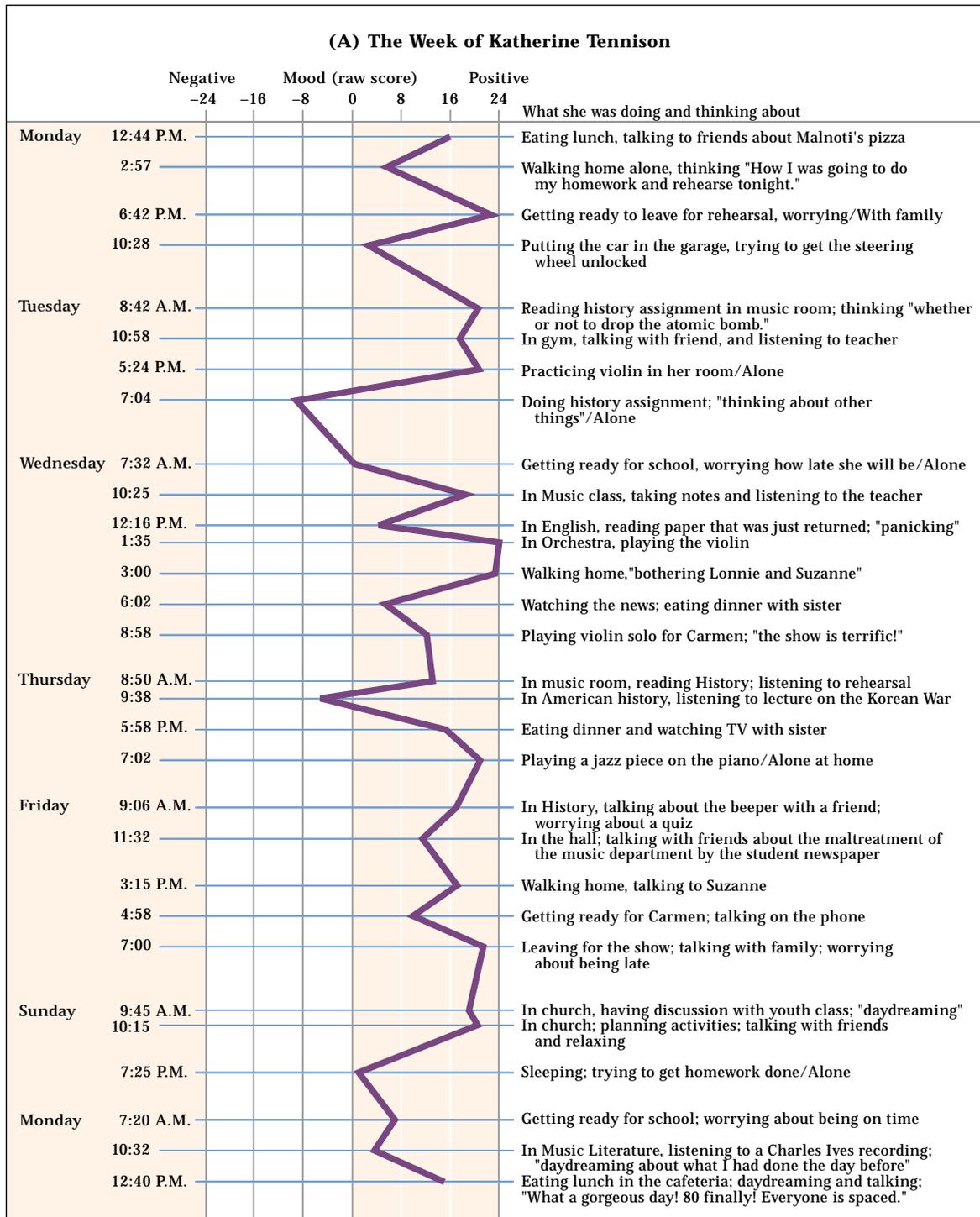
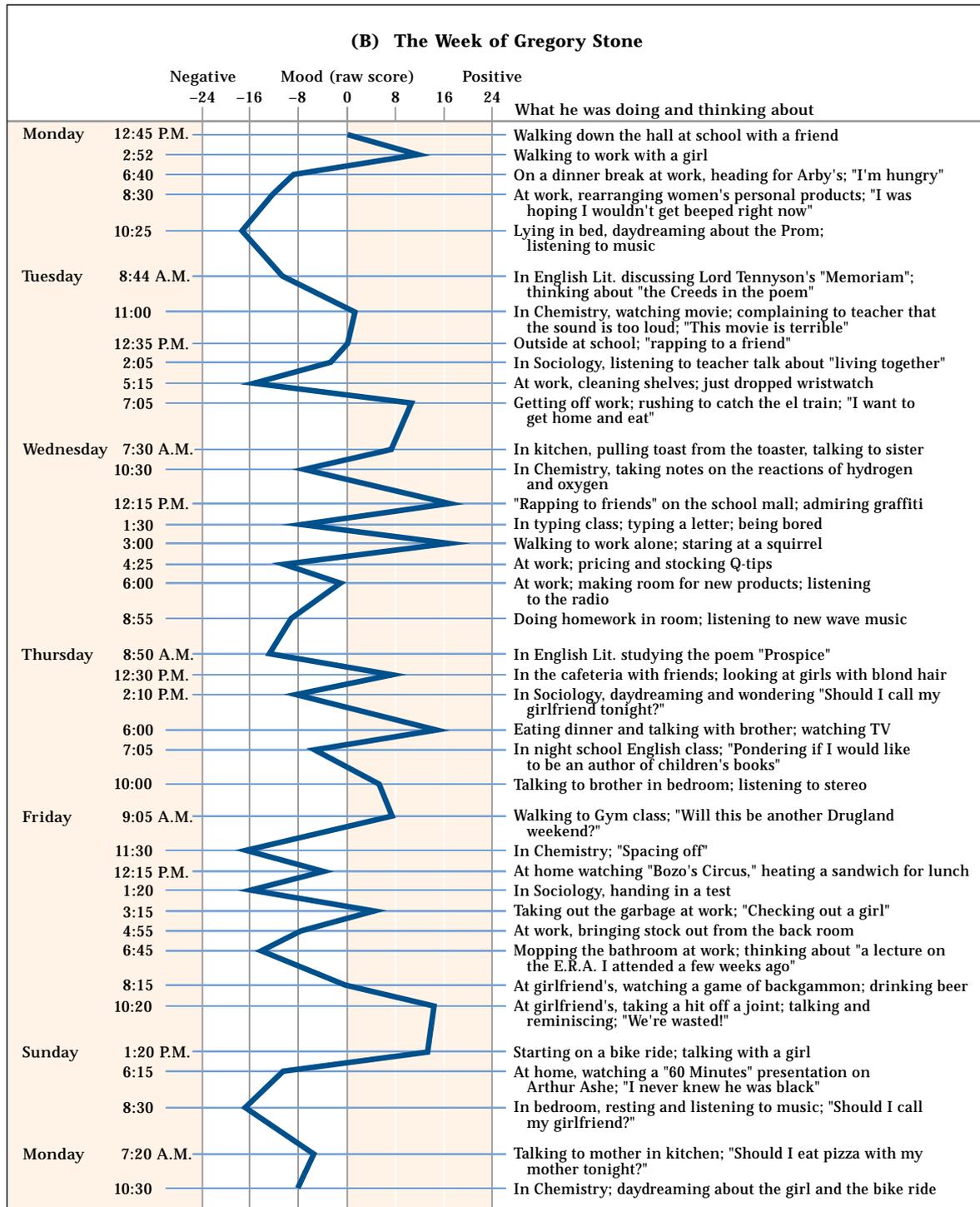


Figure 1.10 Fluctuations in two adolescents' moods over the course of week. (Csikszentmihalyi & Larson, 1984)





▲ *Studies indicate that parent-adolescent conflict may increase during puberty.* (Stewart Cohen/Tony Stone Images)

adolescents to report to school even *earlier* than younger children, since this demand clearly conflicts with the natural sleep preferences of adolescents. Indeed, one study found that adolescents were least alert between the hours of 8 and 9 A.M. (when most schools start) and were most alert after 3 P.M., when the school day is over (Allen & Mirabell, 1990).

Although individuals' preferred bedtime gets later as they move from childhood into adolescence, the amount of sleep they need each night remains constant, at around nine hours. Yet in one study of more than 3,000 Rhode Island high school students, it was found that only one-fifth of the students got at least eight hours of sleep on an average school night and that nearly half got seven hours or less (Wolfson & Carskadon, 1998). There is now a clear consensus among scientists that most American teenagers are not getting enough sleep, and that inadequate sleep is associated in adolescence with poorer mental health (more depression and anxiety) and lowered school performance. In the Rhode Island study, for example, the students who were earning grades of *C* or lower were going to bed 40 minutes later and sleeping about 25 minutes less each night than their classmates whose grade-point averages were *B* or better. The students with poorer

grades also reported staying up considerably later on weekends than they did on school nights. Despite many adolescents' belief that catching up on their sleep on weekends makes up for sleep deprivation during the week, research indicates that having markedly different bedtimes on weekend versus weekday evenings contributes to further sleep-related problems (Wolfson & Carskadon, 1998).

● **Puberty and Family Relationships** Research into the impact of puberty on family relationships has pointed to a fairly consistent pattern—namely, that puberty appears to increase conflict and distance between parents and children. The distancing effect of puberty on adolescent-parent relationships is not as strong in single-parent homes (Anderson, Hetherington, & Clingempeel, 1989) and not as consistently observed in ethnic minority families, however (Molina & Chassin, 1996; Sagrestano, McCormick, Paikoff, & Holmbeck, 1999). Among white families, though, several studies show that, as youngsters mature from childhood toward the middle of puberty, distance between them and their parents increases, and conflict intensifies, especially between the adolescent and his

or her mother (Laursen, Coy, & Collins, 1998; Paikoff & Brooks-Gunn, 1991). The change that takes place is reflected in an increase in “negatives” (e.g., conflict, complaints, anger) and, to a lesser extent, a decrease in “positives” (e.g., support, smiles, laughter) (e.g., Flannery et al., 1994; Holmbeck & Hill, 1991). Although negative interchanges may diminish after the adolescent growth spurt, adolescents and their parents do not immediately become as close as they were before the adolescents entered puberty. Interestingly, puberty increases distance between children and their parents in most species of monkeys and apes, and some writers have suggested that the pattern seen in human adolescents has some evolutionary basis (Steinberg, 1987a).

Because this connection between pubertal maturation and parent-child distance is not affected by the age at which the adolescent goes through puberty—in other words, the pattern is seen among early as well as late maturers—it suggests that something about puberty in particular transforms the parent-child bond. To date, it is unknown whether this effect results from the hormonal changes of puberty, from changes in the adolescent’s physical appearance, or from changes in adolescent psychological functioning, which in turn affect family relationships. Moreover, because few studies of family relationships at puberty have examined multiple aspects of adolescent development simultaneously, it is difficult to say whether the patterns of change in family relationships that many studies have found do, in fact, result from puberty and not from another change taking place at the same time in the adolescent or in the parent (Paikoff & Brooks-Gunn, 1991).

Whatever underlying mechanism that is involved, one interpretation of these studies is that developments occurring around the time of puberty can upset the interpersonal balances established during childhood, causing temporary periods of disruption in the family system. During a son’s or daughter’s childhood, families develop patterns of relationships that are comfortable and workable, but they may find that puberty disrupts the patterns to which they have grown accustomed. They have developed a certain way of discussing things and a certain way of including the children in discussions. However, as the children go through puberty, they may want to be treated more like adults and may want to have greater say in family decisions. Consequently, families may experience a temporary period of conflict or tension when

sons and daughters enter early adolescence. It may take some time for the individual and the family to achieve a new equilibrium that takes into account the changes brought on by puberty.

Puberty may have an effect on relationships in the peer group, too. One study of adolescents’ social networks—the people they are most likely to see and spend time with—found that adolescents who were physically mature were less likely than their less developed peers to name adults as people who were important to them, and they were more likely to name other adolescents (Garbarino, Burston, Raber, Russell, & Crouter, 1978). This finding suggests that pubertal maturation may influence adolescents’ interests and energies toward the peer group. Boys and girls who are physically mature are more likely than less mature age-mates to be involved in cross-sex activities, such as having a boyfriend or girlfriend and going out on dates (Crockett & Dorn, 1987), although this depends on the social norm of the adolescent’s peer group and the prevailing expectations about the age at which teenagers should begin dating (Dornbush et al., 1981; Gargiulo, Attie, Brooks-Gunn, & Warren, 1987).

The Impact of Specific Pubertal Events

Several studies have focused specifically on adolescents’ attitudes toward and reactions to particular events at puberty, such as girls’ reactions to menarche or breast development, and boys’ reactions to their first ejaculation. In general, most adolescents react positively to the biological changes associated with puberty, especially those associated with the development of secondary sex characteristics. One study of adolescent girls’ attitudes towards breast development, for example, found that most of the girls greeted this change positively (Brooks-Gunn, Newman, Holderness, & Warren, 1994).

Girls’ reactions to menarche are more varied, however, in part because the onset of menstruation is “not just one of a series of physiological events during puberty, but is also a sociocultural event . . . imbued with special meaning” (Brooks-Gunn & Ruble, 1979, p. 1). Cultural beliefs concerning menarche and the specific information that a young woman receives from parents, teachers, friends, and health practitioners all influence how she greets and experiences menarche (Brooks-Gunn & Ruble, 1982).

Adolescent girls’ attitudes toward menarche are less negative today than they appear to have been in the past (Grief & Ulman, 1982; Ruble & Brooks-Gunn, 1982), a

change that may be attributable to the more open presentation of information about menstruation in schools and in the media in recent years (Merskin, 1999). In general, among today's adolescent girls, menarche is typically accompanied by gains in social maturity, peer prestige, and self-esteem—as well as by heightened self-consciousness (Brooks-Gunn & Reiter, 1990). Nevertheless, many young women have developed a negative image of menstruation before reaching adolescence, and they enter puberty with ambivalent attitudes about menarche—a mixture of excitement and fear (Moore, 1995; Ruble & Brooks-Gunn, 1982).

Interestingly, one set of studies indicates that a strong negative bias toward menstruation before menarche may actually be associated with greater menstrual discomfort. Menstrual symptoms are reported to be more severe among women who expect menstruation to be uncomfortable, among girls whose mothers lead them to believe that menstruation will be an unpleasant or uncomfortable experience, and in cultures that label menstruation as an important event. In addition, girls who experience menarche early, relative to their peers, or who are otherwise unprepared for puberty report more negative reactions to the event (Koff & Rierdan, 1996; Rierdan, Kobb, & Stubbs, 1989).

Far less is known about boys' reactions to their first ejaculation, an experience that we might consider analogous to menarche in girls. Although most boys are not very well prepared for this event by their parents or other adults, first ejaculation does not appear to cause undue anxiety, embarrassment, or fear. It is interesting to note, however, that, in contrast to girls, who generally tell their mothers shortly after they have begun menstruating and tell their girlfriends soon thereafter, boys, at least in the United States, do not discuss their first ejaculation with either parents or friends (Gaddis & Brooks-Gunn, 1985; Stein & Reiser, 1994). In other cultures, the event may be experienced somewhat differently. For example, one study of first ejaculation among adolescent boys in Nigeria found not only that the boys were not upset by the event but also that they told their friends about the experience very soon after it occurred (Adegoke, 1993). Cultural differences in boys' responses to their first ejaculation are likely related to differences in how different cultures view masturbation. As is the case with girls and menarche, boys' reactions to their first ejaculation are more positive when they have been prepared for the event (Stein & Reiser, 1994).

RECAP

Although puberty may cause temporary disruption in the adolescent's social relationships and changes in sleep patterns, research has not shown that puberty is inherently stressful or associated with dramatic changes in mood or behavior. Puberty may be associated with increases in negative moods, but only during the very early stages of hormonal change, when hormone levels are fluctuating widely. More important than puberty itself is how puberty is viewed within the context in which the adolescent matures, as well as the extent to which the adolescent has been prepared psychologically for the biological changes of the era.



Food for Thought

Examine the two mood diagrams that were presented in figure 1.10. Can you draw any generalizations about the role of context in mood fluctuation?

The Impact of Early or Late Maturation

Adolescents who mature relatively early or relatively late stand apart from their peers physically and may, as a consequence, elicit different sorts of reactions and expectations from those around them. Moreover, individual adolescents may be all too aware of whether they are early or late relative to their agemates, and their feelings about themselves are likely to be influenced by their comparisons. Indeed, adolescents' *perceptions* of whether they are an early or a late maturer are more strongly related to their feelings about their physical maturation than whether they actually are early or late (Dubas, Graber, & Petersen, 1991), and adolescents' behavior is related to how old they feel, not simply to how physically mature they actually are (Galambos, Kolaric, Sears, & Maggs, 1999). Nevertheless, early and late maturers are often treated differently by others and view themselves differently; as a result, they may behave differently. As we will see, however, early and late maturation have different consequences in the immediate present and the long run; different consequences in different contexts; and, most important, different consequences for boys and girls.

● **Early Versus Late Maturation Among Boys** The first studies to compare early- and late-maturing boys suggested that it is an advantage to mature earlier than

one's peers. Drawing on data collected as part of the Oakland Growth Study (a longitudinal study begun early in the twentieth century), psychologist Mary Jones and her colleagues compared early- and late-maturing boys on a variety of psychological tests and measures of interpersonal relationships (Jones, 1957, 1965; Jones & Bayley, 1950; Mussen & Jones, 1957, 1958). They found that late maturers were seen by their peers as more childish and were less popular and less likely to have held leadership positions. On personality measures, late-maturing boys exhibited stronger feelings of inadequacy, more negative self-concepts, and less self-assurance.

More recent studies of early versus late maturation have confirmed many of the findings from these earlier studies. As was the case a half-century ago, late-maturing boys today have relatively lower self-esteem and stronger feelings of inadequacy, whereas early-maturing boys are more popular and have a more positive self-image (Graber, Lewinsohn, Seeley, & Brooks-Gunn, 1997). Consistent with this, a study of adolescents' daily moods indicates that boys who are more physically mature than their peers report more frequent feelings of positive affect, attention, strength, and being in love (Richards & Larson, 1993).

With regard to behavior, however, the data on early versus late maturers is quite consistent: In general, early maturers are more likely than their peers to get involved in antisocial or deviant activities, including truancy, minor delinquency, and problems at school (Duncan, Ritter, Dornbusch, Gross, & Carlsmith, 1985), and they are more likely to use drugs and alcohol and engage in other risky activity (Andersson & Magnusson, 1990; Silbereisen, Kracke, & Crockett, 1990; Williams & Dunlop, 1999). One reasonable explanation is that boys who are more physically mature develop friendships with older peers and that these friendships lead them into activities that are problematic for the younger boys. Once involved with these older peer groups, the early maturers' higher rate of delinquency and substance use increases over time through their social contacts (Silbereisen, Petersen, Albrecht, & Kracke, 1989). Thus, early puberty seems to play a role in the initiation, but not the intensification, of substance use.

It is clear that early-maturing boys enjoy some psychological advantages over late maturers during early adolescence, when some boys have matured physically but others have not. But what about later during adolescence, when the late maturers have caught up? At least one study points to some interesting advantages



▲ *These adolescents are all the same chronological age, despite their markedly different physical appearances. Among boys, early maturation is associated with greater popularity and higher self-esteem. Although early-maturing girls are also more popular with their peers, they report more emotional difficulties than young women who mature later. (Alan Carey/Image Works)*

for late-maturing boys, despite their initially lower popularity with peers. Although early and late maturers exhibit similar psychological profiles before they enter adolescence, during the time of pubertal onset, as well as one year later, late maturers show significantly higher ratings on measures of intellectual curiosity, exploratory behavior, and social initiative. Interestingly, early maturers experience more frequent and more intense temper tantrums during puberty (Livson & Peskin, 1980).

Why might this be? One explanation is that late maturers have the advantage of a longer preadolescent period, giving them more time to prepare psychologically for the onset of puberty (Peskin, 1967). This preparation may be important if rapid increases in hormones at puberty provoke changes in mood. Many theorists believe that the middle childhood and preadolescent years are extremely important periods for the development of coping skills—skills that prove valuable during adolescence and adulthood. Although puberty by no means marks the end of the growth of coping abilities,

it does come as an abrupt interruption to the more relaxed preadolescent era. A later puberty, and hence a longer preadolescence, might allow for coping skills to develop more fully before adolescence. This may account in part for the apparently better coping skills demonstrated by late maturers—not only during puberty but as adults.

Do the psychological and interpersonal differences that are observed between early and late maturers during adolescence persist into adulthood? In order to answer such questions, a series of follow-up studies conducted 25 years later looked at the adult personalities of males who had been studied during adolescence (Livson & Peskin, 1980). At age 38, the early maturers were more responsible, more cooperative, more self-controlled, and more sociable. At the same time, though, early maturers had also grown up to be more conforming, conventional, and humorless. Their peers who had been late maturers remained somewhat more impulsive and more assertive but turned out to be more insightful, more inventive, and more creatively playful. What had happened?

One interpretation is that, because of their more adultlike appearance, the early-maturing boys had been pushed into adult roles earlier than their peers. They were more likely to be asked to assume responsibility, to take on leadership positions, and to behave in a more grown-up manner. But this early press toward adulthood may have come too soon and may have stifled a certain amount of creativity and risk taking.

Have you gone to any gatherings of former high school classmates? Did you discover that some of the people you had remembered as extremely mature and socially successful during high school have turned out to be not all that interesting a few years after graduation? Perhaps too much leadership, responsibility, social success, and maturity during the high school years interferes with the sort of psychological development that makes for interesting and creative adults. Many psychologists believe that adolescents may benefit in the long run from having an extended period of time during which they are *not* being pushed into adulthood.

In short, success and social status may come too easily and too early for early-maturing boys, leaving them with less need to develop creative or flexible solutions to life's problems and less time to experiment with new roles and identities. In contrast, late-maturing youngsters, experiencing more difficulty in achieving social standing and recognition because of their immature physical appearance, may be forced to develop more in-

ventive means of problem solving and greater cognitive and social flexibility. In other words, the greater difficulty that late maturers face as early adolescents may lead to their developing coping skills that prove useful when they reach adulthood. Unfortunately, however, at least one study of late-maturing boys indicates that heavy drinking may be one of the “coping” behaviors that persists into young adulthood (Andersson & Magnusson, 1990).

● **Early Versus Late Maturation in Girls** Early research on this issue, again conducted by researchers working on the Oakland Growth Study, suggested that, in contrast to boys, early-maturing girls are at a disadvantage—although the findings were far less consistent than they were in the studies of boys (Jones, 1949; Jones & Mussen, 1958). Early-maturing girls were found to be “less popular, less poised, less expressive, and more submissive, withdrawn, and unassured than [their] age-mates” (Livson & Peskin, 1980, p. 71). Like the late-maturing boy, the early-maturing girl is out of step with her peers. And, since girls mature about two years earlier than boys, the early-maturing girl is not only more physically advanced than her female peers but far more advanced than nearly all her male classmates as well. In these studies, the late-maturing girls were more likely to be seen as attractive, sociable, and expressive.

As is the case with research on early- and late-maturing boys, more recent research on girls has tended to corroborate the findings of the earlier studies, but we have learned a good deal more about the development of early-maturing girls, in particular, in the ensuing years. A number of studies find that early-maturing girls have more emotional difficulties than do girls who mature on time or late, including lowered self-image and higher rates of depression, anxiety, eating disorders, and panic attacks (Aro & Taipale, 1987; Ge, Conger, & Elder, 1996; Graber et al., 1997; Hayward et al., 1997). These difficulties seem to have a great deal to do with girls' feelings about their weight, because early maturers are, almost by definition, heavier than their late-maturing peers (Petersen, 1988). In societies that define as physically attractive the thin, “leggy” woman, a late-maturing girl will look more like this image than an early-maturing girl will.

Whether earlier maturation has a negative effect on the young girl's feelings about herself appears to depend on the broader context in which maturation takes place, however. For example, studies of American girls generally find that early-maturing girls have lower self-

esteem and a poorer self-image because of our cultural preference for thinness and our national ambivalence about adolescent sexuality (Brooks-Gunn & Reiter, 1990). In Germany, however, where sex education is more open and attitudes toward adolescent sexuality are less conflicted, early-maturing girls are found to have *higher* self-esteem (Silbereisen et al., 1989).

Interestingly, even *within* the United States, the impact of physical maturation appears to depend on the social context in which teenagers live (Dyer & Tigge-mann, 1996). One study of suburban Chicago youngsters, for example, found that the girls' body image was significantly higher in one community than in another—despite comparable levels of physical maturation between the two groups. One factor that differentiated the two communities was “cliquishness”: In the more cliquish high school, girls were less satisfied with the way they looked, perhaps because cliquish girls place more emphasis on physical appearance in determining popularity (Richards, Boxer, Petersen, & Albrecht, 1990).

Although some early-maturing girls may have self-image difficulties, their popularity with peers is not jeopardized. Indeed, some studies indicate that early maturers are more popular than other girls, especially, as you would expect, when the index of popularity includes popularity with boys (Simmons, Blyth, & McKinney, 1983). Ironically, it may be in part because the early maturer is more popular with boys that she reports more emotional upset: At a very early age, pressure to date and, perhaps, to be involved in a sexual relationship may take its toll on the adolescent girl's mental health. Consistent with this, research indicates that early-maturing girls are more vulnerable to emotional distress when they have relatively more opposite-sex friendships (Ge et al., 1996) and when they are in schools with older peers (for example, sixth-graders who are in a school that also has seventh- and eighth-graders) (Blyth, Simmons, & Zakin, 1985). Again, we see the importance of context.

Like their male counterparts, early-maturing girls are also more likely to become involved in deviant activities, including delinquency and drug and alcohol use; are more likely to have school problems; and are more likely to experience early sexual intercourse (Aro & Taipale, 1987; Caspi & Moffitt, 1991; Flannery, Rowe, & Gulley, 1993; Ge et al., 1996; Graber et al., 1997; Magnusson, Stattin, & Allen, 1986). This is true in Europe as well as in the United States (Silbereisen et al., 1989). These problems appear to arise because early-

maturing girls are more likely to spend time with older adolescents, especially older adolescent boys, who initiate them into activities that might otherwise be delayed (Magnusson et al., 1986). Girls with a history of problem behavior prior to puberty appear most susceptible to the adverse effects of early maturation (Caspi & Moffitt, 1991) (see “The Scientific Study of Adolescence: Early Maturation and Girls' Problem Behavior—Activation or Accentuation?”).

Again, however, it is important to consider the role of context in interaction with pubertal change. Although it is generally true that early-maturing girls are more likely to engage in delinquent behavior than are their late-maturing peers, a study of New Zealand youngsters indicates that this may hold true only for girls who attend coeducational high schools (Caspi, Lynam, Moffitt, & Silva, 1993). Early-maturing girls in all-female schools are no more likely than late maturers to be involved in delinquent activities, presumably because there are far fewer opportunities for delinquency in same-sex schools. Thus, although early puberty may predispose girls toward more frequent and earlier deviance, this predisposition may be realized only in an environment that permits the behavior—such as a school that places early-maturing girls in close contact with older boys.

One study of the adult personalities of women who had been either early or late maturers suggests some interesting parallels between the personality development of early-maturing girls and late-maturing boys (Peskin, 1973). Both sets of youngsters may have self-esteem problems during adolescence, but both appear to be somewhat more psychologically advanced than their peers during adulthood. Like late-maturing boys, early-maturing girls may be forced to develop coping skills during adolescence that have some long-term positive effects.

At the same time, however, more recent research indicates that the earlier involvement of early-maturing girls in problem behavior may adversely affect their long-term educational achievement. In one study of Swedish girls, for example, the researchers found that the school problems of the early-maturing adolescent girls persisted over time, leading to the development of negative attitudes toward school and lower educational aspirations. In young adulthood, there were marked differences between the early- and late-maturing girls' levels of education; for example, the late-maturing girls were twice as likely as the early-maturing girls to continue beyond the compulsory minimum number of years of high school (Magnusson et al., 1986).

The Scientific Study of Adolescence

Early Maturation and Girls' Problem Behavior—Activation or Accentuation?

As you know, researchers have observed for some time now that early physical maturation in both boys and girls is associated with higher rates of problem behavior, including delinquency, drug and alcohol use, and precocious sexual activity. But does early maturation by itself actually cause problem behavior to emerge at adolescence? Or are the two variables associated in some other fashion?

In order to examine this question, psychologists Avshalom Caspi and Terrie Moffitt drew on data from an extensive study of 15-year-old New Zealand girls who had been studied since birth (Caspi & Moffitt, 1991). One of the interesting features of the data set used by the researchers was that measures of problem behavior had been gathered on the adolescents both during childhood, well before the onset of puberty (at age 9), and during adolescence, after puberty had begun (at ages 13 and 15). The researchers used age at menarche as their indicator of early

(menarche before age 13), on-time (menarche between 13 and 14), and late (menarche after age 14) maturation. They looked to see whether problem behavior increased between 13 and 15 to a greater degree among early maturers than among the other girls.

As hypothesized, and consistent with other studies, Caspi and Moffitt noted a larger increase in problem behavior between ages 13 and 15 among the early-maturing girls. However, when they further broke down the early-maturing sample into two smaller groups—girls who had shown high rates of problem behavior before puberty and those who had not—they saw an interesting pattern: Early maturation was associated with an increase in problem behavior only among those girls who had a history of difficulties. As you can see in the accompanying figure, the discrepancy in problem behavior between early maturers and other girls is far more evident in the group of girls who had been rated high

RECAP

Psychologists have long been interested in the consequences of early versus late physical maturation. In general, early maturation brings with it more social advantages for boys and girls, but very early maturation may be somewhat of a psychological liability for girls, at least in the United States. For both sexes, however, early physical maturation is associated with more problem behavior, including drug and alcohol use, delinquency, and precocious sexual activity. This may be because early maturers see themselves as being more adult and, consequently, as being more entitled to engage in these activities. It is important to keep in mind, however, that early maturation has different effects in different social contexts.



Food for Thought

What are the major advantages and disadvantages of early pubertal maturation? of late maturation? How are these advan-

tages and disadvantages similar, and how are they different, between males and females? How might the advantages and disadvantages of being early, on time, or late vary across historical eras?

EATING DISORDERS

Although a variety of nutritional and behavioral factors can lead to weight gains during adolescence, gaining weight can sometimes result directly from the physical changes of puberty. Not only does the ratio of body fat to muscle increase markedly during puberty, but the body's basal metabolism rate also drops about 15 percent. The **basal metabolism rate** is the minimal amount of energy one uses when resting. A person's weight is partly dependent on this rate.

Because adolescence is a time of dramatic change in physical appearance, the young person's overall self-

in problem behavior before adolescence. Indeed, within the group of girls who had been rated low in problem behavior at age 9, there were no differences at all between early and on-time maturers in terms of problem behavior.

Does early maturation cause problem behavior during adolescence? Not entirely; rather, early maturation appears to accentuate, or magnify, differences between individuals that existed prior to adolescence. Why should this be so?

According to Caspi and Moffitt, early puberty is stressful, and stress, they suggest, tends to bring out differences between individuals. Although we tend to think of stress as something that changes people in dramatic ways, Caspi and Moffitt say that just the opposite is true: During times of stress, not only do we not change markedly but we also become even *more* like we were before the stress occurred.

Interestingly, in another paper, these and other researchers used the same data set to examine the possibility that problem behavior leads to early puberty, rather than the reverse (Moffitt, Caspi, Belsky, & Silva, 1992).

Although, like other researchers, they found that earlier maturation is associated with higher levels of family conflict in childhood, they found no evidence that early puberty follows higher levels of behavior problems.

Source: Caspi, A., & Moffitt, T. (1991). Individual differences and personal transitions: The sample case of girls at puberty. *Journal of Personality and Social Psychology*, 61, 157–168.

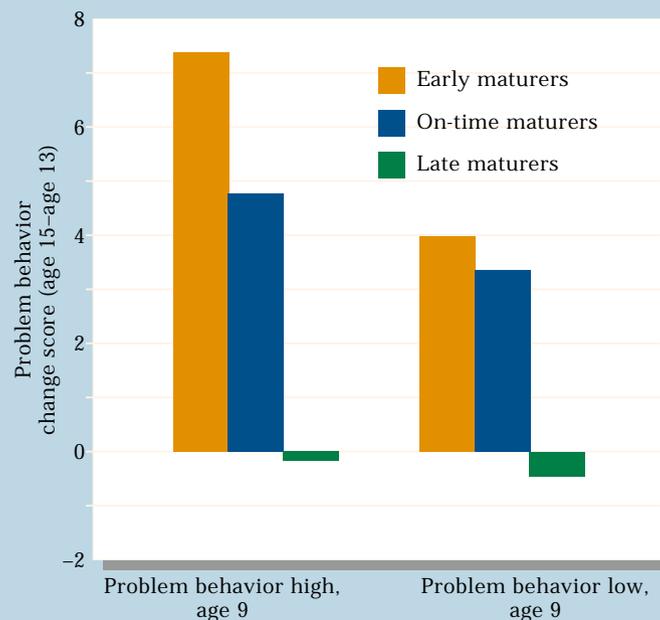


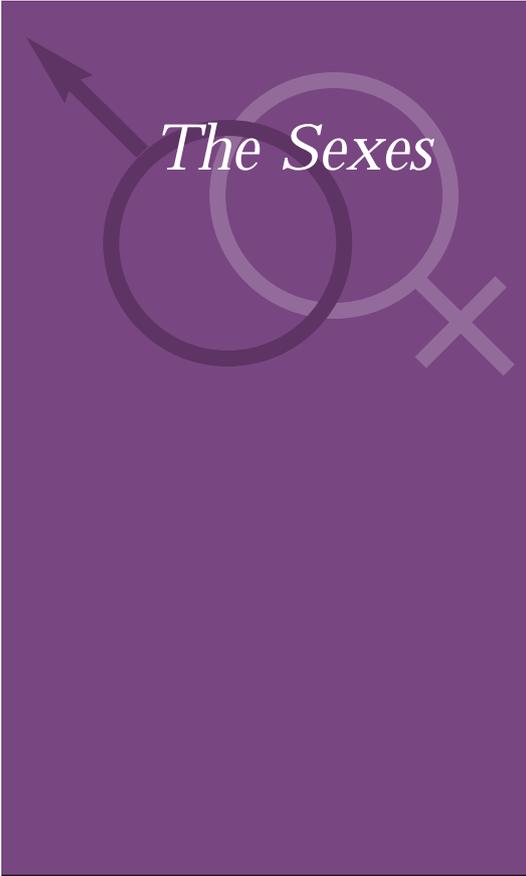
image is very much tied to his or her body image. Deviation from the ideal physique can lead to loss of self-esteem and other problems in the adolescent's self-image. In light of the tremendous emphasis that contemporary society places on being thin, particularly for females, it comes as no surprise to learn that the normal weight gain and change in body composition that accompanies puberty leads many adolescents, especially girls, to become extremely concerned about their weight.

Many adolescents, of course, have legitimate concerns about being overweight. According to national surveys, for example, nearly 20 percent of adolescents in the United States are overweight, and about 5 percent are obese—that is, they are more than 20 percent over the maximum recommended weight for their height—and an additional 15 percent are seriously overweight (Gans, 1990). Current research indicates that obesity is a result of an interplay of genetic and environmental factors (Friedman & Brownell, 1995).

Research on the *psychological* consequences of obesity has not led to consistent conclusions, with some

studies showing higher levels of psychological distress (e.g., depression, low self-esteem) among obese individuals, especially during adolescence, but many studies show no such effect (Friedman & Brownell, 1995). Nevertheless, because nearly 80 percent of obese adolescents will be obese adults, obesity during adolescence places the individual at much higher risk for other health problems, including hypertension (high blood pressure), high cholesterol levels, and diabetes (Must, Jacques, Dallal, Bajema, & Dietz, 1992). The high prevalence of obesity among African American females, in particular, poses a serious risk to the cardiovascular health of this group (Flynn & Fitzgibbon, 1996; Morrison, Payne, Barton, Khoury, & Crawford, 1994). Often, a program of intense physical exercise combined with proper nutrition can help youngsters lose weight (Kimm, 1995).

Health-care professionals have been concerned not only about adolescents who are obese but also about adolescents who have unhealthy attitudes toward eating and toward their body image (French, Story, Downes,



The Sexes

The Effects of Early Maturation

Researchers are still trying to make sense of the complicated pattern of findings that emerges from comparisons of early and late maturers, but one fact is clear: Early maturation brings many more disadvantages for girls than it does for boys. Psychologists have offered several explanations for this sex difference. The explanations all are compatible, but they derive from very different premises.

One explanation might be termed the “deviance” hypothesis (Simmons & Blyth, 1987). Simply put, youngsters who stand far apart from their peers—in physical appearance, for instance—may experience more psychological distress than adolescents who blend in more easily. Studies of adolescents who stand out physically in other ways—obese students and students who attend schools in which

they are clearly in a racial minority—support the view that standing out too much can be an unfortunate disadvantage (Blyth et al., 1980; Simmons et al., 1983). Because girls mature earlier than boys, on average, early-maturing girls mature much earlier than their male and female age mates. This makes them stand out at a time when they would rather fit in and, as a result, may make them more vulnerable. This explanation would also account for the lower self-esteem of late-maturing boys, who are deviant toward the other extreme.

A second explanation focuses on “developmental readiness.” Here the notion is that psychological distress results when youngsters have experiences before they are psychologically ready for them (Simmons & Blyth, 1987). If puberty is a challenge that

Resnick, & Blum, 1995). Egged on by advertisers, who promote the idea that thin is beautiful—middle-class white girls define bodily perfection as being five feet seven inches tall and 110 pounds—many adolescents respond to normal bodily changes at puberty by dieting, often unnecessarily (Brumberg, 1997). Studies, for example, indicate that more than half of all adolescent girls consider themselves overweight and have attempted to diet (Fisher et al., 1995). Psychologists use the term **disordered eating** to refer to patterns of behaviors and attitudes about eating that are unhealthy. Disordered eating can range from unnecessary preoccupation with weight and body image to full-blown clinical eating disorders, such as anorexia and bulimia. Studies show that disordered eating is associated with a range of psychological problems associated with stress, including poor body image, depression, alcohol and tobacco use, and poor interpersonal relationships (French et al., 1995; Graber, Brooks-Gunn, Paikoff, & Warren, 1994; Neumark-Sztainer, Story, Dixon, & Murray, 1998), although it is not clear whether these problems precede, or follow from, disordered eating (Leon, Fulkerson, Perry, Keel, & Klump, 1999).

In contemporary America, as the expression goes, one can never be too rich or too thin. Studies of maga-

zines aimed particularly at women and adolescent girls reveal clear and consistent messages implying that women cannot be beautiful without being slim and suggesting a range of products designed to promote weight loss. Between 1970 and 1990, moreover, the images used in these magazines' advertisements changed, with the ideal body shape becoming slimmer and less curvaceous (Guillen & Barr, 1994, p. 471). Ironically, research indicates that adolescents' attempts to control their weight through intensive dieting, the use of laxatives and appetite suppressants, and deliberate vomiting leads to weight *gain*, not loss (Stice, Cameron, Killen, Hayward, & Taylor, 1999). Girls whose mothers have their own body image problems are especially likely to engage in extreme weight-loss behaviors (Benedikt, Wertheim, & Love, 1998), as are those who report more negative relationships with their parents (Archibald, Graber, & Brooks-Gunn, 1999). Interestingly, among Hispanic American girls, those who are more acculturated (i.e., “Americanized”) are significantly more likely to develop disordered eating than are those who are less acculturated (Gowen, Hayward, Killen, Robinson, & Taylor, 1999).

Not everyone is genetically or metabolically meant to be as thin as fashion magazines tell people they

requires psychological adaptation by the adolescent, perhaps younger adolescents are less able than older ones to cope with the challenge. Because puberty occurs quite early among early-maturing girls (some may begin maturing at age 8 or 9 and may experience menarche at age 10), it may tax their psychological resources. Early maturation among boys, because it occurs at a much later age, would pose less of a problem. The developmental readiness hypothesis has been used to account for the finding that older youngsters (eighth-graders) fare better during the transition from elementary to secondary school than do younger students (sixth-graders). This perspective also helps account for the fact that, in puberty, late-maturing boys seem better able than early maturers to control their temper and their impulses (Peskin, 1967).

A final explanation concerns the cultural desirability of different body

types (Petersen, 1988). Early maturation for girls means leaving behind the culturally admired state of thinness. Among girls, the ratio of fat to muscle increases dramatically at puberty, and many girls feel distressed when they mature because they gain weight. Early maturers experience this weight gain at a time when most of their peers are still girlishly thin. One interesting study showed that, in ballet companies—where thinness is even more important than in the culture at large—late maturers, who can retain the “ideal” shape much longer than earlier maturers, have fewer psychological problems than even on-time girls do (Brooks-Gunn & Warren, 1985). In contrast, at puberty boys move from a culturally undesirable state for males (being short and scrawny) to a culturally admired one (being tall and muscular). Early maturers enjoy the special advantage of being tall and muscular before their

peers and therefore are more likely to react well to puberty. The fact that the effects of early maturation on girls’ self-esteem vary across cultures suggests that contextual factors need to be taken into account in explaining this pattern of sex differences.

Whatever the explanation, the fact that early-maturing girls are at heightened risk for temporary psychological problems, at least in the United States, is an important fact for parents and school counselors to bear in mind. Unfortunately, as long as our culture overvalues thinness and encourages the view that females should be judged on the basis of their physical appearance rather than their abilities, values, or personality, the risks of early puberty will probably persist. Adults can help by being supportive, by helping the early-maturing girl to recognize her strengths and positive features—physical and non-physical alike—and by preparing her for puberty before it takes place.

should be. Some young women become so concerned about gaining weight that they take drastic—and dangerous—measures to remain thin. Some go on eating binges and then force themselves to vomit to avoid gaining weight, a pattern associated with an eating disorder called **bulimia**. In the more severe cases, young women who suffer from an eating disorder called **anorexia nervosa** actually starve themselves in an effort to keep their weight down. Adolescents with these sorts of eating disorders have an extremely disturbed body image. They see themselves as overweight when they are actually underweight. Some anorectic youngsters may lose between 25 and 50 percent of their body weight. As you would expect, bulimia and anorexia, if untreated, lead to a variety of serious physical problems; in fact, nearly 20 percent of anorectic teenagers inadvertently starve themselves to death.

Anorexia and bulimia both began to receive a great deal of popular attention during the 1980s, because of their dramatic nature and their frequent association in the mass media with celebrities. Perhaps because of this attention, initial reports characterized these eating disorders as being of epidemic proportion. Although unhealthy eating and unnecessary dieting may be prevalent among teenagers, careful studies indicate that the

incidence of genuine anorexia and genuine bulimia is rather small (Fisher et al., 1995). Fewer than one-half of 1 percent of adolescents are anorexic, and only about 3 percent are bulimic (American Psychiatric Association, 1994). Anorexia and bulimia are far more common among females than males, however, and are rarely seen before puberty.

Although the incidence of anorexia and bulimia is small, the proportion of adolescents who are unhappy with their body shape or weight is not. This is especially the case among female adolescents from relatively more affluent backgrounds, which no doubt accounts for the greater incidence of anorexia and bulimia in this population (Gardner, Friedman, & Jackson, 1999). In one study, for example, more than one-third of the girls whose weight was considered normal by medical and health standards believed that they were overweight—including 5 percent who actually were underweight by medical criteria. (Less than 7 percent of normal-weight boys, and no underweight boys, described themselves as being overweight.) In this study, more than 70 percent of the girls reported that they would like to be thinner than they are (as opposed to one-third of the boys), and more than 80 percent said that being thinner would make them happier, more successful, and more popular (Paxton et al., 1991).



▲ *Although it is far less glamorous and less well publicized than anorexia or bulimia, obesity is the most common eating disorder. According to national surveys, nearly 20 percent of adolescents in the United States are overweight, and about 5 percent of adolescents are obese.* (Bob Daemmrich/Stock Boston)

Not surprisingly, dissatisfaction with one's body is likely to lead to the development of eating problems (Attie & Brooks-Gunn, 1989). Some researchers caution, however, that a large number of adolescents who are "watching their weight" are engaging in behaviors that are perfectly normal, even healthy (Nichter, Ritenbaugh, Nichter, Vukovic, & Aickin, 1995).

Unfortunately, many girls gain weight during puberty, and, for early adolescent girls, being overweight is highly correlated with being rated as unattractive by others (Rosenblum & Lewis, 1999). Despite adults' wishes that girls would not place so much emphasis on being thin, research indicates that the widespread belief among adolescent girls that being slim will increase their popularity, especially with boys, is based in reality (see figure 1.11) (Halpern, Udry, Campbell, & Suchindran, 1999). This places many girls in a difficult situation, as one team of researchers noted:

Most girls in our sample reported that having a boyfriend was either somewhat or very important to them, and virtually all girls saw physical attractiveness as important. As adolescent girls experience the weight and fat gains that accompany and follow puberty, they must reconcile these gains with their belief that slimness is an important factor in dating and popularity with boys. . . . For White girls and Black girls with college-educated mothers, more

body fat, even among non-obese girls, strongly lowered the probability of dating. . . . The 5 ft 3 in. girls who weighed 110 pounds was twice as likely to date as a girl of the same height and level of pubertal maturity who weighed 126 pounds. . . . Obviously, these adolescent girls had not carried out the sort of probability calculations that we have presented here, but adolescents, White adolescents in particular, believe that slimness is important to the likelihood of dating. Our data indicate that they are right. (Halpern et al., 1999, p. 732)

Initial reports on the prevalence of disordered eating among adolescent girls led to the conclusion that eating disorders are especially common among affluent, suburban, white and Asian American girls (e.g., Condit, 1990). More recent studies do not support this contention, however, suggesting either that the initial conclusions were incorrect or that there have been changes over time in the links among disordered eating, ethnicity, and socioeconomic status. Whatever the explanation, contemporary research indicates that disordered eating and body dissatisfaction have been reported among poor, as well as affluent, teenagers and among African American and Hispanic, as well as Asian American and white, youngsters (Davis & Gergen, 1994; Fisher et al., 1995; Pastore, Fisher, & Friedman, 1996a; Robinson et al., 1996; Schreiber et al., 1996). There is some evidence, however, that African Americans have more flexible conceptions of beauty that tolerate a wider range of body types, including body types that other ethnic groups view as overweight (Flynn & Fitzgibbon, 1996; Parker et al., 1995; Thompson, Sargent, & Kemper, 1996).

Several theories have been proposed to account for the onset of anorexia and bulimia during adolescence (see Condit, 1990). One perspective emphasizes the biological basis for anorexia, in particular, since there is strong evidence that anorexia is both genetically and hormonally influenced (Holland, Sicotte, & Treasure, 1988; Leibowitz, 1983). Unfortunately, it is difficult in hormonal studies to separate cause and effect: Changes in hormone levels can effect weight loss, but starvation and dieting also affect hormone levels.

A second view emphasizes psychological factors. Some theorists have proposed that anorexia is related to the adolescent's attempts to assert her autonomy within an overly controlling family system (Bruch, 1973; Killian, 1994; Minuchin, Rosman, & Baker, 1978). Others have suggested that anorexia is a sort of avoidance mechanism that reflects the young woman's fears of entering adulthood (Crisp, 1983). One of the consequences of starvation during early adolescence, for example, is that pubertal development is severely delayed (Surbey, 1987).

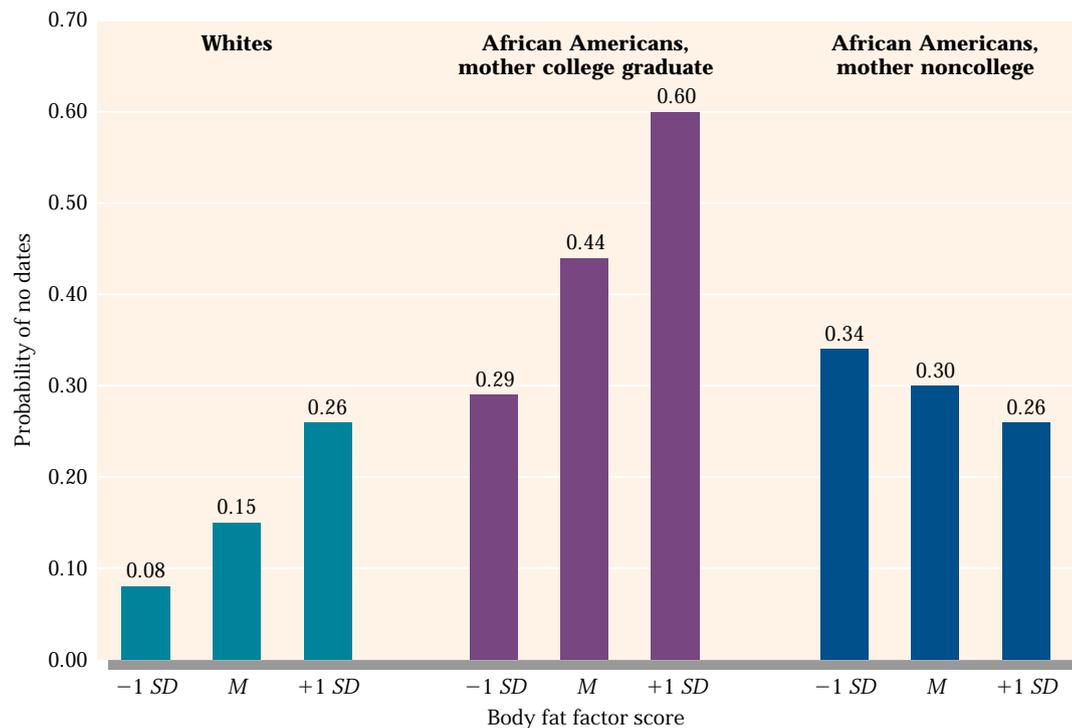


Figure 1.11 White girls and middle-class African American girls are significantly less likely to date when they are not as slim as their peers. The same is not true for less affluent black girls, however. (Halpern et al., 1999)

A third school of thought views eating disorders as part of a more general syndrome of psychological distress. Many studies have pointed to links between eating disorders and other serious mental health problems, such as depression, obsessive-compulsive disorder, and substance abuse; many anorectic and bulimic women display such psychological problems along with their eating disorder (Casper & Jabine, 1996; Leon, Fulkerson, Perry, & Dube, 1994; Munoz & Amado, 1986; Rastam, Gillberg, & Gillberg, 1996; Strober, Freeman, Bower, & Rigali, 1996). These studies suggest that anorexia and bulimia may be best understood not as independent or unique disorders but as particular manifestations of a more general underlying psychological problem—called *internalized distress*—which can be displayed in a variety of ways. (As you will read in chapter 13, many different psychological disorders in adolescence occur together, or “covary.”) In support of this view, there is some evidence that the medications that are successful in treating depression and obsessive-compulsive disorder are useful in treating anorexia (Condit, 1990).

Finally, because anorexia and bulimia are 10 times more common in females than males, it is likely that

broader social forces are a main factor in the development of these eating disorders (Brumberg, 1988). Research indicates, for example, that girls who are early maturers and early daters are likely to report greater dissatisfaction with their bodies and to be at greater risk for disordered eating (Cauffman & Steinberg, 1996; Smolak et al., 1993; Swarr & Richards, 1996) and that girls who turn to popular magazines, such as *Seventeen*, *Sassy*, and *Glamour*, for information about dieting and appearance are more likely to have a high drive for thinness and disturbed patterns of eating (Levine, Smolack, & Hayden, 1994). One interesting study showed, for example, how bulimia became socially “contagious” in a college sorority (Crandall, 1988). This researcher found that, over the course of the academic year, the women’s eating behavior became more and more like that of their sorority friends—even in a sorority in which binge eating was the norm. Other research indicates that girls’ attitudes toward eating and dieting are influenced by the attitudes of their parents and friends (Mukai, 1996).

Just because cultural conditions contribute to the development of anorexia nervosa doesn’t mean that individual characteristics do not play a role as well. It may be that cultural conditions predispose females more

than males toward these eating disorders and that, within the population of adolescent women, those who have certain psychological traits (prone to depression, for example), physical characteristics (e.g., early pubertal maturation), familial characteristics (e.g., strained relations with parents), or social concerns (e.g., high interest in dating) may be more likely to develop problems (e.g., Cauffman & Steinberg, 1996; Frank & Jackson, 1996; Swarr & Richards, 1996). The onset of eating disorders, like so many aspects of adolescent development, cannot be understood apart from the context in which young people live.

A variety of therapeutic approaches have been used successfully in the treatment of anorexia and bulimia, including individual psychotherapy and cognitive-behavior modification, group therapy, family therapy, and, more recently, the use of antidepressant medication (Agras, Schneider, Arnow, Raeburn, & Telch, 1989; Condit, 1990; Killian, 1994; Vigersky, 1977). The treatment of anorexia often requires hospitalization initially in order to ensure that starvation does not progress to fatal or near-fatal levels (Mitchell, 1985).

RECAP

Many writers link the emergence of eating problems in adolescence to the biological changes of puberty, which typically include increases in weight and changes in body composition. Disordered eating can range from mild disturbances in attitudes and diet to serious and potentially life-threatening clinical disorders, such as anorexia. Although many adolescents, especially girls, are unhappy with their body and concerned about being overweight—even when their weight is perfectly normal—clinical eating disorders such as anorexia and bulimia are actually quite rare. Nevertheless, studies indicate that individuals with eating disorders are at risk for a wide range of other mental health problems, including depression, substance abuse, and other forms of internalized distress. Current thinking suggests that eating disorders are caused by a complex interplay of biological and environmental factors.



Food for Thought

Boys may not show the symptoms of anorexia or bulimia to the extent that girls do, but many boys are overly concerned about their body and weight nevertheless. What might be some signs in an adolescent male that could indicate problems in this area?

PHYSICAL HEALTH AND HEALTH CARE IN ADOLESCENCE

Although puberty is undoubtedly the most important biological development of the adolescent decade, concerns about the physical health and well-being of young people are far broader than those involving reproductive maturation. In the past two decades, the field of **adolescent health care** has grown rapidly, as health educators and health-care practitioners have come to better understand that the health-care needs of young people differ from those of children and adults in important respects (Slap & Jablow, 1994).

Adolescence is a paradox as far as physical health is concerned. On the one hand, adolescence is one of the healthiest periods in the life span, characterized by a relatively low incidence of disabling or chronic illnesses (e.g., asthma, cancer), fewer short-term hospital stays, and fewer days in which individuals stay home sick in bed. Nonetheless, in the United States, nearly 1 in 15 adolescents has at least one disabling or chronic illness, with the main causes of disability being mental disorders, such as depression; respiratory illnesses, such as asthma; and muscular and skeletal disorders, such as arthritis (Ozer, Macdonald, & Irwin, in press). Fortunately, in the past 50 years, the rates of death and disability resulting from illness and disease during adolescence have decreased substantially, and new medical technologies and better health-care delivery have improved the physical well-being of children, especially those with chronic illness and disabling medical conditions (Gans, 1990). Adolescents are far less likely than individuals of any other age to seek and receive medical care through traditional office visits to practitioners, however. Moreover, there are large socioeconomic and ethnic disparities in adolescents' access to care, with poor and ethnic minority youth far less likely to have adequate health insurance and health-care access than affluent or white youth (Ozer et al., in press).

The most virulent threat to adolescent health comes from unhealthy behaviors (such as drug use), violence (both self-inflicted and inflicted by others), and risky activity (such as unprotected sexual intercourse or drunk driving). In some senses, then, many of the improvements made in preventing and treating the traditional medical problems of the period—those having to do with chronic illnesses—have been offset by what some scientists call the “new morbidity and mortality” of adolescence (Hein, 1988b). Contributors to this new morbidity and mortality include accidents (especially

automobile accidents), suicide, homicide, substance abuse (including tobacco and alcohol use), and sexually transmitted diseases (including AIDS).

The contrast between the old and new mortalities of adolescence is readily apparent. Fifty years ago, illness and disease accounted for more than twice as many deaths among teenagers as violence or injury, but the reverse is true today, although deaths due to accidents, mainly automobile accidents, have fallen dramatically in the past two decades (Ozer et al., in press). According to recent estimates, approximately 45 percent of all teenage deaths result from car accidents and other unintentional injuries, and another 30 percent are a result of homicide or suicide (Ozer et al., in press). Adolescents are involved in more driving accidents than are adults primarily because they are less experienced behind the wheel (at any age, new drivers are more likely to have accidents than seasoned drivers) but also because adolescents are more likely to take chances while driving—perhaps because they are likely to be driving with other teenagers who encourage risk-taking (Simpson, 1996). Adolescents are also more likely than other age groups to be injured as pedestrians and bicyclists in traffic accidents (Hingson & Howland, 1993). One piece of good news is that, although alcohol contributes greatly to automobile accidents among young drivers, the rate of alcohol-related traffic fatality among young people has dropped dramatically in recent years (Sells & Blum, 1996).

The consensus among health-care experts, then, is that the most significant threats to the health of today's youth arise from psychosocial rather than from natural causes (Ozer et al., in press). Unlike many other periods of the life span (such as infancy or old age), when we are more vulnerable to disease and illness, most of the health problems of teenagers are preventable. Moreover, patterns of diet, smoking, and exercise established during adolescence persist into adulthood (Kelder, Perry, Klepp, & Lytle, 1994). As a result of this recognition, the focus in the field of adolescent health has shifted away from traditional medical models (in which the emphasis is on the assessment, diagnosis, and treatment of disease) toward more community-oriented, educational approaches (in which the emphasis is on the prevention of illness and injury and the promotion of good health) (Millstein, Petersen, & Nightingale, 1993; Susman, Koch, Maney, & Finkelstein, 1993).

In other words, instead of asking how we can best treat sick adolescents, experts in adolescent health care are now asking how we can encourage adolescents to take the steps necessary to prevent illness and disability. How can we help adolescents reduce **health-compromising behav-**

iors, such as violence, drug use, unsafe driving, and unprotected sexual intercourse, and increase **health-enhancing behaviors**, such as eating properly, exercising adequately, and wearing seat belts? Current efforts include providing teenagers education about alcohol and other drug use, accident prevention, safe sex, and proper nutrition, as well as encouraging health-care professionals to do more direct screening for risky health practices among their adolescent patients—as one group of experts put it, “Don’t Ask, They Won’t Tell” (Blum, Beuhring, Wunderlich, & Resnick, 1996, p. 1767).

Adolescent medicine expert Charles Irwin, Jr. (1993), has suggested that parents, practitioners, and educators who are interested in helping adolescents live healthier lives keep in mind the “five As” of successful health promotion:

- Anticipatory guidance.* Establish a trusting relationship with the young person prior to adolescence.
- Ask.* Query adolescents directly about their health-enhancing and health-compromising behaviors.
- Advise.* Give advice about health promotion, even if the young person doesn’t ask for it.
- Assist.* Encourage the adolescent to participate in programs that promote health.
- Arrange.* Arrange follow-up visits or consultations to monitor the adolescent’s progress.

A variety of new, wide-reaching strategies for promoting adolescent health have been attempted in recent decades. Among the most popular of the latest wave involve **school-based health centers**. These are located in or adjacent to schools, and they provide such services as physical examinations, the treatment of minor injuries, health education programs, dental care, and counseling related to substance abuse, sexuality, and mental health. They often are set up to serve poor youth, who generally are less likely to receive medical and dental care than are their more affluent counterparts.

School-based health centers became increasingly popular because they are positioned to address the most pressing problems in adolescent health care: the fact that most adolescent health problems are preventable, the fact that adolescents underutilize conventional medical services, and the fact that adolescents often want their health-care needs to remain confidential. Although the development of these centers has generated controversy in a number of communities because some school-based health centers distribute contraceptives (a practice that upsets many adults), studies show that the vast majority of visits to these centers are for injuries,



▲ *School-based health centers deliver important services to adolescents, including contraceptive information and counseling. (J. Stettenheim/Saba)*

acute illnesses (e.g., influenza, strep throat), and mental health services (e.g., counseling). Visits for family planning services account for only 10 percent of visits to school-based clinics (Scales, 1991).

How well are school-based health centers working? Recent evaluations of several school-based health programs—including those designed to improve adolescents' physical and mental health, those designed to reduce drug and alcohol use, and those designed to reduce teenage pregnancy—have been inconsistent. Although most programs have shown some success in increasing adolescents' understanding of health-related issues (e.g., how AIDS is spread) and knowledge about health risks (e.g., the dangers of cocaine use), few programs have been markedly successful in changing adolescents' *behavior*, particularly after the program was completed (Kisker & Brown, 1996; Millstein et al., 1993). Why is this so? As is the case in studies of adults, studies of adolescents indicate that it is far easier to alter what individuals know than it is to change how they behave.

As many experts point out, health behavior is influenced by a large number of factors, of which knowledge is only one component (e.g., Leventhal & Keeshan, 1993). Changes in the context in which adolescents live (e.g., the accessibility of handguns, the availability of illicit drugs, the role models to which young people are exposed) must accompany changes in adolescents' knowledge and un-

derstanding if lasting health promotion is to be accomplished. For example, investigations of the impact of changing one element of the broader context of adolescent health—the legal drinking age—have found that raising the age leads to a significant decline in accidental death rates among young automobile drivers and pedestrians, as well as in the rates of unintentional injuries not involving cars and homicides (Jones, Pieper, & Robertson, 1992).

Improving the health of young people is an especially important concern among those working with adolescents who are poor or from ethnic minority groups, because these youngsters are at greater risk for many of the old as well as the new morbidities and mortalities of adolescence (Ozer et al., in press; Singh & Yu, 1996a). Nonwhite youngsters, for example,

are relatively more likely than white youngsters to suffer from a chronic illness (Ozer et al., in press); to be obese or to have high blood pressure or high cholesterol levels (National Heart, Lung, and Blood Institute Growth and Health Study Research Group, 1992); to be physically inactive (Wolf et al., 1993); to be victims of violent crimes (Earls, Cairns, & Mercy, 1993); to contract AIDS (Sells & Blum, 1996); to die from drowning (Warneke & Cooper, 1994); or to be murdered (Sorenson, Richardson, & Peterson, 1993). Homicide is the leading cause of death for African American adolescents, accounting for almost half of all deaths in this ethnic group, and homicide is largely responsible for higher mortality rates among Hispanic youth (Ozer et al., in press). American Indian/Alaska Native males have suicide rates four times higher than any other racial/ethnic group (Ozer et al., in press). Yet, despite their generally poorer health, minority youngsters less likely to have access to sources of medical care, less likely to visit the doctor when ill, and less likely to have health insurance (Lieu, Newacheck, & McManus, 1993).

The terrible combination of poor health and poor access to health care is even more concentrated among the sizable proportion of adolescents who live in poverty, a disproportionate number of whom are from ethnic minority backgrounds (Klerman, 1993). There is now convincing evidence that the links between health

and socioeconomic status are strong and pervasive across various sorts of health problems, with physical and mental health problems increasing linearly as one moves down the socioeconomic ladder (Adler, 1994; Keating & Hertzman, 2000) Because increases in the size of the adolescent population over the next several decades worldwide will be concentrated among poor and minority youth (Fussell & Greene, in press), the most daunting challenge facing health-care providers and policymakers will be finding ways of minimizing or even eliminating the socioeconomic and ethnic disparities in health and health care that currently exist around the world (Ozer et al., in press).

RECAP

Today, in contrast to 50 years ago, the most important physical health problems in adolescence have psychosocial rather than natural causes. This new morbidity and mortality of adolescence is caused by such preventable phenomena as automobile accidents, violence, substance abuse, and unprotected sex. New approaches to adolescent health care, emphasizing prevention and health promotion instead of treatment, are being studied. Among the most important innovations are school-based health centers.



Food for Thought

What is meant by the distinction between the old and the new health problems of adolescence? Given this distinction, what do you think are the most important things society should do to minimize health problems during this period of development?



Web Researcher A Girl Scout troupe asks you to run a session on feeling good about yourself during the transition to adolescence. You know that sleep and good nutrition are important parts of feeling good about yourself that often get neglected because of busy schedules and worries about their looks. What would you tell them, and how might you help them take what you have to say to heart? Go to www.mhhe.com/steinberg6 for further information.

KEY TERMS

activational role of hormones
 adolescent growth spurt
 adolescent health care
 adrenarche
 androgens
 anorexia nervosa
 asynchronicity in growth
 basal metabolism rate
 bulimia
 cross-sectional study
 delayed phase preference
 disordered eating
 endocrine system
 estrogens
 feedback loop
 glands
 gonads
 health-compromising behaviors
 health-enhancing behaviors
 hormones
 HPG axis
 hypothalamus
 leptin
 longitudinal study
 menarche
 organizational role of hormones
 peak height velocity
 pheromones
 pituitary gland
 school-based health centers
 secondary sex characteristics
 secular trend
 set point
 Tanner stages