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Human Biology - Your Changing Body

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The Program in Human Biology,
Stanford University, (HumBio)

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Stanford University, (HumBio)

CHAPTER 1 Introduction to Your Changing Body - Student Edition (Human Biology)

CHAPTER OUTLINE

1.1 Human Biology

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1.2 Introduction to Your Changing Body

Contents

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CHAPTER 2

Growth, Development, and Puberty - Student Edition (Human Biology)

CHAPTER OUTLINE

2.1 Growth, Development, and Puberty

How does your body change during puberty and how does it feel?

Did you look in the mirror this morning? Did your face look any different than it did yesterday? Unless you got a haircut or changed your hairstyle, chances are you look pretty much the same today as you did yesterday. But if you look at one of your photographs taken when you were much younger, you may be amazed at how much you have changed. Yet you will have no problem recognizing yourself. In this section you will begin learning about the changes your body goes through as it grows and matures.

"Took stock of my appearance today. I have only grown a couple of inches in the last year; so I must reconcile myself to the fact that I will be one of those people who never get a good view at the cinema. My skin is completely disfigured, my ears stick out and my hair has got three partings and won't look fashionable whichever way I comb it."

-*The Secret Diary of Adrian Mole,* Age $13\frac{3}{4}$

Sue Townsend

Our bodies change throughout our lives, but we maintain a certain likeness. Change makes it possible for us to grow from an infant to an adult-to grow taller and leaner, to change shape, and to even change in appearance. Constancy makes it possible for us to stay the same person throughout these changes.

Your body goes through two kinds of changes. The first type of change is **growth,** which means an increase in size. The second is **development.** Development involves not only getting bigger, but also improving what a particular organ or part of the body does.

Apply Your KNOWLEDGE

During puberty, girls' breasts grow larger and boys' testes begin to produce sperm. Why would these changes be called "development" rather than "growth"?

Mini-Activity

Puberty Brainstorm How have you changed from childhood? Create a chart, sorting as many changes as you can think of under the headings Physical and Psychological. Look at Figure 1.1 for some examples.

The term *growth* usually refers to physical growth, such as getting taller. But the term *development* refers to physiological (physical) changes as well as psychological changes-changes in how we think, feel, and behave as we become more mature. **Maturation** is another word commonly used to describe the development of physical, emotional, and behavioral characteristics through the growth process.

As you become an adult, your physical development and psychological development occur together. We cannot understand one without the other. However, to more easily distinguish these two processes, we use the terms **puberty** and **adolescence**. Puberty is the time when physical growth and development that lead to sexual maturity occur. Adolescence is the time between being a child and becoming an adult, when psychological development and social development occur.

TABLE 2.1:

Development
Physical
Weight gain
Growth
Psychological
New responsibilities
Mood swings

Figure 1.1 Defining physical and psychological development.

In this unit on your changing body, you will learn more about the following:

- How do males and females grow and develop during puberty?
- What factors influence growth?
- What are hormones and what do they do?
- How does puberty make you feel?
- What are some healthy ways you can take control of your body?

Activity 1-1: You Must Have Been a Beautiful Baby

Introduction

Enormous changes occur as we grow and develop, but some characteristics remain identifiable throughout our lives. In this activity you try to identify your classmates from their baby pictures.

Materials

- One picture of you between the ages of 2 and 5 Activity Report

Procedure

Step 1 Bring in a picture of yourself between the ages of 2 and 5 and give it to your teacher. Put your name on the back.

Step 2 Your teacher will give your picture a number and post it along with the rest of the class pictures.

Step 3 Study the pictures and try to guess which picture belongs to which classmate. As you study the pictures, try to think about which physical characteristics will be most helpful in identifying people.

Step 4 Write your guesses on the Activity Report provided by placing the name next to the correct number.

Step 5 Summarize your conclusions about what characteristics helped you in your identification.

"As I go through changes I am confused because I feel new emotions and have new ideas and priorities. I no longer feel that my parents understand me nor that they are always fair or correct as they used to be. I'm no longer sure as to whether I am a child or adult."

-Jamie

Puberty

All animals go through a series of developmental stages. Since these stages are predictable and repeated in each generation, they make up a **life cycle.** The immature and mature forms of some species look dramatically different. For example, the caterpillar (the immature stage of a butterfly) looks nothing like the mature butterfly. Moreover, the basic difference between the immature and mature among animals is not just a matter of appearance, but one of function. The sexually mature animal can **reproduce** (produce offspring similar to itself); the sexually immature cannot.

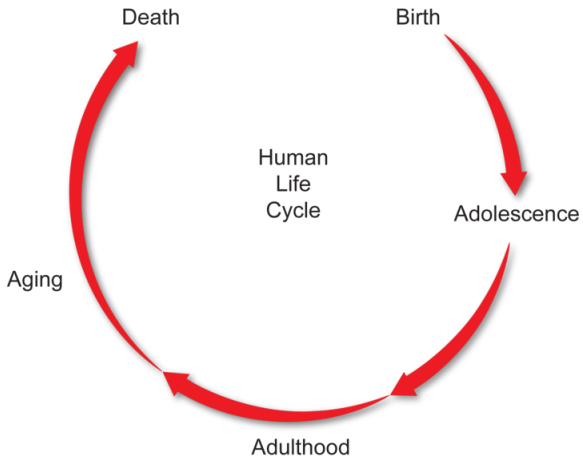


Figure 1.2 Adolescence is one part of the human life cycle.

Humans go through predictable stages of growth, but the changes are not as dramatic as those of the butterfly. Puberty marks a stage of rapid growth and sexual development, signaling the end of childhood and the beginning of adulthood. All the body's systems undergo changes at this time, including the maturation of the reproductive system that allows us to reproduce, or have children.

Unlike in other animals, the ability to reproduce among humans is not enough to turn you into a full-fledged adult. In our society, adolescence is a lengthy process of psychological development and social learning that lasts about 10 years, roughly spanning from age 10 to age 20.

Mini-Activity

Prove it! Convince your class that the following statements are either reasonable or totally outrageous:

a. I am a billion seconds old.
b. I am a trillion minutes old.

By the end of puberty you and your friends end up in the same place biologically, but you may notice a lot of variation during puberty itself. To allow for these differences, we speak of age in two different ways. One is **chronological age,** which means how old you are or how many years you have lived. The other way we speak of age is **developmental age.** Developmental age refers to how developed you are in a biological sense at a given time.

Girls and boys of the same chronological age can look very different because they are at different developmental ages. You probably have compared yourself with others your age. Sometimes you may think another person is the model for what is normal. Perhaps he has a deeper voice and is taller, or she has wider hips. Chances are the person with whom you have been comparing yourself also feels uncertain about his or her appearance at times. He or she may even have looked at you to define what is "normal."

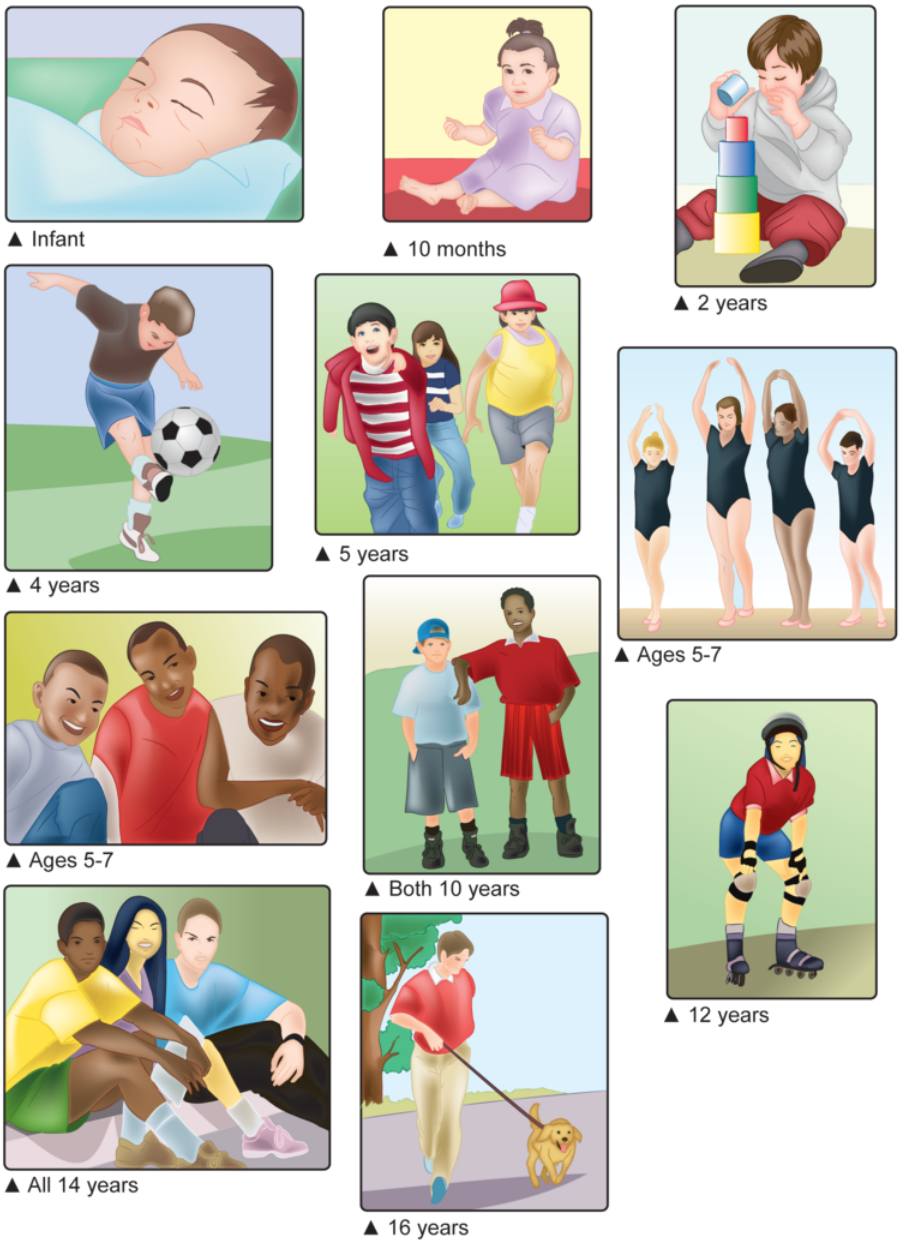


Figure 1.3 Stages of growth from birth to age 16.

Mini-Activity

Describing Puberty Write down three words that describe puberty and adolescence and pass them in. The teacher will put them up on a board so your class can discuss them. Now create a poem, picture, or a paragraph using the words and concepts discussed.

Puberty occurs over time at fairly predictable ages. It is common to think of it as part of the process of children getting older. But growing older and entering puberty are not always the same thing. This is because puberty starts at somewhat different ages and moves at different rates for different people. "Normal" development refers to three interrelating concepts:

a. Being like everyone else
b. Developing changes within the average age ranges
c. Whether or not everything works correctly, medically

Normal development, to you, probably refers to being like everyone else. While developing early or late is very normal, you may feel different. So, think of normal in a slightly different way. **Normal development** is a function of **averages.** To identify averages, the ages at which adolescents reach certain stages of puberty are collected, added together, and then divided by the number of persons studied. For example, a girl may develop breasts on average by age 13, but the normal range includes ages 8 to 17. "Normal" also refers to whether or not body parts work the way they should. Developing breasts at age 8 or 17 is less important than whether the breasts begin to function as they should (produce milk for a baby when the time comes).

Activity 1-2: Examining Differences

Introduction

In our society, we consider it proper that our sexual organs and female breasts be covered when we are in public. Even when we go swimming, we wear bathing suits. As a result, most of us are not completely comfortable looking at human bodies, or pictures of human bodies, and we're not used to talking about what we see. Sometimes, however, it is important to be able to do this in a serious manner so that we can learn. It is particularly important in this unit, since it deals with growth and changes of the human body.

In this activity you look at pictures of people at various stages of physical development. You examine the pictures, look for differences, and make some conclusions about the types of changes that occur in puberty. You need to be respectful of others throughout this exercise and remain focused on the serious nature of the activity.

Materials

- Activity Report

Procedure

Step 1 Your teacher will divide you into groups.

Step 2 You will be given the Activity Report, and your teacher will go over the questions with you.

Step 3 Your group will be given time to study the pictures, make observations, and record your answers to the questions.

Step 4 Your teacher will then ask each group to report back to the entire class and compare observations.

"I stood there looking at this other person in the mirror who looked just like me, and all of a sudden I wasn't thinking at all. This other person in the mirror was someone and I was someone and I wasn't sure who because I didn't know either of us and we weren't the same person and I wasn't there at all, because I wasn't thinking, because my mind was quite blank."

-Camilla

Going through Puberty

Puberty is not just a matter of the body changing, but also how you feel about these changes.

- Do you sometimes feel you are on an emotional roller coaster, up one minute and down the next?
- Are there times when you feel uncomfortable with the ways your body is changing?
- Have people treated you differently because of your changing appearance?
- Are there times when you feel "out of it" and think no one else could understand how you feel?
- Have you quietly looked at others to see how your growth, development, or appearance compares with theirs?

If you answer "yes" to any of these questions, you are not alone. These very common feelings can be upsetting at times. There is joy as well as some concern in seeing oneself change. Since very little can be done about these changes, it is important to give yourself time to adjust. Here are a few stories from other teenagers going through puberty.

Janet's Story

"I started maturing when I was very young. And I never wanted to. When I was about nine I already started having breasts and I hated it. I was still a tomboy and I used to do anything to hide my chest, like wear baggy shirts and overalls all the time. Now that I'm older, I realize that I just didn't feel ready to grow up then. My body was leading the way and my feelings about changing were about a mile behind." (*Changing Bodies, Changing Selves,* pg. 21)

Steve's Story

"Well, for me it was weird because I didn't even start growing until last year. Everybody thought there was something wrong with me because I still looked like a ten-year-old until I was 15 or 16. That has been a really bad experience for me because everybody around me was changing and I was standing still. I was changing in my head but not my body. My parents were even going to take me to the doctor to see if I was deformed or something like that, but they didn't, and finally last year I started to grow. My voice is changing and everything, so I guess I am normal after all, but I think it is going to be a while before I stop feeling like I'm different from everybody else." (*Changing Bodies, Changing Selves*, pg. 11)

What does happen to your body during puberty? Figure 1.4 summarizes the changes you will read about in this unit.

> **What Do You Think?**
> Why do you think the legal age for marriage is 18 years old (in most states), although sexual maturity is often reached several years earlier? What are the advantages and disadvantages of early marriages?

What Happens to Your Body During Puberty?

What is normal? Normal can be different for each person. This chart shows the changes that take place in every adolescent's body during puberty. When and in what order these changes take place can't be pinpointed, but they will happen. If you are concerned or have questions, talk with a health professional.

TABLE 2.2:

	Boys	Girls
Reproductive Organs	Testes begin to enlarge and produce sperm. Penis enlarges. Wet dreams begin.	Ovaries begin to produce mature eggs. Uterus enlarges. Vagina enlarges. Menstruation begins.
Secondary Sexual Characteristics	Facial hair appears. Axillary hair appears. Pubic hair appears. Voice deepens.	Breasts develop. Axillary hair appears. Pubic hair appears.
Other Changes	Skeleton grows. Muscles develop and become stronger. Fat is deposited under skin. Circulary system and respiratory system become more efficient. Thinking skills mature.	Skeleton grows. Muscles develop and become stronger. Fat is deposited under skin. Circulatory system and respiratory system become more efficient. Thinking skills mature.

Figure 1.4 A summary of the physical changes boys and girls experience during puberty.

Apply Your KNOWLEDGE

Give some examples of life cycles of other animals. How are they the same as or different from the human life cycle?

What Do You Think?

American society does not have formal "rites of passage" (events that mark new stages of development), but some "development markers" may serve similar functions. What are some "rites of passage" or "development markers" you can think of for adolescents in this country?

Journal Writing

What kind of baby were you (fussy, sweet, active, sleepy, etc.)? What kind of behavior did you exhibit as a child? What physical characteristics distinguish you? What personality characteristics distinguish you? Think about these elements of yourself as they apply to you today: What is the you-in-you that remains constant throughout the changes in your life?

Each of us is different in some way. What does being different feel like? In what ways are you unique? What are some positive aspects, and what are some negative aspects?

Review Questions

1. What is the difference between growth and development?
2. What is the difference between puberty and adolescence?
3. What is the difference between developmental and chronological age?
4. What is normal development?
5. What are some common feelings about experiencing puberty?

CHAPTER 3

Growth of the Body - Student Edition (Human Biology)

CHAPTER OUTLINE

3.1 Growth of the Body

What changes of puberty do both boys and girls experience?

Puberty involves important changes in all parts of the body. In this section you will learn about growth in height, weight, muscles, and a few other related changes.

Height

Height refers to how tall you are. Several factors influence how tall you will be as an adult. Adult males are generally somewhat taller than adult females. Nutrition and general health will also make some difference. Most importantly, you inherit your height from your biological parents. **Genes** determine **heredity,** which means that how tall you will be is already more or less decided by the time you are born. You can't do much about your height, except to realize that it is normal to be shorter or taller than others are.

Did You Know?

At age 10, boys are 78% of their adult height; girls are 84% of their adult height.

Both boys and girls experience a growth spurt during adolescence. This growth happens because your skeleton grows faster than some other parts of the body. But different parts of the skeleton grow at different rates. As a result, not only are children and adults different sizes, but also their body parts have different **proportions.** For example, the skull is the first part of the skeleton to reach its adult size, and as a result, children have bigger heads in proportion to the rest of their bodies than adults do. The hands and feet are the next parts of the skeleton to grow fast and they get ahead of the arms and legs. The trunk is the last to catch up. So, while your trunk is still child-sized, your arms and legs may be more like those of an adult. If you sometimes feel as though your body doesn't quite go together, this may be why!

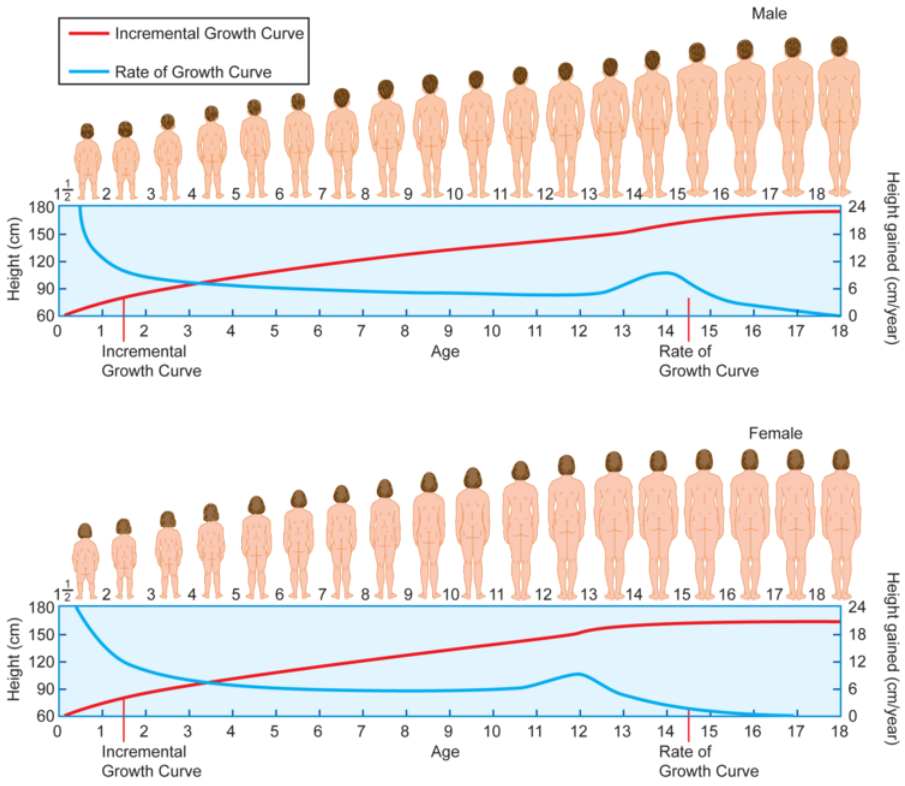


Figure 2.1 During puberty bodies of the same height can have very different proportions, as shown in the charts.

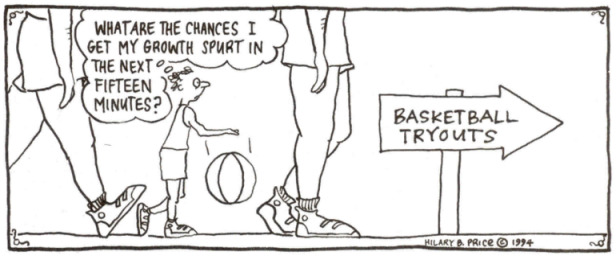


Figure 2.2

Activity 2-1: How Tall?

Introduction

In this activity you learn how tall and how fast boys and girls grow until they reach their adult height. You look at *average* heights and *average* rates of growth, and it is important to know that not everyone fits this pattern. For example, if you are 13, you might be 4-feet tall, or 5-feet tall, or 6-feet tall. The *average* height for your age might be five feet, but the other heights are just as "normal." Some people follow a slower, and others a faster, rate of growth. There is some chance that you will continue growing taller until you are 20 years old.

Materials

- One metric ruler per student or group

- Activity Report

Procedure

Step 1 Examine the graph in Figure 2.3. The vertical axis shows the average heights for males and females at 10-centimeter intervals. The horizontal line shows the ages in 1-year intervals.

Step 2 Answer the questions on your Activity Report that relate to this chart.

Step 3 Figure 2.3 has shown you how tall average boys and girls are at each age, but growth does not always occur at the same rate over time. There are times in your life when you will grow very quickly for a while, and other times when you will grow more slowly. The next graph shows you how the average rate of growth changes at different ages.

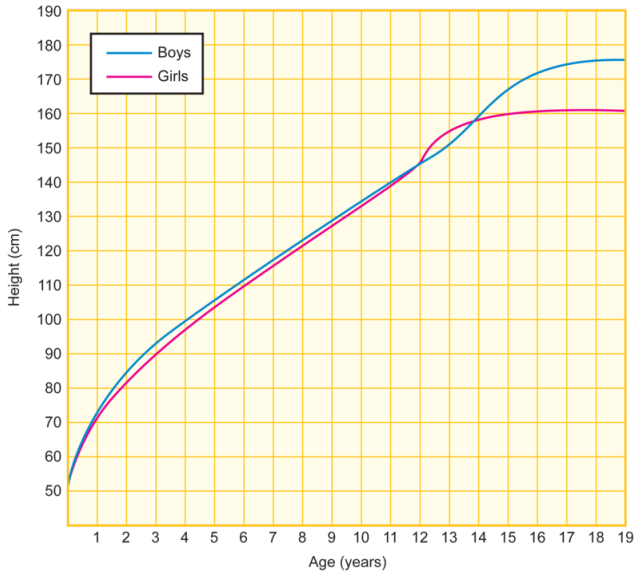


Figure 2.3 Average heights for boys and girls.

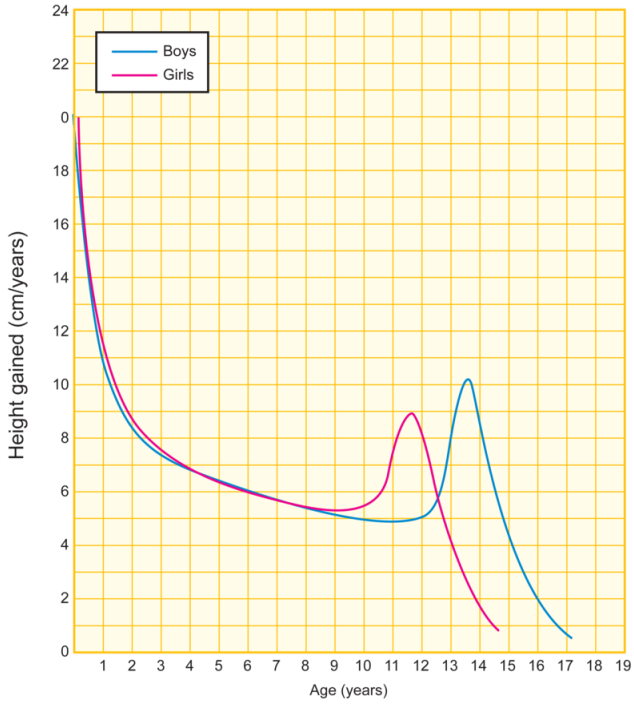


Figure 2.4 Growth spurts: rate of growth for boys and girls.

Step 4 Look closely at the graph in Figure 2.4. The vertical axis shows the height gained (growth) during each year. It does not show the height itself.

Step 5 Answer the questions on your Activity Report that relate to this graph.

Step 6 Note that the growth rate for both boys and girls is very high during the first two years of life, but then it slows down. At age 11 for girls and age 13 for boys it shoots up again, only to go down again after a few years. This burst of growth during puberty is called a growth spurt. By the end of this growth spurt, females, at about age 15, have reached 99% of their adult height. Boys do the same by the age of 17.

Did You Know?

How did we learn about growth and development?

- Around 200 B.C., people thought children had higher concentrations of blood and that growth resulted from thinning out the blood; so once blood reached an equilibrium, growth stopped.
- In the 18th century, people thought blood vessels grew smaller and smaller the farther away from the heart. Growth happened until blood vessels got too small to sustain tissue around them.
- Now we think growth stops when cells reach capacity.

Weight

Both boys and girls also show a spurt in weight gain during adolescence. In fact, more non-skeletal growth occurs in puberty than skeletal growth. This growth comes primarily from an increase in muscle tissue and fat. Boys generally develop broader shoulders than girls do, and girls develop generally wider hips (skeletal growth) than boys do. Both boys and girls develop stronger muscles, but on average, boys' muscles develop stronger than girls' muscles do. Both boys and girls put on fat, but on average, girls put on somewhat more than boys do. This fat is largely deposited under the skin, especially in the buttocks, hips, breast area, and back of the arms (see Figure 2.5). This distribution gives girls past puberty more rounded features and boys more angular features. It also allows the muscles of boys to show more clearly.

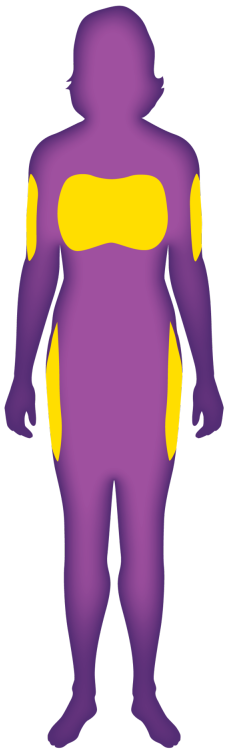


Figure 2.5 Girls store energy as fat in the hips, breasts, and arms.

On average, adult females have a higher percentage of body fat than men have because of their reproductive functions. To be pregnant for nine months and breast feed her baby, a woman must have extra sources of nutrition if food is scarce. Her body stores this extra supply as fat.

Weight generally varies more than height. Weight depends in part on heredity, but weight is mainly a function of what you eat and how much you exercise.

As you grow older, your body needs more calories (units used to measure energy in food). But the amount of calories needed per pound of body weight actually decreases. For example, babies need about 50 calories of food per pound of body weight. Adolescents aged 13-15 need about 27 calories per pound of body weight. Adults need only 18 calories per pound of body weight.

Muscles

Both boys and girls greatly increase their muscle size and strength during puberty. Before puberty, there is little difference in strength and physical capacity between boys and girls. During puberty, the number of muscle cells in boys increases 14 times, in girls only 10 times. On average, boys also develop larger hearts, lungs, and a greater number of red blood cells. So, although both girls and boys get stronger as they go through puberty, these real and universal differences give males a physiological advantage in terms of the potential for overall strength and capacity for physical exertion.

> **Did You Know?**
> Olympic records are only one measure of physical fitness and physical capacity. Longevity, or how long one lives, is also a measure of fitness. Women live, on average, six years longer than men live.

One muscle that especially grows larger at puberty is the heart. A large, strong heart can pump blood throughout the body faster than a weak heart. Because blood carries the oxygen needed by all parts of the body, including muscles, you can exercise more efficiently as your heart grows larger. In addition, the lungs (an organ, not a muscle) become larger and more efficient at puberty, making it possible for you to breathe in larger amounts of air. Working together, the heart and lungs take in oxygen and distribute it to every cell in the body. This makes it possible for those past puberty to exercise harder and for a longer time and to recover from the effects of exercise quickly. Sports requiring **endurance,** such as cross-country running, are generally possible only after puberty.

TABLE 3.1:

Year	Men	Women
1948	25′8″	18′8.25″
1952	24′10″	20′5.75″
1956	25′8.25″	20′9.75″
1960	26′7.75″	20′10.75″
1964	26′5.75″	22′4.5″
1968	29′2.5″	22′4.5″
1972	27′0.5″	22′3″
1976	27′4.5″	22′0.75″
1980	28′0.25″	23′2″
1984	28′0.25″	22′10″
1988	28′7.25″	24″3.5″
1992	28′5.5″	23′5″
1996	27′10.75″	23′4″

Figure 2.6 Olympic long-jump winning distances.

Although boys, on average, have a physiological advantage, exercise and fitness greatly affect strength and en-

durance. Thus, a girl who exercises regularly is likely to outperform a boy who is not physically fit. The differences we see between males and females in physical activity and ability are therefore partly due to the biological changes of puberty and partly due to lifestyle choices.

If women and men continue to improve at the rates shown in Figure 2.6, will women ever jump farther than men? How likely is this to occur? What will it depend on?

Apply Your KNOWLEDGE

Look at the table above showing Olympic performances in the long-jump event. At what rate are the men's and women's records changing?

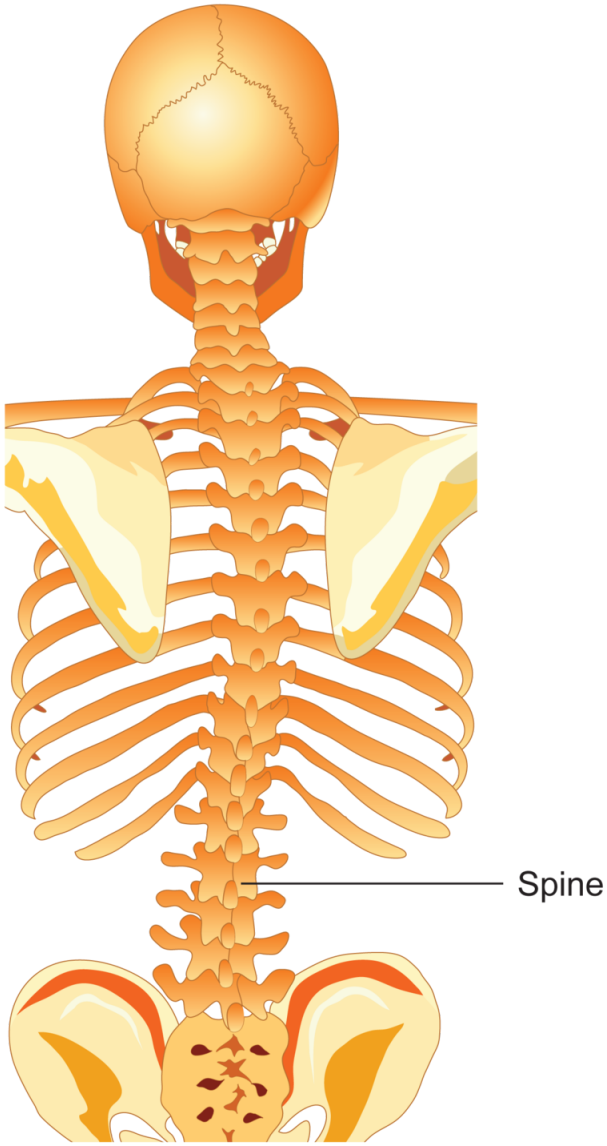


Figure 2.7 Scoliosis-curvature of the spine.

Health Concerns in Puberty

The most common adolescent health problems are not related to puberty but are due to accidents, violence, alcohol or drug use, excessive dieting, pregnancy, and sexually transmitted diseases. Most teenagers experience no serious health problems due to puberty itself. Many adolescents experience some degree of acne. Although not typically

serious, it can be an annoying condition. Acne is usually most severe between the ages of 14 and 17 for girls and between 16 and 19 for boys. Since male sex hormones (a product of various glands, also present in girls but in lesser amounts) bring on the changes in skin glands, boys are more likely to get pimples.

About 6% of adolescents suffer from more **chronic,** or long lasting, illnesses. Most often these are psychological problems, diseases of the respiratory system (such as asthma), and conditions affecting muscles and bones. One such condition is scoliosis, or abnormal curving of the spine. It is usually first noticed after age 10, when the adolescent has started growing very rapidly. Scoliosis more commonly affects girls than boys. The spine bends sideways in a curve and makes one part of the back higher and fuller than the other side. An early diagnosis can improve chances for successful treatment by using braces or surgery.

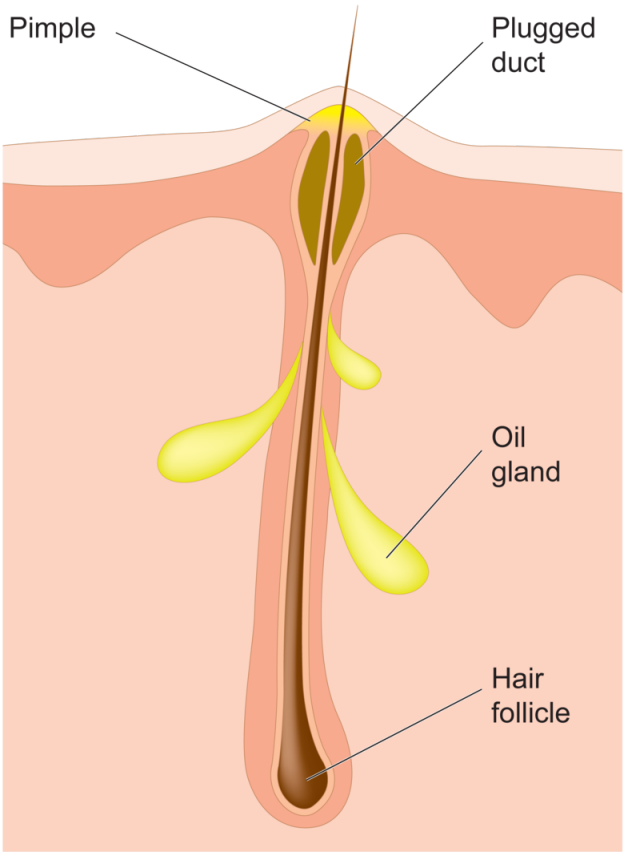


Figure 2.8 Acne comes from plugged ducts that are infected with bacteria.

Acne and "Growing Pains"

Decide if these statements are true or false.

- Soap can clean out blockage causing acne.
- Blackheads are just dirt.
- Certain foods cause acne.

Acne is one of the most common health concerns among adolescents. What causes acne? Glands in the skin next to hair follicles grow and secrete oil faster than the oil can come out (see Figure 2.8). When the duct of the gland becomes plugged, its secretions accumulate. Sometimes bacteria infect these glands, pus forms, and you get a pimple. If a blockage widens a pore enough to let air in, the waxy plug darkens and you have a "blackhead."

How do you get rid of acne? Popping a pimple spreads bacteria around and causes more pimples. Continual scrubbing causes the skin to produce even more oil. Because acne in adolescence is typically caused by hormones,

the best you can do is clean your skin properly two times a day and be patient! A doctor can prescribe medicine to help clear up your skin if needed.

"Fatty chocolate, greasy pizza, and oily potato chips don't affect the amount of oil your skin makes or the number of bacteria enjoying it."

-The Body Book

Sara Stein

Another ailment seen in adolescents affects their knees. As young teenagers become more active with sports, their upper thigh muscles may become tender, and their knees may also become sore and painful. Although not usually serious, this condition can come and go for a few years. Rest and reduced physical activity can alleviate these growth pains.

What Do You Think?

On average, since adult males have the potential to develop stronger muscles than adult females, should adult females be excluded from jobs that involve heavy physical labor (for example, firefighting)?

These conditions are just two examples of health concerns commonly seen among adolescents. They occur because of the rapid growth of bones and muscles during puberty. The earlier health concerns are identified, the better chance a physician has of treating them successfully. Because your body is changing so quickly, yearly physical exams by a physician or nurse are important.

Journal Writing

What are some ways you mark your growth and development? Do your friends or family celebrate or recognize milestones (accomplishments, growth) in any way? How? How might you recognize those milestones important to you, but not currently celebrated, and share them with someone?

Review Questions

1. What factors influence how tall you will be?
2. What factors affect your weight?
3. How does puberty affect exercise and endurance?
4. What causes acne, and what can you do about it?
5. Name three other health concerns common to adolescents and describe them.

CHAPTER 4

Sexual Maturation - Student Edition (Human Biology)

CHAPTER OUTLINE

4.1 Sexual Maturation

What changes should girls and boys expect?

Your body goes through two periods of rapid growth in your lifetime. The first is from birth to age three. The second is during puberty. Puberty is also a time of rapid development in the reproductive systems of both boys and girls. The changes in the reproductive system, which result in sexual maturation, make it possible to carry out the main biological function of the human species-to reproduce.

Did You Know?

Vital organs like the heart and lungs keep us alive as individuals. Sexual organs let us survive as a species.

Sexual maturation involves two kinds of change. "Primary" changes directly involve the reproductive organs themselves, such as the testes and ovaries. As a result males begin producing sperm and females begin producing eggs.

In addition, there are some related changes, such as the growth of breasts in females and the growth of hair under the armpits (**axillary hair**) and around the sex organs (**pubic hair**) in both sexes. These **secondary sexual characteristics** are considered "secondary" because they do not directly involve the reproductive organs themselves. These characteristics are sexual because they indicate sexual maturity and distinguish male from female.

"I think what is happening to me is so wonderful, and not only what can be seen on my body, but all that is taking place inside. I never discuss myself or any of these things with anybody; and that is why I have to talk to myself about them."

-Diary of a Young Girl

Anne Frank

Sexual Maturation among Girls

For girls, one of the most important experiences of puberty is the onset of **menstruation**, which is the flow of blood, or the shedding of the lining of the uterus, from the vagina once a month. Most girls have their first period, called **menarche**, between the ages of 11 and 13, but it may occur just as normally as early as age 9 or as late as 16 or 17.

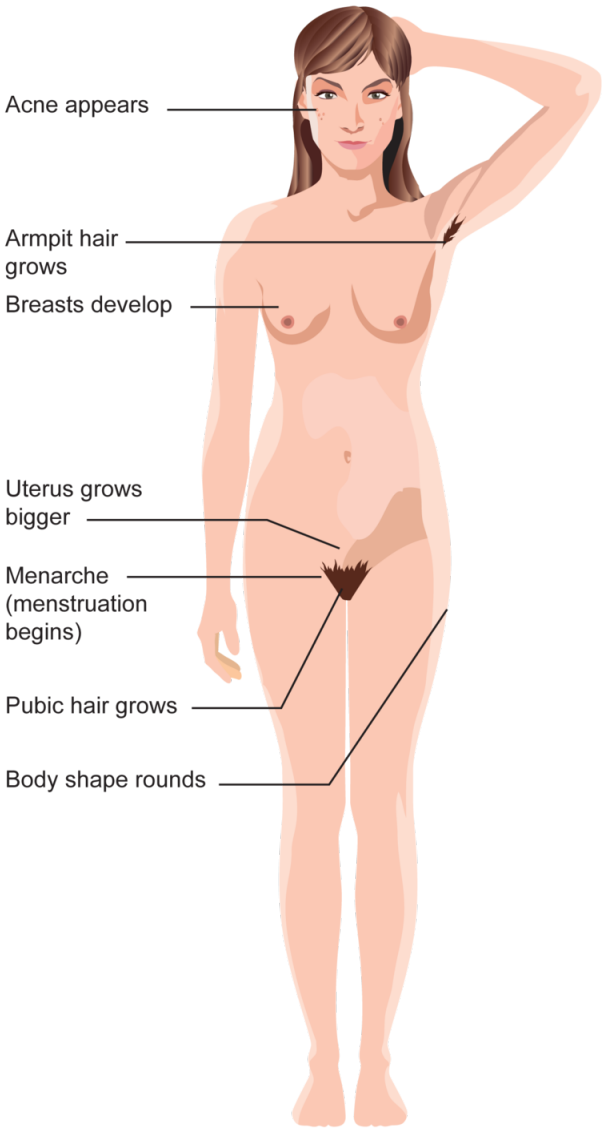


Figure 3.1 The primary changes and secondary sexual characteristics that females develop during puberty.

During a menstrual period, which usually lasts several days, menstrual fluid flows from the lining of the uterus and out through the vagina. This fluid is made up of blood and discarded tissue from the uterine lining. Most women have a menstrual period every month, except when pregnant, from puberty until about the age of 50. These years are a woman's childbearing years. When an older woman no longer has menstrual periods and can no longer bear children, she is said to have reached **menopause.** This too is a normal stage of adult life.

Mini-Activity

Word Origin: Menarche Where does the word *menarche* come from? Go to a dictionary or other word reference book and write down your findings.

Most girls are taught to expect their first menstrual period, but occasionally a girl will have it without warning, and she may think she is sick. However, menstruation is a normal body function and not an illness. During her menstrual period a woman can do all her usual activities. Only some women experience discomfort during menstruation, as we will discuss later in this unit.

The **ovaries** increase a little in size during adolescence. No new eggs are formed during puberty. A girl is born with all the eggs she will ever produce. (This is different for boys, who don't produce sperm until puberty and then produce millions of new sperm cells every day.) The eggs stay protected in an immature state in the ovaries until puberty; then each month one of them matures and is released from an ovary.

What Do You Think?

If girls are biologically able to have children by age 13, should they start becoming mothers at this time? Why or why not?

During puberty, breast development usually starts to show when the area under each nipple buds or swells a little. The area may be uncomfortable to touch for a while. In the next stage, the breasts and areolae, the darker skin around the nipples, increase in size.

Like other types of growth at puberty, the rate of breast growth may vary, so that one breast may be, for a while, larger than the other one. Although usually temporary, some girls may worry about the difference. Even some adult women have breasts of different sizes, but typically this is noticeable only to themselves. Any size difference comes mainly from the amount of fat stored in breast tissue, not from the milk glands in the breast. Breast size has nothing to do with a woman's ability to nurse a baby. Small breasts and large breasts function in the same way.

Did You Know?

- Your body is covered with 5 million hair follicles, of which about 15% are inactive-so you have about 4 million hairs on you at any given time!
- Hair and nails are made out of the same thing-dead cells filled with keratin, a protein.

Growth of pubic hair in the area of the **genitals** (external sex organs) and on the lower part of the abdomen is also a visible event of puberty for girls. When pubic hair first grows, it is very fine and straight, and there is only a little of it. Gradually, the hair becomes coarser, curlier, darker, and it begins to spread. About the time that the pubic hair begins to reach the adult state, axillary hair appears under the arms.

You should remember that the ages marking the beginning and end of puberty changes may vary a lot among girls. Sometimes, these developments last a shorter period of time or a longer period. These time period variations are perfectly normal. Variations within the sequence of changes are also normal, so it is possible that a girl may have her menarche even before other changes occur. But the most common order of changes is as shown in Figure 3.2.

Apply Your KNOWLEDGE

How do animals distinguish male from female? Give some examples and describe the distinguishing secondary sexual characteristics.

Activity 3-1: Changes in Girls during Puberty

Introduction

The changes you go through at puberty follow a general schedule. The various changes occur in a fairly predictable order and on a fairly predictable time schedule. There is, however, a fairly wide range of normal in terms of when these events begin to occur and when they are complete.

Materials

- Activity Report

Procedure

Step 1 Look at Figure 3.2 shown below.

a. The ages at which changes take place are listed on the horizontal line at the bottom of the graph.

b. The bars each represent a different change or development during puberty.

c. The dark part of each bar indicates the ages at which the change typically takes place, and how long it generally takes for the change to occur.

d. However, it is perfectly normal for each change to begin or end earlier or later than the "average" time. The dotted section of each bar indicates this normal range for each event.

e. For example, breast development in girls usually starts around age 11 and is completed by age 15 (the dark part of the bar), but it can start as early as 8, or as late as 13, and be completed at 17 (the dotted parts of the bar).

f. Notice that the graph for height spurt is different. Like the other changes, the increase in height goes on over several years, but the rate of growth starts out slowly, then it speeds up, reaches its peak, and slows down again.

g. Notice also that the dark band for the onset of the first menstrual period, known as menarche, is very short, because menarche is a brief, onetime event. The dotted part of the bar is wide, because although the average age of this development is between 12 and 13, it can occur as early as 9, or as late as 16 and still be within the normal range.

Step 2 Use this graph to answer the questions on your Activity Report.

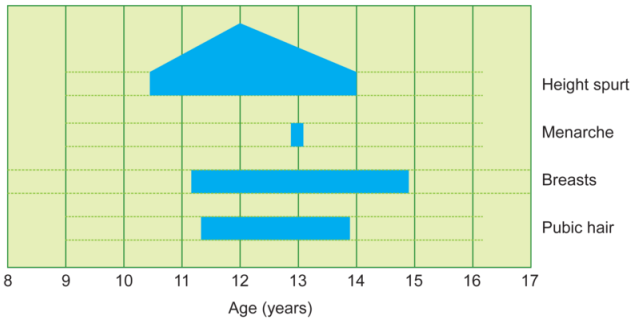


Figure 3.2 Changes in puberty for girls.

Sexual Maturation among Boys

The early signs of sexual maturation among boys are not as obvious as among girls. You may hardly notice the earliest change, such as enlargement of the **testes,** the organs where sperm cells are produced. Change in the **scrotum,** which contains the testes, is a little more evident as its skin becomes coarser. About a year after the testes start to grow, the **penis,** the male organ through which sperm is delivered and urination occurs, also begins to grow in length while the testes and scrotum continue to enlarge.

As the testes enlarge, the production of **sperm** cells begins. The production of sperm cells begins during puberty and will continue throughout the rest of a man's life. Sperm production is necessary for reproduction, because a sperm cell will combine with a woman's egg cell to create an embryo. Nutrient fluids and sperm make up **semen.** Semen is what comes out of the penis during **ejaculation.**

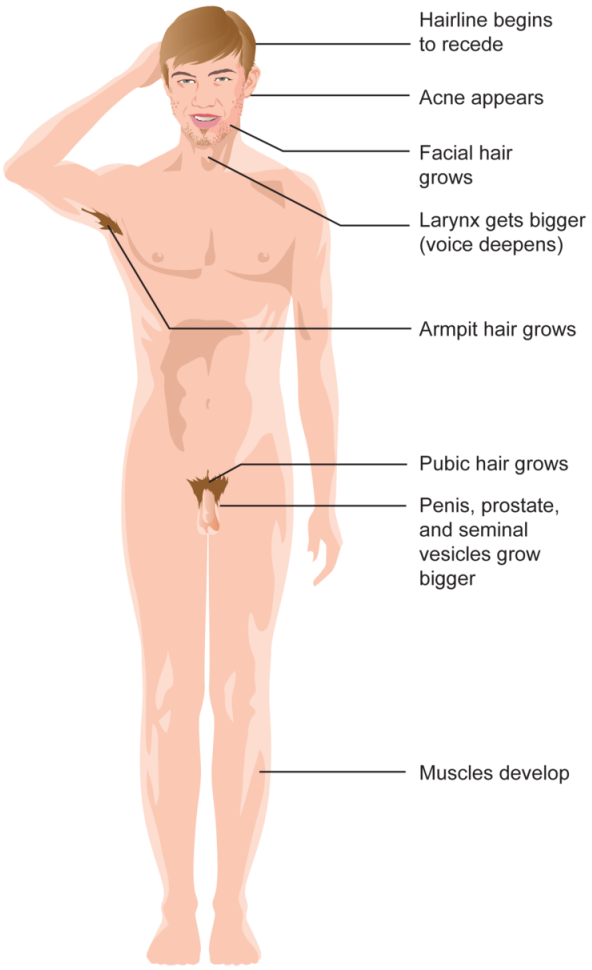


Figure 3.3 The primary changes and secondary sexual characteristics that males develop during puberty.

Boys find out that they are producing semen if they begin having "wet dreams," or **nocturnal emissions.** These occur when semen is ejaculated from the penis during sleep. Boys usually begin having wet dreams around the age of 13 or 14. Some have them earlier, later, or not at all. All of these experiences are normal. Though a wet dream is pleasurable, some boys worry about it. They may think they are sick, or they may feel embarrassed. However, nocturnal emissions are perfectly normal, and many boys have them. A boy may also experience his first ejaculation during **masturbation,** when he stimulates his own penis.

Apply Your KNOWLEDGE

What is the function of the scrotum?

What Do You Think?

Can you think of any reasons that hair growth varies among cultural groups? For example, Asians grow lighter and more sparse facial hair, while Mediterranean and Middle Eastern men tend to have darker and heavier beards.

Among the secondary sexual characteristics, the growth of pubic hair in boys usually occurs early in puberty but may start any time between the ages of 10 and 15. Pubic hair appears first at the base of the penis. Initially, the strands of hair are sparse and straight. Then they become darker and coarser. Pubic hair continues to grow and spread up to the abdomen until well past puberty.

About two years after the appearance of pubic hair, boys develop hair under the armpits. At about the same time, the first downy hairs appear on the upper lip. Later, this facial hair spreads to the cheeks and becomes coarser, forming a beard and mustache. Depending on inheritance, some boys will develop heavy beards while others may have less facial hair. The amount of chest hair also varies-some men have a lot and others almost none. Growth of chest hair is a late event in puberty.

Men generally have deeper voices than women do. Late in puberty, boys' voices deepen when the **larynx** (voice box) in the throat grows larger. We often call this enlargement an "Adam's apple." Boys go through a period when their voices crack, going from low to high pitch in the middle of a sentence. While more obvious in boys, voice changes also occur to some degree in girls.

Similarly, some changes we associate with girls may also occur in boys, though to a lesser degree. For example, boys may have some breast tenderness around the nipple, as well as a temporary enlargement of the breasts. An overweight boy may especially look as if he has breasts. This breast growth is fairly common (about 2 out of 3 boys by age 14) and usually shrinks in a year or two. If not, a doctor can treat this condition for reasons of appearance.

> **What Do You Think?**
> Why do we talk more about (and have a term for) a girl's first menstruation (menarche) than a boy's first ejaculation? Are they similar or different experiences?

As with girls, you should remember that the ages marking the beginning and end of puberty changes might vary a great deal between one boy and another. Sometimes, these developments last a shorter period of time or a longer period. These time-period variations are perfectly normal. Other variations within the sequence of changes are also normal; for example, the penis may start growing before pubic hair does.

Activity 3-2: Changes in Boys during Puberty

Introduction

The changes you go through at puberty follow a general schedule. The various changes occur in a fairly predictable order and on a fairly predictable time schedule. There is, however, a fairly wide range of normal in terms of when these events begin to occur and when they are complete.

Materials

- Activity Report

Procedure

Step 1 Look at Figure 3.4 shown below.

a. The ages at which changes take place are listed on the horizontal line at the bottom of the graph.

b. The bars each represent a different change or development during puberty.

c. The dark part of each bar indicates the ages at which the change typically takes place and how long it generally takes for the change to occur.

d. However, it is perfectly normal for each change to begin or end earlier or later than the "average" time. The dotted section of each bar indicates this normal range for each event.

e. For example, development of the testes in boys usually starts around age 12 and continues through age 15 (the dark part of the bar), but it can start as early as 9 or as late as 15 and be completed at 17 (the dotted parts of the bar).

f. Notice that the graph for height spurt is different. Like the other changes, the increase in height goes on over several years, but the rate of growth starts out slowly, then it speeds up, reaches its peak, and slows down again.

Step 2 Use this graph to answer the questions on your Activity Report.

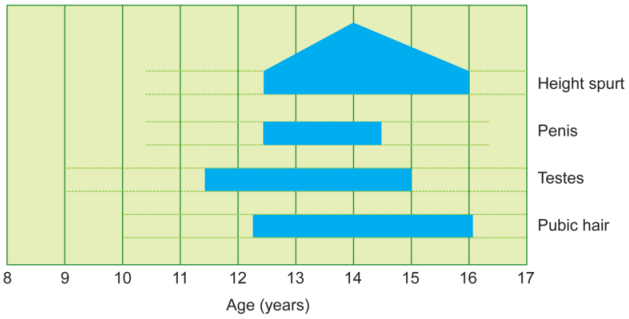


Figure 3.4 Changes in puberty for boys.

Activity 3-3: Knowing about Each Other

Introduction

Many changes take place during puberty. Some may be easy for you to accept or get used to. Others may take time to adjust to. How you feel about the changes of puberty varies from person to person. You may be very conscious of the changes that are going on in your own body but less aware of the changes going on in the opposite sex. It is important to realize that *everyone* has to deal with changes at puberty. Earlier in this section you learned about the changes that girls and boys go through. Now it is time to talk about how you feel about those changes and to think about how members of the opposite sex might be feeling about the changes that they have to face.

Materials

- Activity Report

Procedure

Step 1 In the space provided on your Activity Report, write down five things that you think are the hardest things for someone of your sex to accept or feel comfortable with during sexual maturation.

Step 2 Then do the same thing for the opposite sex.

Step 3 Next, your teacher will divide the class into groups by gender. Compare the list that you have made with the other lists in your group. Have a member of the group keep a tally of how many times an item is mentioned. Then make a group list of the five most commonly mentioned items for boys and the top five items mentioned for girls.

Step 4 Select a representative from your group to read your group list to the class, or write it on the board, as directed by your teacher.

Step 5 As a class, compare the lists from all groups. First look at the lists for what boys might find difficult. Were the girls able to predict what changes the boys might find hardest? If not, have the girls explain why they thought a particular change might be hard for the boys, and have the boys respond to why this change is not particularly hard. If boys felt that a change would be hard for the girls but the girls did not identify it, have the boys explain why they see that change as difficult.

Step 6 Then reverse the process, and look at the lists for what girls might find difficult to deal with. Were the boys able to predict what changes might be hardest for the girls? If not, have the boys explain why they thought a particular change might be hard for the girls, and have the girls respond to why this change is not particularly hard. If the girls felt that a change would be hard for the boys but the boys did not identify it, have the girls explain why they see that change as difficult.

Factors Influencing Puberty

Hormones, discussed in the next section, bring about the changes of puberty. A number of factors influence these hormones and the timing of their release. All human growth and development, in fact everything that happens to living organisms, result from the interaction of two factors-heredity and environment.

Did You Know?

Hippocrates, an ancient Greek physician, thought colder climates caused puberty to start later. Weather does affect growth as discussed on this page, but not the way Hippocrates thought.

Heredity is the transmission of biological characteristics from parent to child. The agents of heredity are genes, which contain all the instructions about how the body is to develop and function. Every species has its own schedule of reproductive maturation. For humans, sexual maturation occurs during puberty. But genetic and environmental diversity ensures that each of us is unique-each of us develops in a predictable way, but not on a precise or identical schedule.

Height increases twice as fast in the spring and weight increases four times as fast in the fall. But the time of the onset of puberty remains somewhat unpredictable.

Genes pass along a tendency to develop at a certain rate. For example, girls unrelated to one another reach menarche (their first menstrual period) at ages differing on average by 19 months. Sisters, who inherit some of the same genes from their parents, begin menstruating within 10 months of reaching the same age. Identical twins, sharing exactly the same inheritance, start menstruating within an average of 3 months of each other.

TABLE 4.1:

Environment	
Physical	**Social**
air	friends
food	family
sun	community

Figure 3.5 Elements of our physical and social environments.

Environment refers to everything around us, or the world in which we live. It includes the **physical environment**-the air we breathe, the food we eat, the sun that shines on us, and all else we come into contact with, whether or not we are aware of it. And it includes the **social environment,** the people with whom we interact. These people include our family and friends, the people in our school, community, and nation, and the world as a whole. This social environment is no less important to our development than the physical environment.

Environmental Influences on Puberty

Heredity makes it more likely you will look and sometimes even act a certain way, and its influence is difficult to control. Your environment, however, is changeable, although not always within your control. Your body's growth and development is very sensitive to your environment, especially to sources of nutrition and physical and emotional health. For example, if a young girl is undernourished or ill, her body will dedicate its food and energy to staying alive. Girls who live in places with inadequate or unpredictable food supplies tend to enter puberty later than usual. This makes sense since a woman's body should have a mechanism that protects her from conceiving (getting pregnant) when her body cannot physically sustain, or feed and care for, an infant.

What Do You Think?

How can you best evaluate and control your environment? Give an example of one element in your environment you can and want to change.

Numerous studies show a direct connection between nutrition and health and normal growth and development during

childhood and puberty. Children living in extreme situations, where food and health care are scarce, may not grow as much or at the same rate as better nourished and cared for children. For these and other reasons, the rate of maturation in different environments varies. For example, girls in Cuba reach menarche about six years sooner than girls in the African country of Rwanda.

What Do You Think?

With medical advances available today, it is possible to medically treat children who do not enter puberty at the average age. Should we treat children who have not yet entered puberty at the average age, or wait for nature to take its course? Why or why not? How long should we wait?

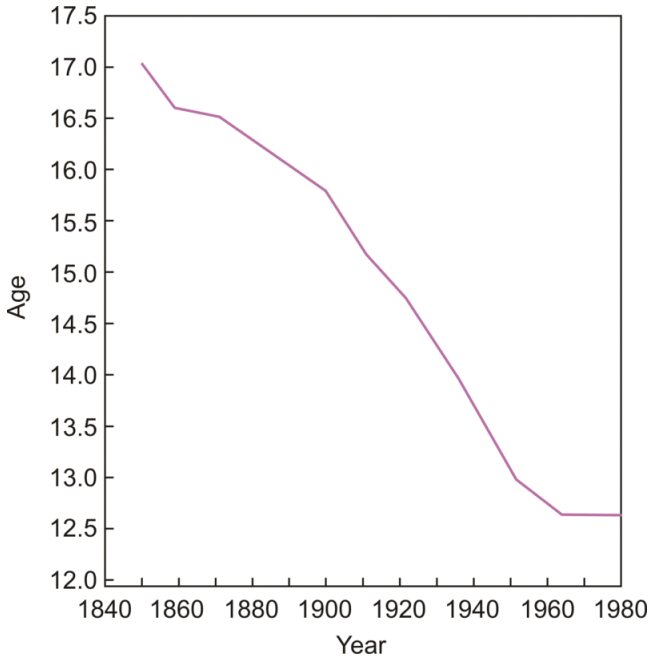


Figure 3.6 Age of first menstrual period.

Another factor that can affect when an individual girl begins to menstruate is physical activity. For instance, girls who are very athletic tend to begin menstruating later than girls who are less active do. Women who engage in very strenuous exercise, such as marathon runners, may stop having menstrual periods for a while. The ratio, or percentage, of fat to body mass may influence the control of menstruation by the nervous system. Since exercise burns off fat, high levels of certain activities will influence the usual pattern of development at puberty.

Finally, emotional factors (part of your social environment) can also affect growth. Children from extremely deprived situations, growing up in homes where they do not receive love from those who care for them, do not grow at the same rate as other children. When these children are placed in an environment where they receive love and affection, their growth returns to average levels.

Did You Know?

One hundred years ago, in northern Europe, girls began to menstruate at about age 17. Now they usually reach menarche at about 12.8 years. This trend has leveled off, with girls now reaching menarche at about the same age as their mothers. The earlier maturation is due to better nutrition and health care.

A dramatic example of how social environment can affect growth occurred in a British orphanage right after the Second World War. Though food was scarce, the children received extra food and initially grew faster than those outside of the orphanage. Then a very harsh director took charge of the orphanage. She was very hard on the children and often punished them at mealtime. As a result, the growth rate of the children slowed, although they continued to receive the extra food. The only children who continued to grow at a higher rate were those to whom the director gave care and paid attention.

Apply Your KNOWLEDGE

According to the Did You Know? on this page, the age of menarche has come down significantly in the last 100 years. Based on what you know about factors influencing puberty, what might explain this trend? This trend has stopped at about age 12.8 years. How might you explain why the trend has not continued?

Activity 3-4: Factors Influencing Puberty

Introduction

Many factors influence your growth and development. Some of these factors are within your control and others are not. In this activity you identify many of the factors that contribute to growth and development during puberty and decide which ones you can influence.

Materials

- One Activity Report per group

Procedure

Step 1 Your teacher will divide you into groups.

Step 2 With your group, look over the Activity Report and decide which of the factors you have little or no control over and those you have some or a great deal of control over. Refer back to the text if you need to review the terms. Put them in the proper categories as indicated on your Activity Report. There may be some factors that you think actually fit in both categories. In that case you may put the factor in both charts but must explain your reasoning.

Step 3 After you have filled out the charts and answered the questions, select a member of your group to read your final paragraph aloud to the class.

Step 4 Compare your answers, and see if you can agree as a class on how to maximize your chances for healthy development.

"Hormones thump hearts, tremble hands, fill you with butterflies of fear: They make you grow. They make you sleep. They wake you up again the next morning. Hormones shape embryos into boys and girls, and boys and girls into men and women."

-The Body Book

Sara Stein

Journal Writing

Are you ready for all the changes that puberty will bring to you? What changes of puberty do you think will be the easiest and hardest to deal with for you? Why? What are the changes of puberty that you are actually the most excited about? What do you look forward to about growing up and changing?

Review Questions

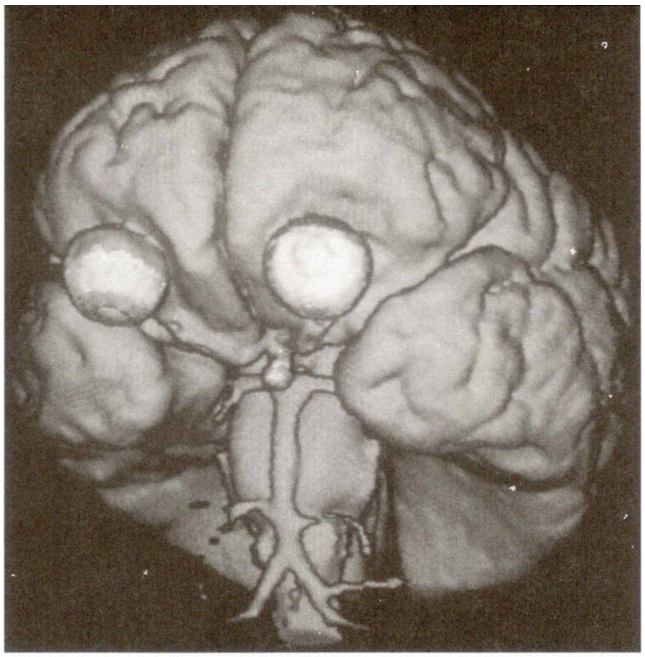
1. What is the difference between a primary and a secondary sexual characteristic?
2. Give two primary changes for boys and two primary changes for girls.
3. Give two secondary changes for boys and two secondary changes for girls.

4. What are the major parts of the female reproductive system?
5. What are some of the reasons a female might have irregular menstrual periods?
6. Name three factors affecting puberty you can control and three factors you cannot control.

CHAPTER 5 Hormones and Puberty - Student Edition (Human Biology)

CHAPTER OUTLINE

5.1 Hormones and Puberty



3-D Cat Scan of brain, eyes, optic nerves, pituitary glands, and spinal base.

What are hormones and what do they do?

In the previous section you learned about the changes your body goes through at puberty. But how and why do these changes occur? What makes them happen? If we were to choose one word to answer these questions, it would be *hormones*. In this section you will learn about hormones and what they do.

Did You Know?
Hormones . . .

- have short lives-they remain active for only a few minutes.
- can bind to different kinds of cells and produce different results. For example, androgen can stimulate muscle growth or hair growth.
- of different types can send conflicting messages to a cell. What does the cell do? Compromises and listens to both-or to the one shouting the loudest.
- cause the human body to follow rhythms, the menstrual cycle for example.

Hormones are chemical substances that the body's various systems need to perform their functions. These chemicals are produced by **endocrine glands,** clusters of specialized cells located in various parts of the body. Each hormone influences the functions of certain target cells in the body. Thus, a hormone acts like a chemical message sent out by an endocrine cell and received by a target cell. There are over a dozen major endocrine glands in the body. We will focus on only four of these: the hypothalamus, pituitary, adrenals, and the gonads (ovaries and testes).

Endocrine glands are not the only glands in the body. Others, called **exocrine glands,** do not produce hormones but release secretions to the places needed through ducts, or small tubes. For instance, saliva, a secretion from an exocrine gland in the cheek is delivered through a duct to the mouth. As you chew food, saliva mixes with the food and helps soften and digest it.

"Just as some girls make enough androgens to grow a shadow of a mustache so some boys make enough estrogen to grow minor bumps beneath their nipples."

-The Body Book

Sara Stein

Endocrine glands have no ducts. These ductless glands release hormones directly into the bloodstream where they circulate throughout the body. Hormones play a vital role in regulating all the body's functions. They are responsible for your growth and sexual maturation, and they help keep you healthy and alive. This section will focus on the hormones directly responsible for the changes of puberty.

Mini-Activity

Word Origin: Endocrine, Exocrine Where do the terms *exocrine* and *endocrine* come from? Use a dictionary or other word reference book to find the answer.

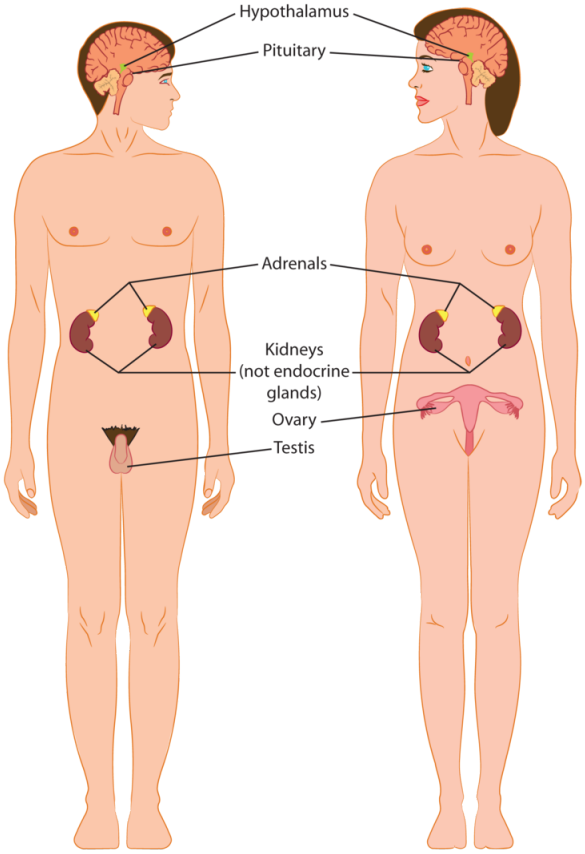


Figure 4.1 The endocrine glands of males and females that are discussed in this unit.

TABLE 5.1:

Glands	
Exocrine (ducts)	**Endocrine (no ducts)**
• secretions	• hormones

TABLE 5.1: (continued)

Glands		
	• delivered to specific location	• delivered into blood stream

Figure 4.2 The difference between exocrine and endocrine glands.

How do hormones function?

As mentioned, hormones are released directly into the bloodstream. Once released and circulating in the bloodstream, they go to every cell in every corner of the body. Although every cell comes into contact with many different hormones, only target cells bind to their respective hormones. How? Before you read further, stop and make a prediction about how cells might know which hormones to select and which to reject.

A cell's selection of hormones works a little like the way people pick up their luggage at an airport baggage claim area. Suitcases come out to the carousel and go round and round. People identify and pick up their own suitcases as they go by. They do not take up the suitcases that do not belong to them.

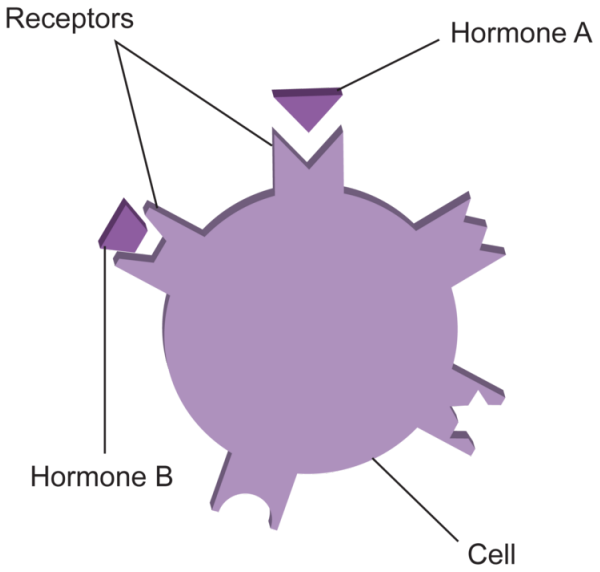


Figure 4.3 Certain hormones bind to certain receptors the way a lock fits a key.

> **Did You Know?**
> You are aware of less than 1% of what's happening in your brain and body at any given time.

This system requires that people recognize a suitcase as theirs. How can cells recognize a hormone as theirs? They do so through **receptors** located either within the cell or on the cell surface that recognize and bind with hormones. A cell receptor and a hormone work like a lock and key. If the key (hormone) fits, the lock (receptor) will open-if the key (hormone) does not fit, the lock (receptor) will not open. Each hormone has its own kind of receptor. So, although hormones come in contact with cells, they do not affect a cell unless they match the cell's receptors.

Hormones can cause many different reactions, depending on the type of cell to which they attach. They can make a cell grow bigger, secrete fluids, or move. Hormones can affect a cell close to the releasing endocrine gland or

influence cells far away from the gland. Glands function like a remote control device: they emit hormones to turn body functions on and off.

Hormones don't function alone, however. The endocrine (hormone) system works closely with the **nervous system,** consisting of the brain, spinal cord, and nerves, to integrate and control the physiological functions of the body, such as the reproductive system. You should think of them as one large system whose functions and actions are closely coordinated. They work together like a team. The team members have different positions and specific tasks, but they all work together toward a common goal: making the body function.

Apply Your KNOWLEDGE

Why does the body need both a nervous system and an endocrine system to regulate its function?

Activity 4-1: Glands and Hormones

Introduction

Hormones from endocrine glands circulate through all parts of the body but are picked up only by certain cells. This exercise will help you learn about the way cells identify the hormones they need and the way that hormones attach themselves to particular cells.

Materials

- 1 Activity Report for each team
- 1 pair of scissors per team
- 1 glue stick per team

Procedure

Step 1 Reread the section in your text about the selection of hormones by cells.

Step 2 Look at the Activity Report you have been given. Cut out all the hormones from the strip at the bottom of the page, being careful to cut accurately.

Step 3 Your job is to match the hormones with the proper cells by fitting them into the receptors.

Step 4 Imagine that the hormones are circulating through the body, past the cells. Move the pieces you have cut out across the page of cells at random. If the hormone does not fit a particular cell that it is passing near or through, move it past that cell to the next one. When a hormone comes near a cell with a proper receptor, fit it into place and leave it there.

Step 5 When you have all the hormones lined up at their proper receptor sites, glue them in place.

Step 6 Then answer the questions on the Activity Report.

What Do You Think?

What do you think would happen if the body didn't begin producing more and different hormones at puberty?

The Hormones of Puberty

Now that you know how hormones work, you're ready to learn about the hormones that are specific to puberty. Interestingly, most of the hormones affecting puberty are found in both females and males, and they produce similar results in both sexes.

The **pituitary gland** produces many hormones, including some of the hormones of puberty. This pea-sized "master gland" is located near the base of your brain.

One very important hormone produced by the pituitary is the **growth hormone (GH).** It makes your body's bones and tissues grow larger. At puberty, GH is responsible for the growth spurt, although other hormones, like the thyroid hormones that affect metabolism, also influence this process. Until recently, children who lacked growth hormone failed to grow normally. Now they can be treated with injections of GH.

Unlike GH, other hormones of the pituitary gland do not work directly to change body tissues. Rather, they stimulate other endocrine glands to produce hormones that in turn change body tissues. The pituitary's effect on the reproductive glands, or gonads, will serve as a model of how this chain of events works.

What Do You Think?

Now that you know something about what hormones can do, what do you think is meant by the phrase "raging hormones"? Why is the term often used when talking about adolescents?

The female reproductive glands are the ovaries. The male reproductive glands are the testes. These reproductive glands, also called **gonads,** do two things. They produce sex cells (either eggs or sperm) and secrete hormones. In both the male and female, the pituitary gland produces two hormones called **follicle-stimulating hormone (FSH)** and **luteinizing hormone (LH)** that flow through the bloodstream and are picked up by the gonads (remember the lock-and-key method of how hormones work). FSH and LH are together known as **gonadotropins**-hormones that control the gonads. The gonads, in turn, produce their own hormones.

In the female ovaries, FSH stimulates an egg, or ovum, to mature in its follicle, or sac. While maturing, follicle cells produce the hormone **estrogen.** After an egg matures and leaves the follicle, LH causes follicle cells to produce **progesterone.** Estrogen and progesterone play an important role in sexual maturation, the menstrual cycle, and reproduction.

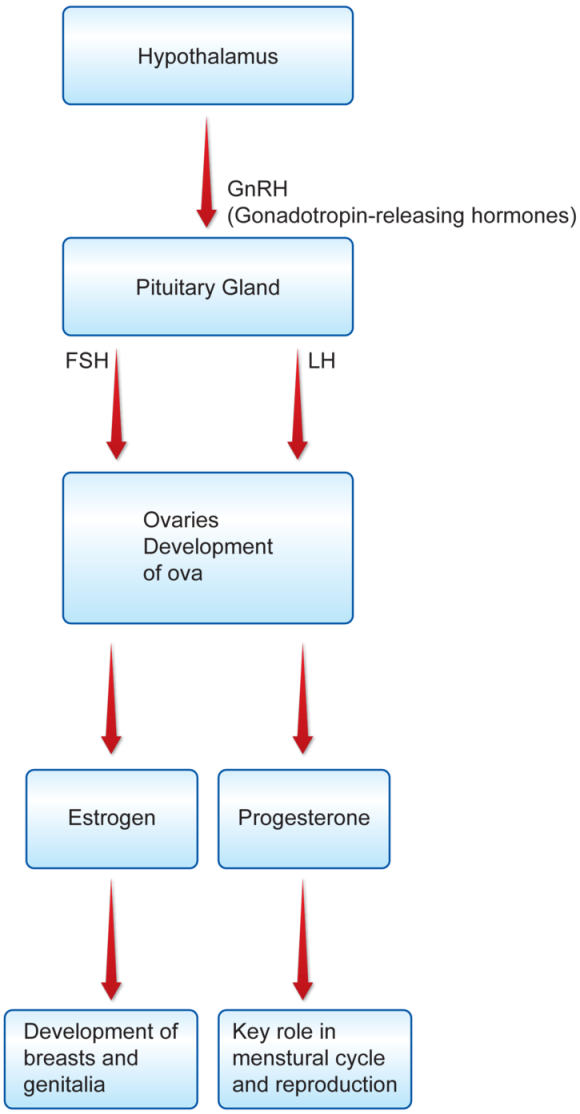


Figure 4.4 Female sex hormones-where they come from and what they do.

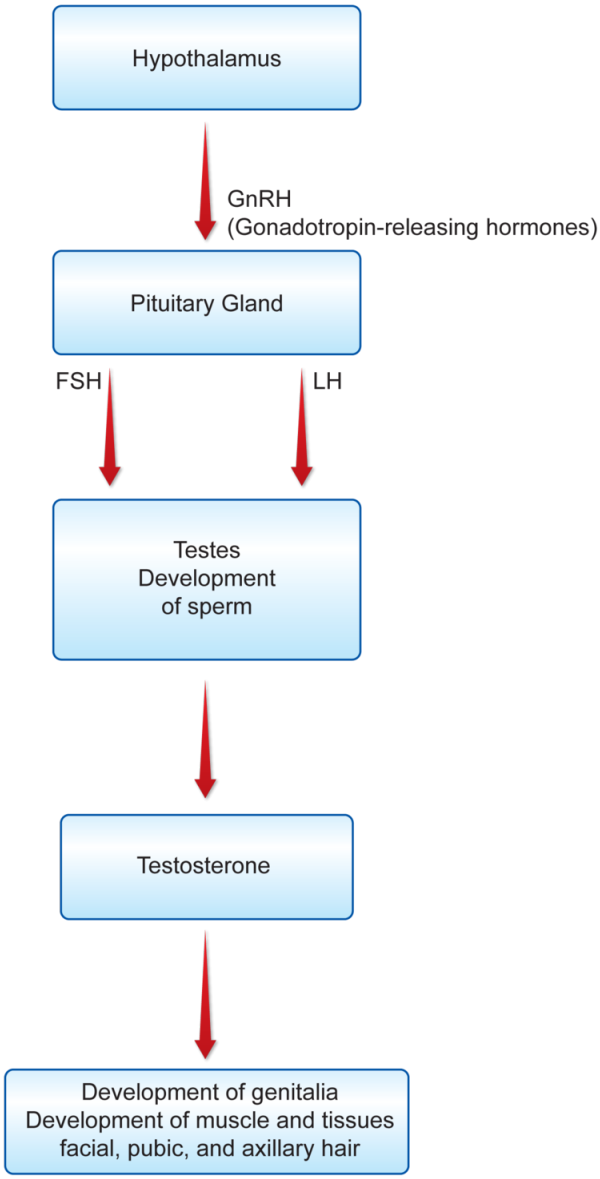


Figure 4.5 Male sex hormones-where they come from and what they do.

Although named after the functions they perform in the female body, FSH and LH also exist in the male but perform different functions. In the male, FSH stimulates the production of sperm cells in the testes, but it does not cause the testes to produce hormones. That function is performed by LH, which acts on cells that are between tiny tubes where sperm are produced, causing the cells to produce a hormone called **testosterone,** which helps develop pubic hair and build muscle.

Another source of testosterone in both sexes is the **adrenal gland.** Also controlled by the pituitary gland, the adrenals are found on top of the kidneys (Figure 4.1). While most of the testosterone in males comes from the testes, the adrenals are the main source of testosterone in females.

"I feel as if I'm going to burst, and I know that it would get better with crying; but I can't. I'm restless, I go from one room to the other; breathe through the crack of a closed window, feel my heart beating . . . "

-Diary of a Young Girl

Anne Frank

It is customary to refer to testosterone (or androgen) as the "male" hormone and to estrogen and progesterone as the

"female" hormones. Yet all three hormones exist in both sexes in differing amounts and all belong to a group of chemicals called **steroids.** These hormones also have some effects that are not sexual. For instance, androgens help build up muscles in both sexes.

If the pituitary controls other endocrine glands such as the testes and the ovary, what controls the pituitary? Is the "master gland" its own boss?

The pituitary itself is under the control of a portion of the brain called the **hypothalamus.** This area of the brain lies right above the pituitary. It is both part of the nervous system as well as part of the endocrine system. This double function shows how closely the two systems are linked together. The hypothalamus produces the **gonadotropin-releasing hormone** (GnRH) that acts on the pituitary gland. The pituitary gland, in turn, releases FSH and LH.

Apply Your KNOWLEDGE

How can a small gland like the pituitary produce so many hormones?

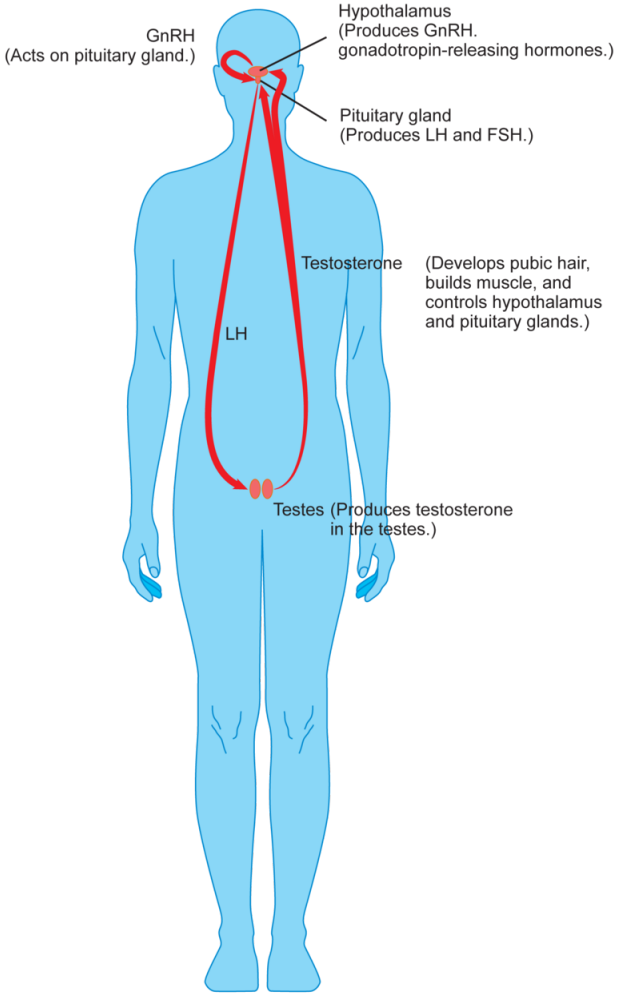
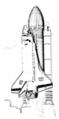


Figure 4.6 The hormones of puberty are regulated by a negative feedback system. This is a process in which the end product controls the function of activity or the starting elements.

What controls the hypothalamus and pituitary gland? The very same hormones produced by the glands they control-testosterone, progesterone, and estrogen-control the hypothalamus and pituitary gland. Look at the chain of command for the production of testosterone in Figure 4.6. The arrow from the hypothalamus shows GnRH acting on the

pituitary gland. The second arrow shows LH acting on the testes. The testes then release testosterone that circulates in the bloodstream. When the level of testosterone in the blood gets above a certain level, it inhibits or limits the hormone outputs of the hypothalamus and pituitary. Both the hypothalamus and pituitary slow down their production of hormones. As a result, the testes get less LH and decrease production of testosterone, until its level in the blood falls to a certain level. This negative feedback system helps keep hormones in the bloodstream at fairly steady levels. How this works with females will be discussed in connection with the menstrual cycle.



Mini-Activity

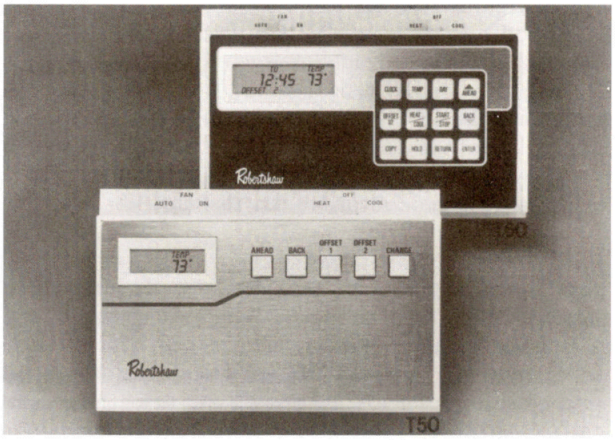
Social Feedback Write a poem or story illustrating the concept of a social feedback system.

An everyday example of a negative feedback system is the heating system in a building. Suppose the thermostat is set at a chosen temperature of $68°F$. When the room temperature drops below $68°F$, the thermostat starts the heater. When the room temperature reaches $68°F$, the thermostat turns off the heater. Now you are back where you started. This way you maintain a more or less constant temperature in the room.

Glands are controlled by similar feedback systems that regulate the level of hormones in the bloodstream. For example, the testes produce testosterone (just like the heater produces heat). But testosterone is constantly being used up (just as heat is gradually lost from the building). When the level of testosterone drops below its "set point," the testes are triggered, and they produce more testosterone. The level of testosterone then rises back to where it started. Such self-regulatory systems help maintain the delicate balance of hormones in the body.

Apply Your KNOWLEDGE

The feedback system discussed here is a negative feedback system. Why? What might a positive feedback system be?



Thermostats are negative feedback systems.

Activity 4-2: All That Happens at Puberty

Introduction

Although it may seem very complicated at first, the way that hormones influence growth and change at puberty works very much like a relay, or a circuit. In this activity you take the role of a hormone or body part and are given a

job, or message to relay to another hormone or body part. That hormone or body part will then pass its own message on to the next hormone or body part, and so on, until the message gets back to the start, which is the hypothalamus.

Materials

- Name card
- Role card
- Construction paper
- Markers
- String, straight pins, or safety pins

Procedure

Step 1 Make sure you have read Section 4 carefully. Ask for help if you are confused.

Step 2 Your teacher will give you a name card that tells you the part you will play. With the construction paper and markers, make yourself a large name tag to pin on or to string and wear around your neck.

Step 3 Your teacher will also give you a role card. It contains background information about what you do. Read this carefully so that you understand your role. It will tell you what body part or hormone gives you the signal to do what you do.

Step 4 At the bottom of the card in boldface is your "script." These are the lines you are supposed to say when given the signal by the hormone or body part that comes before you in the relay. Listen carefully, and read only the line that particular body part or hormone commands you to say at that time. You may have several different jobs to do, each controlled by different hormones or body parts.

Step 5 The hypothalamus will start the relay by saying its lines and "finding" GnRH. Once it says its lines and "tags" GnRH, it stands still, and GnRH says its lines and "tags" the pituitary gland. This continues until all cards have been used. Sometimes more than one thing will be happening at the same time. It is important to be quiet enough to hear the commands and act only when given the proper signal. Once you've done your job, stand still and listen carefully to the rest of the relay.

Journal Writing

Close your eyes and imagine your hormonal system at work. Hormones are surging through your body, passing in and out of some cells, binding to others. What does it feel like? What might it look like artistically, not scientifically? Draw your impression of what's going on under your skin, or describe it with words.

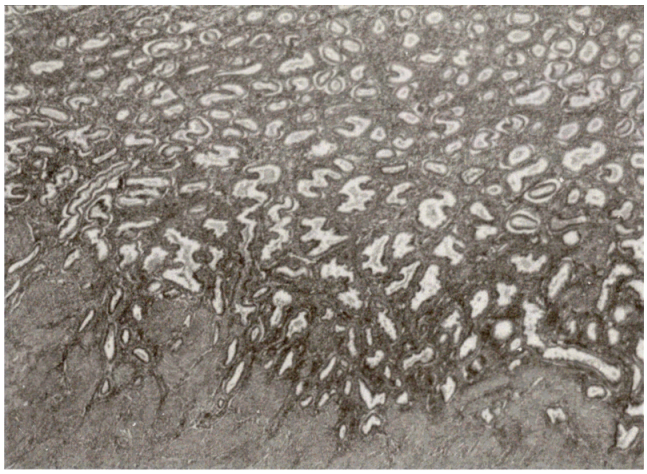
Review Questions

1. What are hormones? Name three body functions they affect.
2. What is the difference between endocrine and exocrine glands?
3. How do cells know which hormones to bind to?
4. What is the difference between the pituitary gland and the hypothalamus?
5. How do FSH and LH stimulate the production of other hormones?
6. What do testosterone, estrogen, and progesterone do in males and females?
7. What is a feedback system? How does it work?

CHAPTER 6 The Menstrual Cycle - Student Edition (Human Biology)

CHAPTER OUTLINE

6.1 The Menstrual Cycle



Lining of uterus (days 18-23).

How does the menstrual cycle work?

Every month after menarche, and for approximately the next 40 years, a woman's body prepares itself for possible pregnancy. If no pregnancy occurs, then a woman menstruates. Menstruation signals the beginning of a new monthly cycle of hormones in her reproductive system. What happens? How does it work? This section will help to answer these questions.

Did You Know?

- Adult males produce millions of new sperm every day.
- Females are born with all the eggs they need.

The female reproductive system works like a relay. As we discussed in the previous section, under the effect of GnRH from the hypothalamus, the pituitary gland releases gonadotropins (FSH and LH). The ovaries pick up the gonadotropins that cause the eggs in the ovaries to mature. The eggs, in their various phases of maturation in the ovary, release estrogen and progesterone. The pituitary releases more FSH and LH, depending on the levels of estrogen and progesterone in the blood. This complex and sensitive feedback system responds to many environmental influences throughout a woman's reproductive years. For example, too much emotional or physical stress can cause irregular periods. Let's take a closer look at how the menstrual cycle works.

TABLE 6.1:

Hormonal Cycle	Ovarian Cycle	Uterine Cycle
The pituitary releases LH and FSH The ovary releases estrogen and progesterone.	Eggs mature and every month one (sometimes more) bursts from an ovary and is pushed toward the uterus.	Uterine lining thickens and secretes nutrients preparing for the fertilized egg to implant. With no implantation, the lining sheds as menstruation.

Figure 5.1 Menstruation is actually the result of three cycles at work.

Menstruation occurs, on average, every 28 days, although some females have cycles as short as 21 days, others as long as every 40 days. Keep in mind that after menarche, periods may be very irregular for the first year. A woman may skip a few months, or have one right after another. It takes a while for all these hormones to reach the right levels and work together.

The following illustrations show what is happening with each of these cycles. First consider the time frame in which these cycles occur and then the sequence of changes in the ovary, hormone levels, or the uterine lining. Look at the illustrations to get a picture of what happens in a female's body week to week. Then look at the various hormone level graphs to see which hormones are rising or falling. The hormone relay begins with the pituitary hormones, which affect the ovaries. The ovaries in turn release gonadal hormones, which then cause the uterus to prepare to shed its lining. Remember that the menstrual cycle begins on the first day of menstruation.

1. **Time Frame**

A typical menstrual cycle (of which menstruation is only a part) takes about 28 days. Some people have cycles that are somewhat longer or shorter than this. As in other biological functions, normal people differ from one another.

Day 1 corresponds to the start of the girl's menstrual period. The menstrual flow lasts several days and, after a few more days of milder "spotting," stops completely.

Figure 5.2 Menstrual cycle timeline in days.

2. **Ovarian Cycle**

In the ovary, a cluster of the ovarian follicles begins to grow at the start of the cycle, but only one egg reaches full maturity. An ovarian **follicle** is a small cavity in the ovary that contains a developing egg. The egg bursts out of the wall of the ovary on day 14 during **ovulation.** This is the most fertile period for a woman-the time when she is most likely to get pregnant. The remaining part of the follicle in the ovary turns into the corpus luteum and then shrinks.

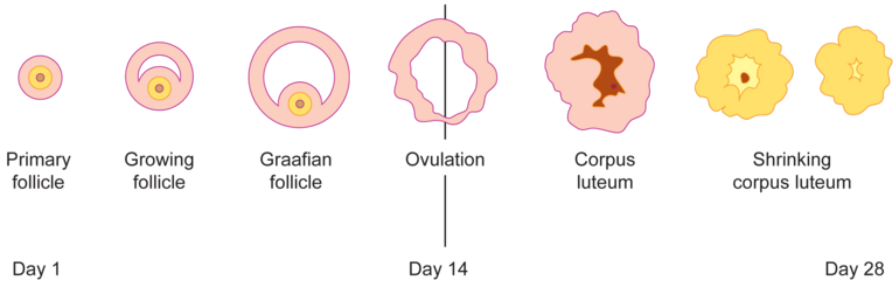


Figure 5.3 Ovarian cycle timeline.

3. **Hormonal Cycle: Pituitary Hormones**

At the beginning of a menstrual cycle, FSH starts low and then gets higher, drifts slightly down, and then reaches its peak and gradually falls clown. LH starts on a similar course, but then it surges up just before clay 14. It is this surge in LH that triggers ovulation.

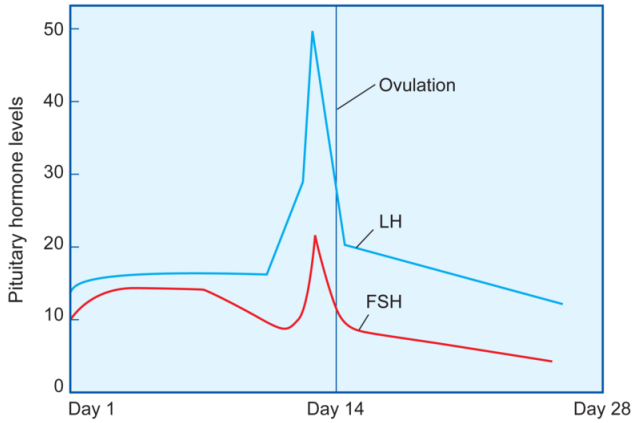


Figure 5.4 LH and FSH curves.

Look at the curves for estrogen and progesterone. Notice how they go up and down. You can now put together what happens in the ovary with the changes in levels of hormones, since they depend on each other.

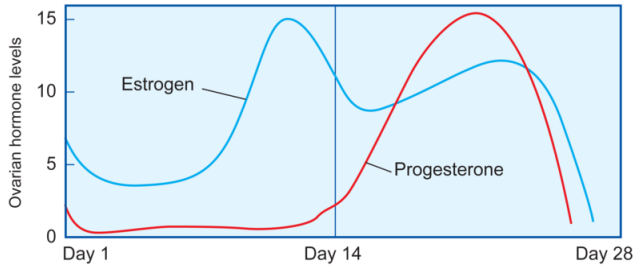


Figure 5.5 Gonadal hormone curves.

At the start of the cycle, the increasing levels of FSH bring about the maturation of the ovarian follicle. The follicular cells in turn produce increasing levels of estrogen. Just before day 14, the sharp increase in LH (and to a lesser extent FSH) causes ovulation. After the ovum leaves the follicle, the remaining cells turn into the corpus luteum (the "yellow body"). This is clue to the effect of LH. The corpus luteum in turn starts producing increasingly higher levels of progesterone (as well as estrogen). Notice that when the gonadal hormones are high, the gonadotropins, FSH and LH, are low (because of negative feedback).

4. **Uterine Lining**

Finally, let us look at the changes of the lining in the **uterus.** Under the influence of estrogen, it gets thicker in the period before ovulation. After that, its glands begin to secrete nutrients.

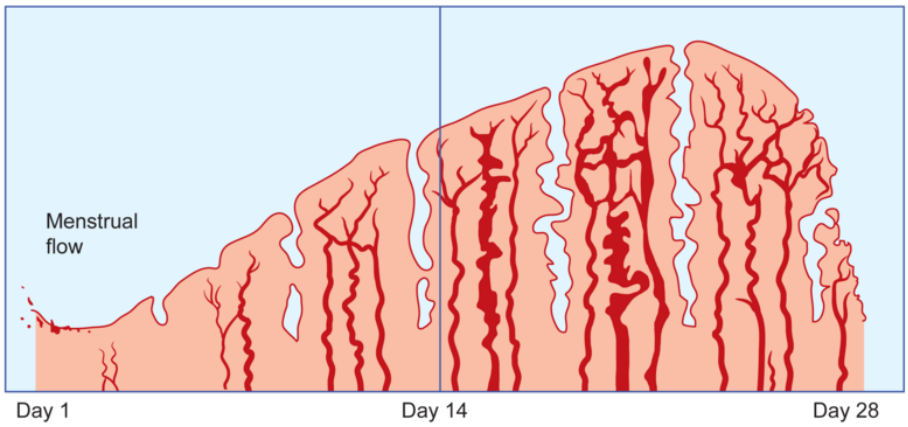


Figure 5.6 Diagram of the uterine lining.

Mini-Activity

How Thick Is the Uterine Lining? By what percent does the endometrium thicken during the menstrual cycle? The lining grows from .04-.06 inches in thickness to .2-.3 inches in thickness.

All of this is to prepare the uterus for pregnancy. If no pregnancy occurs, the level of gonadal hormones gradually drops. As a result, the lining of the uterus sloughs off and menstruation begins and with it a new cycle begins.

Activity 5-1: How Does the Menstrual Cycle Work?

Menstruation results from three cycles working together, each one influencing the others. In this activity you will explore this interaction and learn what happens at each stage of the menstrual cycle.

Materials

- Activity Report

Procedure

Step 1 Go back and review Section 5 carefully. If you still have questions about what words mean, now is the time to ask, or find out.

Step 2 Study the drawings on pages 37, 38, and 39 that show what is taking place in the hormonal, ovarian, and menstrual cycles during each phase of menstruation.

Step 3 Describe in your own words how the three cycles work together by answering the questions on your Activity Report. Try to figure out how all the different cycles are related. For example, do you see a connection between changes in the levels of hormones and changes in the ovaries and uterus? Be as specific as you can, indicating on what day of the cycle major changes take place. You will have to read the graphs carefully to do this. For example, if hormone levels are constant and then begin to rise, specify when in the cycle they change.

Step 4 When you think you have described the process accurately, compare your answers with those of several other people in the room. If you need to make changes to your answers or ask more questions, do so before you turn your work in.

The Experience of Menstruation

No matter how much a girl knows or prepares for it, her first menstruation is an important event. This section focuses on experiencing menstruation-what happens and what it's like.

Menstruation is an important life experience, not only for what it represents in the reproductive cycle, but also because it affects a woman's body and feelings, as well as the lives of people around her. Menstruation is an ordinary and normal body function. It is also a private function. We usually do not talk about it in public. But there is nothing secret or shameful about it.

Menstruation, also called a period, is usually not the first sign of puberty. A girl's first period usually comes two years after breast development begins, and a year or so after the peak in her growth spurt. Most girls have plenty of time to learn about menstruation and feel "ready" for it, emotionally and physically. Since a girl cannot tell when she will have her first period, she may warty about it-will it happen at school or when she is out with her friends? Talking with her mother or some other trusted adult ahead of time, and making sure tampons or pads are readily available, may ease her worry.

Figure 5.7

Did You Know?

While women in every culture menstruate, not every woman has the same experience. In some cultures, a woman takes a ritual bath at the end of her period. In other cultures, a girl lives alone in a separate hut during her periods.

What will happen?

For the first year or so, a girl's periods may be quite irregular. One may follow another after 20 days, or 40 days. Eventually, her hormones will settle to a fairly regular cycle and she will menstruate about once a month or about every 28 days. Many physical factors (such as strenuous exercise, malnutrition, illness) or psychological factors (such as emotional upsets) can make periods irregular for a while or stop them altogether.

The most common reason women miss their periods is pregnancy. However, missing her period does not always mean a woman is pregnant. The fear of pregnancy itself may cause a woman to miss her period. If a woman misses her period after having sexual intercourse, it is important to find out as soon as possible if she is pregnant.

Menstrual Flow

Menstruation begins as the lining of the uterus comes off gradually and flows out through the vagina. This menstrual flow is quite slow and gradual. There is no sudden "gushing" out of blood like from a cut. Over the next day or two, the flow will increase a bit, and then over another day or so it will gradually decrease and stop. The amount of blood lost during menstruation may vary quite a bit. The flow is heavier for some girls than others, or from one month to another. Normally, girls lose about three tablespoons of blood. With a good diet including plenty of iron, a mineral required to make red blood cells, the body easily replaces the lost blood. But if bleeding is heavy, or the

girl's dietary intake of iron is insufficient, she may develop **anemia**, which is a condition of insufficient red blood cells. A doctor can easily treat anemia.

"We started dancing again but I couldn't help thinking: Suppose the paper towels aren't enough? Suppose it gets on my skirt and Peter says, "What's that . . . your period?"

-Just as Long as We're Together,

Judy Blume

All that a girl needs to do when menstruating is prevent the menstrual blood from staining her clothes. She can use either a sanitary pad or a tampon. In both cases, instructions for use come in the package. Pads and tampons come in various sizes for different amounts of menstrual flow. They should be changed every 4 or 5 hours when the flow is heaviest; and less often when it is light. Girls can learn more about pads and tampons from their mothers, the school nurse, or health professionals.

Fresh menstrual blood has no odor. It will develop an odor if exposed to air. If a girl changes pads often, she doesn't need to worry about menstrual odors. There is no need to use deodorant tampons because the chemicals they contain may irritate the vagina. A girl can remain fully active during her period, including participation in sports.

Apply Your KNOWLEDGE

- **How can a girl keep herself healthy before and during menstruation?**
- **List the factors that may affect the regularity of menstruation.**

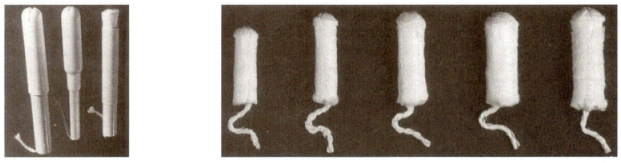


Figure 5.8 Tampons come in a variety of absorbencies, depending on flow of blood. Tampons are inserted into the vagina to absorb blood and should be changed every 4 hours.

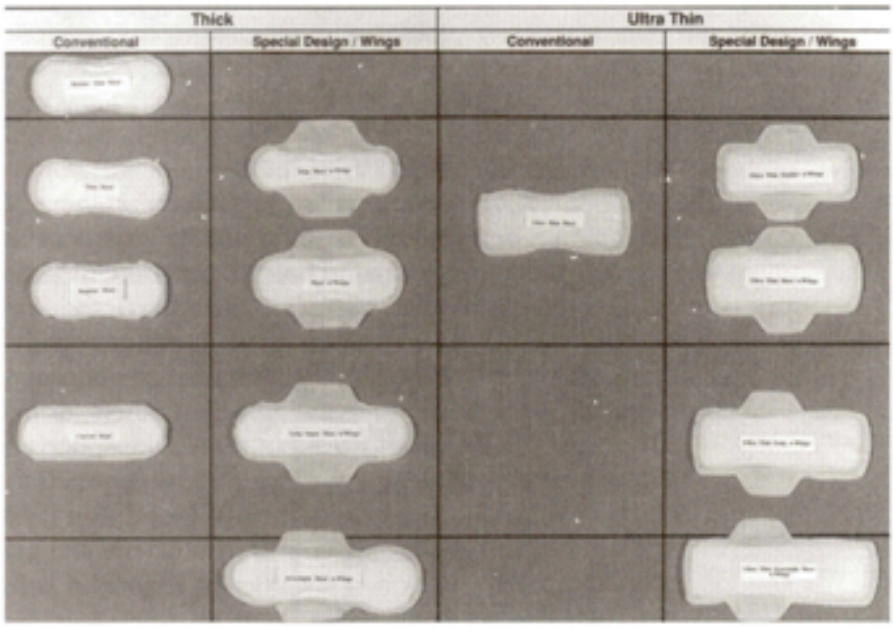


Figure 5.9 Pads come in a variety of shapes and thicknesses, depending on the amount of absorbency needed. A woman peels off the center strip of the back and sticks the pad to underwear.

A rare but important complication associated with tampon use is called **toxic shock syndrome.** This condition is caused by bacteria that may grow in a tampon soaked with blood. The symptoms of toxic shock syndrome include high fever, vomiting, muscle aches, other flulike symptoms, and a rash that looks like sunburn. If a woman experiences any of these symptoms, she should see a doctor immediately.

Toxic shock syndrome is not associated with the use of sanitary pads. It happens only with tampon use, especially the super-absorbent tampons. It can be avoided by not using super-absorbent tampons, changing tampons frequently, washing hands before inserting the tampon, and using a sanitary pad instead of a tampon at night.

Menstrual Discomfort

Many girls remain perfectly comfortable during their periods. Others feel mild to moderate discomfort. Some may be quite bothered by them, in which case help from the school nurse or a visit to the doctor may be necessary. However, we should not think of menstruation as an illness. It is a normal body function.

What Do You Think

a. Some judges have acquitted (let go) women accused of violent crimes committed while suffering from severe PMS. This is based on the argument that people under conditions of "diminished responsibility" cannot be held accountable for what they do. Do you agree or not? What are your reasons?
b. If people cannot be held responsible for their actions during periods of temporary physiological circumstances, should they be allowed to engage in risky activities in which others may be hurt (flying an airplane)? Could this provide excuses for discriminating against women?

Menstrual discomfort takes one of two forms. The first is called menstrual cramps, or **dysmenorrhea.** Cramps may occur during menstruation and can cause pain in the lower abdomen and the back. There may also be some nausea. A hot water bottle on the abdomen, rest, and drinking warm fluids may help. If cramps are severe, medications from a doctor or pharmacy may help.

A second form of discomfort, called **premenstrual tension syndrome** (PMS), occurs during the several days before menstruation starts. Some physical symptoms include slight swelling of hands and legs, a bloated feeling in the abdomen, temporary weight gain, and headache. Other symptoms of PMS may be psychological, including moodiness, irritability, anger, trouble concentrating, and lack of energy. This is not to say, however, that "it's all in one's head," and not a real problem. Although the causes of PMS remain unclear, changing hormone levels are probably the cause. Again, a woman should see a doctor if she experiences any severe symptoms.

Journal Writing

Girls: The onset of menstruation is not predictable. What would you do if your period started during school?

or

Boys: Voice changes arc unpredictable, and sometimes so are erections. What would you do if your voice kept cracking while you were trying to give a presentation in class?

Review Questions

1. What is the difference between the ovarian cycle and the menstrual cycle?
2. At the time of ovulation, describe where the menstrual, ovarian, and hormonal cycles are.
3. When does menstruation usually occur during puberty?

4. What are the pros and cons of tampon and sanitary pad use?
5. What common discomforts might a girl experience? Explain.
6. List the factors that may affect the regularity of menstruation.

CHAPTER 7

Gender Identity and Body Image - Student Edition (Human Biology)

CHAPTER OUTLINE

7.1 Gender Identity and Body Image

How do you see yourself physically and psychologically?

Your identity refers to the characteristics that distinguish you as you. It is the answer to the question, "Who am I?" These characteristics include physical features, interests, personality, ethnic origin, your gender, and so on. One of your most distinguishing personal characteristics is being male or female. A child learns this distinction by age two or three and will be very unhappy if you make a mistake about it!

"I used to think boys were gross. Now, I don't mind them so much."

-Carey

A person's sex refers to being male or female. Currently, the word **gender** is also often used to mean male or female. However, scientists use "sex" and "gender" to mean different things. In this case, sex refers to the biological differences between men and women, or what makes them male and female, such as their genes, hormones, genital organs, secondary sexual characteristics, and some other aspects of their bodies. These biological differences constitute the sex of the person.

Men and women, however, also differ in other ways than the shape or functions of their bodies. *Gender* refers to the differences in their feelings, thoughts, and behavior, things that make males masculine and females feminine.

Did You Know?

The word *role* originally referred to a small wooden roller around which was wrapped the actor's script. The idea of a *role* comes from the theater where an actor enacts a role according to a script.

Biology determines sex differences between male and female bodies. Bodies are basically the same in all cultures, but gender differences are largely shaped by your social and cultural groups. There are two important parts to gender: **gender identity,** how you see yourself as masculine or feminine, and **gender role**, how society expects you to behave because of being male or female. Like two sides of a coin, they are different but closely linked.

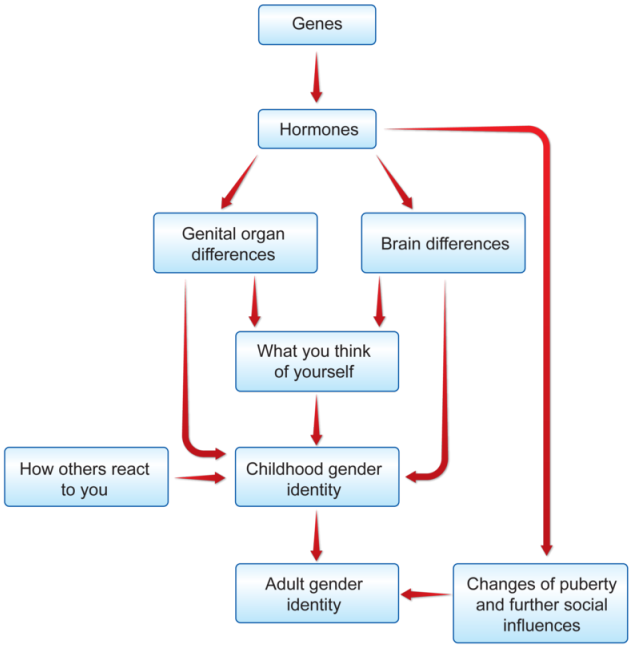


Figure 6.1 Development of gender identity.

What Do You Think

Can girls and boys be different in some ways yet be treated as social equals?

What you think and feel about yourself as being male or female, as well as being masculine or feminine, defines your sense of gender identity. We are not sure at this time how and when the sense of gender identity gets "fixed." Some researchers think that gender identity is shaped by biology, perhaps by the effects of hormones before birth. Gender identity then undergoes further changes during puberty, at which point hormones again play a defining role.

Other scientists think gender identity is learned in childhood and is set by age three. From early childhood on, boys and girls are socialized, by the expectations of others, to think of themselves in certain ways. Consciously or not, parents, other adults, and your friends treat you in certain ways depending on your sex. So some researchers believe it is not biology, but social expectations that determine what it means to be masculine or feminine.

Most likely, both biological and social factors determine gender identity, as shown in Figure 6.1. In this model, males and females start with some biological differences that are then exaggerated by learning and socialization about what it means to be masculine or feminine.

What Do You Think?

Can you think of any social scripts that tell us how to behave in certain social situations? How do gender role expectations affect you in adolescence?

How does puberty influence your gender identity? Children already know that the genital organs of boys and girls are different. But before puberty, with clothes on, boys and girls don't look that different, especially if they have similar hairstyles. As you mature during puberty, the differences become more obvious as the secondary sexual characteristics develop and clearly distinguish who is male and who is female. These differences are further exaggerated by the way boys and girls dress, cut their hair, and by all the other signals they give about being male or female.

Differences in appearance represent only part of the picture Gender identity is how a person thinks of himself or herself as a boy or girl. An important part of gender identity is how people expect you to behave, how society defines your gender role.

Activity 6-1: Gender Differences

Introduction

Not all little boys like trucks, and not all little girls like dolls. However, in our society, as well as in most other cultures, there seem to be some activities and interests that are often considered more "male" and others that are often considered more "female." In this activity you try to identify those differences and discuss whether or not the differences are a result of "nature" (the way you are biologically) or "nurture" (the way you are raised to be).

Materials

- Activity Report

Procedure

Step 1 Think about the five things you are most likely to do for fun when you have a choice.

Step 2 Your teacher will give you an Activity Report that already lists some ideas. If what you like to do is on the list, circle it. If not, add what you like to do to the list.

Step 3 Compile a class list using everyone's additional choices.

Step 4 Then take a vote to see how many boys and how many girls enjoy or participate in each of the activities when they can.

Step 5 Study the answers and identify any activities that have a high percentage of boys or a high percentage of girls interested in them. Are there any activities that seem to be equally of interest to girls and boys?

Step 6 Have the boys talk about why they like their favorite activity and how and when they learned to like it. Have the girls do the same thing.

Step 7 Find out if there are any girls who would like to do the activity that the boys enjoy, but have been hesitant because "the boys do the activity." Find out if there are any boys who have an interest in doing one of the activities that the girls enjoy, but have been reluctant because "the girls do the activity."

Step 8 Discuss the following questions:

a. Why should it matter if you're a boy or a girl when you're choosing something to do for fun?

b. Do you think boys and girls get teased if they do activities that most of the other members of their sex do not do? Why?

c. Do you think it's harder for a girl to do a traditionally "boy" activity, or for a boy to do a traditionally "girl" activity?

Step 9 GIRLS: As a group, plan a "girl" activity that you can teach the boys to do.

BOYS: As a group, plan a "boy" activity that you can teach the girls to do.

Your teacher will let you know how and when you will carry out these activities.

Mini-Activity

Debate! If women can choose to stay at home to raise the kids or develop a career, men should have the same choice.

What Are Gender Roles?

How you are expected to behave in a given situation because of being male or female defines your gender role. We are taught various social "scripts" that tell us how to behave as boys or girls or as men and women.

The fact that boys generally are larger and more aggressive leads them to play different games. In the past, it led them into a different set of roles, such as becoming hunters or warriors. Girls, on the other hand, learned skills having to do with food preparation and child rearing.

What Do You Think?

Why is it that girls are now raised to be anything they want-from housewives to presidents-yet most boys are raised to develop some career? Why are men, but not women, subject to the military draft? Think about other examples of differences in roles and expectations for men and women. Are they set by "nature," or by "culture"? Do you agree or disagree with the examples you find?

In modern, industrialized societies such as ours, many of these differences have disappeared. In virtually all types of work, including the armed forces, you can now find women as well as men. However, women and men are not always in equal numbers, doing the same jobs, or getting paid the same salary. The idea of "channeling" men and women into different directions is still very much with us. The issue of gender role has become very important in recent years. For instance, our society now has a **sex-discrimination law** that says that men and women cannot be denied access to jobs, areas of study in school, sports, or other life opportunities on the basis of their sex. Making sex discrimination illegal has helped women achieve success in many areas that were previously closed to them.

Aggression, Expression, and Gender

Many emotions become more intense during puberty, including sexual urges, aggression, and emotional expression.

Aggression has two separate meanings. In one sense, it means to be assertive, to be active, to be bold, to take the initiative, to persist. In another sense, it means to attack, fight, conquer, and cause pain.

Aggressive behavior in both senses of the word and in both sexes increases after puberty, but especially among boys. Think of the sports and games that adolescent boys play, and how they play them compared to children. Teenage boys will be more likely to shove and push each other about than they would have as children.

Mini-Activity

Who says so? Name three sources of information about how you are supposed to behave, besides your family, friends, or peer group. Rank them according to how much these sources influence you. Share them with your small group or class, then decide as a class who holds the most power in social leadership.

The aggressive acts of boys in a hostile or destructive sense increase sharply after puberty. Of all those arrested for serious crimes, 16% are boys under 18 years; 5% are younger than 15. Boys age 18 and younger are responsible for 40% of all car thefts, 30% of other thefts, 13% of serious assaults, 14% of rapes, and 11% of murders of different types.

Girls show increased aggression in the first sense of the word-with respect to taking initiative, being active, and persisting. But girls show much less aggression in the form of physical violence. Girls commit very few violent crimes.

What Do You Think?

Think of a situation in which you "flew off the handle." How has an act of emotionality or aggressiveness hurt those around you unnecessarily? What could you say or do to improve the situation, or repair the damage?

Why should there be an upsurge of aggression at puberty and why should boys and girls be different in this respect? One could argue that children are aggressive, and then at puberty they get bigger and can do more harm. Being bigger and stronger may contribute to increased aggression, but it does not seem to be the whole explanation. It

is as if an aggression drive, like the sexual drive, becomes "awakened." Some people believe increased levels of testosterone cause this behavior change, but so far, studies have failed to confirm a connection in either boys or girls.

If biology is not the answer, we must consider other factors. Cultural differences also play an important role. Societies, including ours, have very different expectations as to how males and females should behave, especially with respect to aggressive behavior. These expectations begin to shape how boys and girls behave early in life.

What Do You Think?

If in the United States aggression is largely culturally linked, should we as a society try to change our parenting styles? What positive side of aggression might we want to still keep?

Studies of adolescents in different cultures show important differences in levels of aggression. For example, American youth are more likely to act aggressively than young people in Asian countries, Within the United States itself, aggressive behavior may vary in different groups within the population. Even in your own classroom, some students are more likely to be aggressive than others are. Such differences between individuals are easier to explain on the basis of socialization, learning, and family background, while biological factors may play a role in more general differences between males and females even though these too are likely to be influenced by social factors.

Like aggression, emotional expression increases significantly during puberty. Adolescent boys and girls often experience mood swings. They seem happy one moment and then sad the next. They get enthusiastic over a project, only to lose interest the next day. They may "fly off the handle" and bang doors but then simmer down as if nothing had happened. Of course, not all adolescents behave this way all of the time.

Mini-Activity

It's Never Too Late At some time in our lives, most of us have done things in anger that we regret. Take the time to write a letter or call someone to whom you owe an apology, even if you are apologizing for something that took place a long time ago. That person will feel better and so will you.

Emotional expression is also a function of gender roles and culture how boys and girls are taught to behave. In this country, boys seem to have no trouble losing their temper, but they are not "supposed" to cry if they feel sad. Girls may be more likely to cry when sad, angry, or frustrated rather than lose their temper.

Again, researchers are unable to pinpoint why emotional expression differs between the sexes and what causes an upsurge in expression during puberty. Issues about gender roles and gender behavior make up only one part of the scientific exploration of nature (biology) versus nurture (how you are raised).

Activity 6-2: Behavior Differences

Introduction

Not all little boys run around and tackle their friends. Not all little girls sit quietly and smile. These descriptions are stereotypes, and they may be very different from the way that boys and girls around you behave. However, in every society there seem to be some behaviors that we tend to identify more with one sex or the other. In this activity you identify those behaviors and talk about why you think they seem to be linked more to one sex than the other in this culture.

Materials

- Activity Report

Procedure

Step 1 Your Activity Report has a list of questions about behaviors. Think about how you would answer these questions about yourself. Write a brief description of your own behavior. You don't need to answer all the questions, but use them as a guide to describe the way that you are. For example, you might say, "I am shy around groups but talk a lot to my friends. I listen carefully and . . ."

Step 2 Your teacher will place you in a same-sex group. Look at the questions again with your group and see if you can make any generalizations about the way members of your sex behave in these situations by comparing your descriptions. Remember that individuals may behave very differently than the majority. For example, your group might decide that "Most girls like to be with their friends. They pay attention to how their friends are feeling," even though one girl in the group feels and behaves differently. Then talk about how you see members of the opposite sex behaving in response to these same questions.

Step 3 As a group, write a paragraph, or make a list, of ways that boys behave differently than girls. Then write a second paragraph or list about ways that girls behave differently than boys.

Step 4 Compare the group answers. Do girls say that they behave the same way that boys think that they behave? Do boys say that they behave the same way that girls think that they behave? Do both groups see a difference in the ways that boys and girls behave?

Step 5 As a class, discuss the following questions:

a. What do you think causes the differences in behavior?

b. Do you think these differences are "built-in" or taught?

c. Are some behaviors viewed as "negative" and others as "positive"?

d. If a boy behaved in ways that fit the description of girl behavior, would this be a problem? What if girls behaved in a way that described "boy" behavior? Is one type of behavior right and the other wrong, or are they just different?

e. Would boys and girls in your parents' generation have answered the questions for this activity and the previous activity about interests the same way that your class did? Are boys' and girls' interests and behaviors more alike or more different than they used to be? What changes have there been?

f. What sorts of laws or rules should we have in schools and at work so that people are treated fairly and equally, regardless of sex and gender?

Step 6 Your teacher will divide you into small mixed-sex groups.

Step 7 Your task will be to develop a set of behaviors that you think ALL people should follow, regardless of their sex. It might involve some of the characteristics you've described for males and some that you've described for females.

Step 8 Compare and combine your group lists to come up with a final class list called, ***Ways That Human Beings Should Behave.***

Apply Your KNOWLEDGE

What are some ways teenagers can control aggressiveness? If aggressive behavior is directed at you, what are some ways you can deal with it?

What Do You Think?

Sometimes when boys act aggressively, it is excused with the expression, "Boys will be boys," Based on what you are learning, how do you feel about this statement?

You and Your Body

Our bodies change constantly. These changes are so slow that we hardly notice them. When we grow fast in

childhood, we seem to adjust naturally. But during puberty, when our bodies change rapidly, we feel more self-conscious.

So many changes in such a short period of time require adjustment, or adaptation. Do you remember the last time you put on a new shirt or blouse? Maybe you liked it right away and could not wait to show it to your friends. Or maybe you felt less sure about how it looked and whether or not your friends would like it.

If you decide a shirt is not right for you, you can always exchange it or give it away. Unlike a shirt, you cannot undo the changes brought about by puberty. Therefore, you have to get used to these changes and accept them. Through adaptation, our feelings and our thoughts change to fit the changes taking place in our bodies.

What Do You Think?

- What makes change stressful? How does anticipated change (going to high school) differ from unanticipated change (getting sick)?
- How do biological changes (puberty, aging) differ from social changes (moving and making new friends, getting fired, financial stress)?

The process of adaptation is not always easy. Nor is it something you have to do only once. Our bodies keep changing, and we have to keep adapting to these changes year after year for the rest of our lives. One of the hardest times is early in puberty when the development of secondary sexual characteristics begins, and you feel self-conscious about how you look. Although most young people manage to get used to their changing bodies without much difficulty, adaptation to the changes of puberty, especially when they make a person feel different, is a challenge for everyone.

All adolescents have feelings about being different, different from what they were as children or different from one another. Many young people feel a strong need to be like one another and to be accepted by their **peers**, those alike in age or grade level. Accepting differences within oneself and among others can be a real challenge.

In this section we will discuss some of the reasons it may be hard to feel different and to feel change happening-the fear of the unknown and the fear of being different.

Mini-Activity

Changes Happen Around You, Too Look around you-at your classroom, your school, your friends, and your environment outside. Give some examples of change happening around you.

Activity 6-3: Who Me-Worry?

Introduction

Puberty is a time of many changes. You may be excited about some and scared about others. You may wonder what will happen next, if you are developing normally, or if you will change at all. Both boys and girls have concerns about changes during puberty. This is your chance to see if the things that worry you worry others, too.

Materials

- Activity Report

Procedure

Step 1 Think about the ways you are changing or the ways others are changing around you. Think about all the changes described so far in Unit 1. On your Activity Report, list six things you think worry both boys and girls

about puberty, six things you think worry only girls about puberty, and six things that might worry only boys at puberty.

Step 2 When you have finished this, your teacher will put you in a larger group. Compare your answers and add ideas from other students to your list. As a group, come up with more ideas until everyone has at least 12 ideas in each section on his or her paper.

Step 3 Choose one person from your group to be a spokesperson. Each group will take turns sharing an idea from each category, If someone mentions an idea that you do not have, write it down. When all groups have shared all their ideas, see if the class together can add a few more.

Step 4 In your own mind, select three items that worry you the most.

Step 5 As a class, determine the three most common worries for boys and girls, the three most common worries that affect just girls, and the three that worry just boys the most. Discuss these as a class and offer each other suggestions on how to cope with these changes or worries.

Step 6 On the back of your Activity Report, write a paragraph about what worries you the most, and how you might cope with this worry.

"I pick up a copy of Seventeen and browse through it. The models are all perfect. I wish some of them bad zits or oily hair. I go to the mirror and examine my face. It is not one of my better days. I look tired and my hair is limp."

-Tiger Eyes

Judy Blume

Fear of the Unknown

Concerns about changes in puberty come from several sources. First is the fear of the unknown. The familiar is comfortable and safe. Do you remember the last time you gave up an old pair of shoes? They may have been beaten up and out of shape, looked terrible, and were smelly, but they were yours-almost as much a part of your body as your feet. The new shoes looked terrific but did not quite fit your feet the same way; they were not yet part of you. So it is with the changes in your body.

Since we can never fully predict the future, we tend to fear the unknown. Change means going from the known to the unknown. Therefore, change always causes some **stress**, or feelings of anxiety. It is the way you feel when something exciting or frightening is about to happen. Stress is not always bad. It makes us alert and energetic and makes life more exciting. We sometimes seek out stressful situations such as roller coaster rides.

The changes of puberty involve some degree of stress for everyone. But whether you view this experience as pleasant or unpleasant depends on your attitudes toward these changes. The best thing you can do is to learn about the changes taking place so that you know what to expect.

Fear of Being Different

Another source of anxiety about change is the fear of being different. Though young people realize everyone goes through puberty, not everyone begins to show these changes at the same time or in the same ways. Especially for those who show these changes earlier or later than others, there is a feeling of being different. Like change and fear of the unknown, being different tends to be stressful. It raises questions in the person's mind: "Why is this happening (or not happening) to me?" "Am I normal?" "What will my friends and others think of me?"

Adolescents therefore tend to associate being "normal" with being like others. If they are not like others, they fear something is wrong or that they are abnormal.

"Sometimes I lay awake at night while Lisa slept in the bed beside mine. Then I'd wonder, what's wrong with me? Why aren't I good at anything? Why can't I bit a home run? Why can't I think of anything to say to Larry Steiner? When will I get myself into a bra?"

-Annie's Promise

Sonia Levitin

Some differences among young people are likely to persist or continue into adulthood. One boy, who is taller than another at age 13, may still be taller at age 18. But in other cases, when dealing with early maturers and late maturers, it is difficult to predict what they are going to look like in adulthood. For example, consider your height. Look at Figure 6.2.

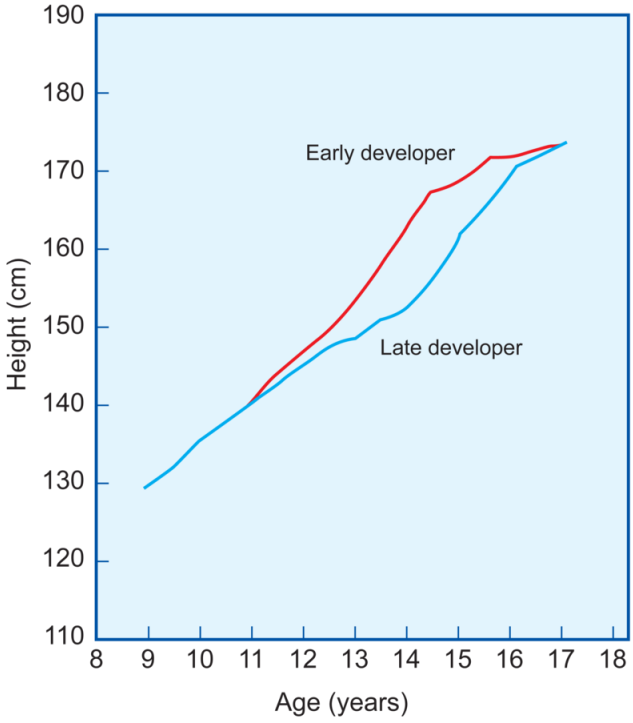


Figure 6.2 Growth curve for boys.

"Each of us must confront our fears, must come face to face with them. How we handle our fears will determine where we go with the rest of our lives. To experience adventure or be limited by the fear of it."

-Tiger Eyes

Judy Blume

What do you observe? The growth curve shifts between the ages of 11 and 12. "Early maturers" push ahead of "late maturers." But by age 18, the late developers have caught up. So those who are taller between the ages of 12 and 18 will not necessarily end up taller than others. Some early developers may feel that they are taller, only to watch others gradually catch up in height and become taller.

> **Did You Know?**
>
> The hormones of puberty bring about a gradual cessation of growth. Earlier sexual maturation of girls is one reason boys are 10% taller than girls are-boys have longer to grow before puberty takes hold. Early maturers tend to have stockier builds, while late maturers of both sexes tend to be thinner and long-legged.

Consequences of Being "Off-Schedule"

Many of the differences in growth rates during puberty are taken in stride. Moreover, their differences usually even out by the time the adolescent becomes an adult. In purely biological terms being "early" or "late" makes no difference-it is all part of the normal process of development. Nevertheless, there are a number of possible effects that follow from being an "early" or "late" developer. These effects are both psychological and social. They have to do with how you feel about yourself and how others perceive you. Here are some examples:

What Do You Think?

What are some strategies for dealing with life's stresses? How do you handle being different? How can you help someone else? How can you develop confidence in your own strengths and interests-especially if they are not like everyone else's?

- Girls as a group generally mature earlier than boys. This can create some awkwardness in social situations such as dances, where the girls often seem more mature and look bigger.
- Individual adolescents who develop faster or slower than their peers often have a harder time with the changes. Not only do they look different from friends of the same sex, but they also become unsure about which peer group they belong to-the one they fit with chronologically (how old they are) or the one they fit with developmentally (how mature they are).
- Early-maturing girls may feel "rushed" into puberty before they are psychologically ready. Since their peers have not yet entered puberty, early maturers may find their friendships shift for a while, until their friends catch up. They often "drop" old friends but come back to them later when growth and maturity have evened out. Early maturing girls also may be somewhat less popular with other girls, while attracting more attention from older boys.
- Early-maturing girls weigh more and may end up slightly shorter than late maturers, Because of cultural emphasis on thinness, these girls may have a poorer body image and are more likely to resort to unnecessary dieting.
- Late-maturing girls tend to be taller.
- Early-maturing boys, by contrast, develop stronger bodies earlier, which gives them an advantage in sports until the later-maturing boys catch up. This may make them more popular with their peers. Adults often expect more of children who look older than their age. These expectations can be unfair sometimes, but advantageous at other times.
- Early-maturing boys and girls also share some potential disadvantages if they engage in "adult" behaviors (such as smoking, drinking, and sexual intercourse). Early maturing exposes them to high risks even earlier than their peers (people their own age). They may also show poorer emotional health than late maturers. Girls are generally more negatively affected by these higher risks than boys are.

- Late maturers may avoid some of these pitfalls. Not distracted by the changes of early puberty, they may be more attentive to their schoolwork. There may be concerns, however, that they are "lagging" behind. This is tougher on boys who are interested in competitive athletics.

What Do You Think?

- Who has the harder adjustment when "off-schedule"-girls or boys?
- What advantages do you feel you have at this age that you may not have at any other point in your life?
- Why do you choose the friends you do?
- Why is it important to be with people who are like you? Why is it important to be with people who are different from you?

By late adolescence, these behavioral differences between early or late maturers have largely disappeared. Moreover, bear in mind that while these differences apply to groups in general, they do not apply to every individual within a group. Thus, you may be an early or late maturer and have some or none of the experiences and feelings described above.

Journal Writing

How much do you feel that the fact that you are a girl or a boy influences the way that you think, the way that you feel, the way that you behave, the things that you do, the opportunities that you are given, and the way that others think about you? In your opinion, how much of this is because you were born a boy or a girl, and how much is because of the culture around you?

Review Questions

1. What is the difference between “gender” and “sex” when describing males and females?
2. What is the difference between gender identity and gender role?
3. To what should we attribute the gender differences in aggression and emotional expression? Explain.
4. How does the term *adaptation* apply to puberty and adolescence?
5. What are three consequences of being “off-schedule” for early maturers? Late maturers?
6. What are three sources of stress for adolescents?

CHAPTER 8 Harmful Ways of Changing Yourself - Student Edition (Human Biology)

CHAPTER OUTLINE

8.1 Harmful Ways of Changing Yourself

Extreme dieting and rejection of food is an unhealthy way to lose weight.

Why do some adolescents handle stress in such unhealthy ways?

Despite the many natural and healthy ways to feel and look more attractive, we may do many harmful things to "improve" our looks. For example, not too long ago people considered having a tan an essential part of looking athletic and attractive. People spent hours in the sun or tanning salons, absorbing harmful ultraviolet radiation. High doses of this harmful radiation caused wrinkles and skin cancer. Although we now know how harmful the sun and artificial tanning methods can be, some people continue to pursue this ideal of attractiveness.

"I don't need people putting me on a pedestal. It's more just this pressure of bating to be what everybody wants me to be. My parents and all."

-Children of the River

Linda Crew

Currently, being thin has become another ideal of attractiveness, especially for women. With so much focus placed on thinness, people can become very concerned with their weight and adopt extreme behaviors to stay or become thin. Part of the adolescent growth spurt is a normal and healthy gain in weight. Yet, adolescents may become overly concerned with their changing weight. With the "ideal" body in mind, some teens, especially girls, may develop unhealthy eating habits. These habits can lead to eating disorders.

Apply Your KNOWLEDGE

When is dieting healthy and when is it unhealthy?

The idea of an ideal body weight can be very misleading to people. They look at a chart and worry that they weigh too much, without considering the more important question, "What is their body composition?" Body composition refers to how much of your body is made up of fat, and how much is not. Less fat is better than more fat. For men, the ideal percentage of body fat to have is 12-20%, but many athletes may have as low as 5% body fat. For women, the average is a little higher, at 20-30% body fat. Female athletes commonly have 16% or less.

What Do You Think?

Have you ever dieted? Do you know someone else who has dieted? How do you know when you are "finished" with your diet?

People can lower their body-fat ratio through exercise and nutrition. Sometimes body composition will change on its own, through inactivity or the aging process (which tends to add fat to the body).

Understanding body composition is more meaningful to people seeking healthy bodies. Dieting can result in weight reduction, but also a loss in muscle mass and little or no loss in fat. Teenagers worried about weight gain that is normal in puberty must be careful to approach weight control in healthy ways. This is especially true in girls since their actions may affect the onset of menarche or normal menstruation.

Mini-Activity

How Can You Get Your Friends to Eat Healthily, Too? A lot of teen social events focus on food-going out for ice cream, pizza, meeting for a hamburger, and so on. These outings make it difficult to maintain a healthy diet. Come up with three new ideas for social events with friends that encourage healthy eating.

Anorexia

A very serious, although rare, eating disorder is called **anorexia**, which involves severe dieting and weight loss. People with anorexia think they are overweight when they actually are not. They have distorted images of their bodies. They severely restrict the food they eat and often exercise to an extreme degree. As a result, they become extremely thin, losing muscle and fat. In its worst case, anorexia may lead to severe illness or even death due to malnutrition and an imbalance of nutrients.

Anorexia most often affects young women, typically between the ages of 10 and 20. Because it is a complex disorder, involving issues of self-image, self-esteem, and sexuality, there is no easy "cure." Counseling from a health-care professional is the only available and effective treatment right now. In order to detect anorexia early, it is important to look for some of the key "symptoms" of anorexia. They include

- Rapid weight loss for no apparent reason
- Loss of menstrual cycles in females
- Excessive exercising or physical activity

Symptoms that some individuals may develop later include

- Excessive water consumption
- Appearance of fine, pale hair in areas previously free of hair (arms, face)
- Continued weight control despite already severe weight loss.
- Inability to recognize or admit a change in weight and/or eating patterns
- Preoccupation with food and eating with unusual eating habits, such as hoarding, standing while eating, or not letting the food touch the lips
- Total weight loss of 25% or 15% below average range for age and height

Apply Your KNOWLEDGE

Suppose that you know a friend at school who seems to be losing weight very, very quickly and also seems to be exercising at every opportunity-jogging to and from school, as well as exercising during lunch and after school. What other symptoms might you look for if you suspect anorexia? What would you do if you suspected this person had anorexia? What resources are available for help? If you don't know, how could you find out?

Did You Know?
Bulimia literally means "ox appetite."

Bulimia

Another eating disorder is **bulimia**, which is characterized by periods of uncontrolled overeating usually followed by vomiting or the use of laxatives to avoid gaining weight. Bulimia is more common in late adolescence and early adulthood. Although rarely fatal, it has serious consequences, including stomach problems. People with bulimia, unlike anorexia, often do not experience an excessive or even noticeable weight loss.

One of the common behaviors of bulimics is "bingeing," which means eating an excessive amount of food (like two cakes and three packages of cookies, or several servings of ice cream and a pizza) in one sitting. The foods chosen are typically high-calorie, high-carbohydrate foods. Shortly after the bingeing, bulimics will purge, or rid themselves of the food by either vomiting or using laxatives. The idea of purging is to get the food that was just eaten out of the body before any of the calories are absorbed. Bingeing and purging is typically done secretively, or in private.

Unlike anorexics, bulimics are not nearly as focused on exercise, but there are other lifestyle changes that may give clues to this eating disorder. For example, bulimics often steal money or food in order to support their habit of bingeing. Because his or her physical appearance does not drastically change, it is difficult to identify someone with bulimia. Instead, you must focus on some of the surrounding behaviors, such as eating in private and stealing. Like anorexia, the only treatment for bulimia is counseling by a health-care professional.

Although no one knows exactly what causes these two eating disorders, the important contributing factor is a negative self-image-feeling unhappy about oneself. In addition to the physical dangers of eating disorders, there is the danger of dependency. Anorexics and bulimics become addicted to their unhealthy behaviors of exercising, dieting, or bingeing and purging-the "reward" of losing one pound or looking thinner keeps the person motivated to pursue the obsession of thinness. These eating disorders are examples of unhealthy or harmful ways of changing your body in an effort to match what is supposed to be the "ideal" look.

Journal Writing

What do you think creates the unrealistic and often unhealthy body image that is so popular these days?

Steroid Use

Another dangerous or harmful way of changing your body is steroid use. In this case, it is mostly boys and men who are involved. Androgens like testosterone help muscles grow, especially when they are exercised regularly. This normal function of testosterone can be abused and exaggerated with the use of synthetic androgens called **anabolic steroids** (anabolic means building up of tissue). Testosterone has now found its way into the illegal drug market, where some athletes buy it for its muscle-building properties, typically exposing the body to 100 times the levels of natural testosterone normally found in the body. The vast majority of abusers are male, but some females involved in sports may also turn to these steroids.

Why do some teenagers use steroids? They want to build up their muscles and strength. Rather than using strenuous exercise, some athletes look to drugs as a short cut to building muscles. In addition, the media creates "ideal" body images through "heroes" on television and in the movies. About a third of steroid users are not athletes-they just want to look muscular to impress their peers.

Steroid use is dangerous to the body's health. Official athletic organizations have banned steroid use by athletes. Although the medical community does not yet know all of the side effects of steroid use, health professionals know that massive doses affect the muscles, sex organs, and the nervous system, including the brain. For males, steroids cause severe acne, early balding, yellowing of the skin and eyes, development of female-like breasts, and shrinking of the testicles, with the possibility of sterility. Female users develop a permanent deepening of the voice, shrinking of the uterus, irregular menstrual cycles, balding, and the growth of facial and body hair. Even more serious for

both sexes, taking anabolic steroids greatly increases the risk of heart disease, certain cancers, kidney damage, and psychological disturbances (depression, mental illness, and extreme aggression). In addition, since steroids are taken by injection, users run the risk of being infected with HIV or hepatitis from contaminated needles. Teenagers on steroids run the risk of stunting their growth, because steroids arrest bone growth. So the boy who uses steroids because he is in a hurry to grow large and strong can end up being much shorter! Over half the teens who use steroids start before the age of 16. Some people start as early as age 10.

"But not everybody was John Carter, president of the Vigils, All-Star Guard on the football team, and president of the Boxing Club. How Brian Cochran would love to be like John Cartel; with muscles instead of glasses, quick with boxing gloves instead of figures."

-The Chocolate War

Robert Cromier

Not only do steroid users experience harmful physical effects, but they also risk steroid addiction. Like anorexics, steroid users are never quite satisfied with their physiques. When they look in the mirror they don't see a realistic image of themselves. Instead, because of their obsession for weight gain and muscle development, they look in the mirror and can think only that they're not big enough. They may increase their drug intake and the resulting weight gain and muscle development gives positive reinforcement to continue increasing the drug use. Steroids are supposed to be taken in cycles-a specific number of weeks of use are supposed to be followed by weeks of "breaks" or no steroid use. But during these periods people lose weight or muscle definition and typically become so panicked or disappointed that they go right back on steroids, often in higher doses. In addition, without steroids in their system, users experience depression. Steroids return the user to a feeling of euphoria or invincibility, but simultaneously bring unpredictable aggression or anger. This can build to huge proportions, resulting in mental disturbance and violence.

Complicating the medical problems is the illegal distribution of the drug on the black market. Unless you receive steroids from a doctor, there is no way to ensure quality. To make more money, the black market dilutes pure steroids by mixing in or substituting a salt solution, other drugs, or bacteria-lad en oils. All of these substitutes can be even more dangerous than the steroids themselves.

Boys use steroids for some of the same reasons that girls become anorexic. They want to achieve the media's, and hence society's, image of attractiveness. Eating disorders and drug abuse can create a never ending cycle in which the real problem never has a chance to surface: developing a positive self-image. As discussed in the previous section, there are many healthy alternatives to improving self-image.

What Do You Think?

How do people get to the point of abusing their bodies in such unhealthy ways? What causes us to hurt ourselves-overeating, drinking, drugs, violence? Are these problems of the individual or of society as a whole? What should society do to help people avoid choosing these destructive paths?

Where do you go for help?

Don't put off getting some help for yourself or a friend. Parents, school health professionals, teachers, or other adults whom you trust can be good sources of support. Other places to try:

- Look in the blue pages of your phone book for your county Department of Social Services. Most list hotline numbers.
- Call local teen clinics, doctors, or hospitals for referrals.
- Call Overeaters Anonymous (OA). Look in the phone book for a local listing.
- Look in the Yellow Pages under Drug Abuse.

Activity 7-1: What Is Attractiveness?

Introduction

Young children are usually not very concerned about how they look, but most adolescents definitely are. As you grow, you become more aware of how you and the others around you look. How you look and dress and appear to others becomes more important. Most people want to be attractive to others. But what does it mean to be attractive? In this activity you decide what it is about a person that makes him or her appealing to others.

Materials

- Activity Report

Procedure

Step 1 A dictionary definition of *attractiveness* is

a. Having the power to attract
b. Pleasing to the eye or mind-appealing
c. Personally engaging-charming

Is that what you thought the word meant? People often confuse the word *attractive* with sexy, but they are not the same things. Being attractive has more to do with personality and with attitude than with looks alone.

Step 2 Your class will be divided into four groups. Each group will be given a different issue to discuss. You will then appoint a spokesperson to report your conclusions back to the whole class. After each group presents, the other groups will have a chance to respond. Remember to keep your responses positive and neutral.

Step 3 After the whole-class discussion, go back to your small group. Ask for a volunteer from your group to act out what it means to behave in an attractive way. Then ask for a volunteer to act out what it means to behave in an unattractive way. Notice that the emphasis is on behavior, not looks.

Step 4 Take turns having each group present its version of attractive and unattractive behavior.

Journal Writing

What are some physical traits about yourself that you think arc nice (hair, eyes, hands, skin . . .)? Remember, they don't have to be perfect! What are the behavior traits that you think help to make you an attractive person? What things do you like to be valued for? Try to write an objective and positive paragraph about yourself. This isn't bragging, and it doesn't mean that there might not be some things you'd like to change . . . it's just focusing on what is already good.

Review Questions

1. Create a Venn diagram of the similarities and differences between anorexics and bulimics.
2. What are five possible harmful side effects of steroid use?
3. What are three things that eating disorders and steroid use have in common?
4. What does negative self-image mean, and how does it relate to the topics discussed in this chapter?
5. Where do you go for help if you or someone you know needs help?

CHAPTER 9 Feeling Good about Yourself - Student Edition (Human Biology)

CHAPTER OUTLINE

9.1 Feeling Good about Yourself

How do you develop positive self-esteem?

Puberty can be a challenging time of life. Your shifting hormones may contribute to moodiness, acne, and a whole new physique. Suddenly, you seem taller than you were the day before, your pants don't fit, and your gymnastics coach suggests you try basketball. Someone who used to be your best friend has developed a whole new personality to go along with her whole new body, and you're not sure you like her anymore.

In a previous section, we talked about how change can create stress and feelings of anxiety. These feelings are very normal. Your life is changing very fast and you are faced with many choices and situations that may feel overwhelming at times. How can you best handle this stress? How can you feel your best in the midst of physical and social chaos?

Taking Care of Your Body

The best place to start feeling your best is to take care of your body. Although your body can survive a lot of abuse (think of prisoners of war or even marathon runners), it functions best with the following elements:

- Balanced diet
- Exercise
- Good health habits

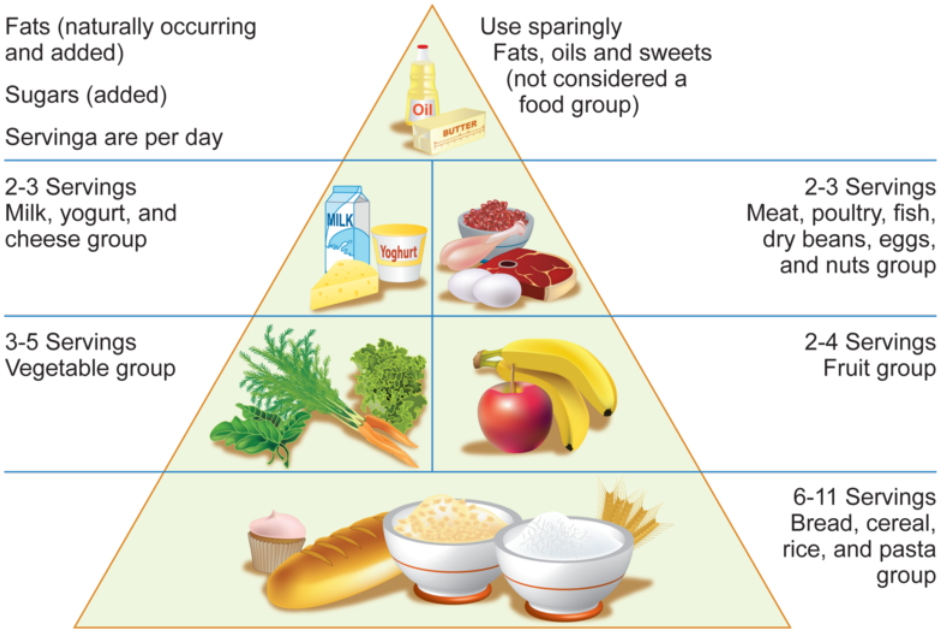
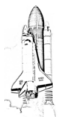


Figure 8.1 Your body needs the most foods from the groups at the bottom of the pyramid and the least from the top.



Mini-Activity

How Does What You Eat Make You Feel? Keep a journal for a month and see how you feel. Increase sensitivity to how your body feels and reacts to outside influences and internal functions.

Balanced Diet

There is a lot of truth in the saying, "You are what you eat." What you eat affects how you behave, how much energy you have, how your hair and skin look, and your body shape. Your body is growing and developing so much right now that it is especially sensitive to the food you eat.

Eating right, however, can be a challenge when you and your friends meet after school at the bakery, the pizza parlor, or at the mall and enjoy foods high in fat, calories, and sugar. That's OK, if you balance these snacks with other kinds of food during the day. Every snack and meal doesn't have to be perfect, but your daily intake should be balanced.

As Figure 8.1 shows, you will feel best if you eat most of your food from the bottom of the food pyramid and the least from the top of the pyramid. In addition, if you start paying attention to how you feel after you eat, you can learn to listen to your body and eat what it needs (cravings for certain kinds of foods) and in the quantities it needs. Listening to your body requires a lot of trust and willingness to take control over how you feel. But once you do, you will notice a big difference.

Exercise

Numerous studies show a direct connection between physical activity and

- heightened mood (feeling happier),
- increased energy levels,
- improved immune system response,
- reduction of stress,
- overall feeling of accomplishment and control.

Becoming more physically active doesn't mean you have to join a team, or even play sports. It means adding some form of exercise to your daily routine-for example, walking or biking to school instead of driving. It could mean taking a dance class, aerobics class, or even a weight-lifting class. It could mean taking the dog for a walk or using stairs instead of an elevator. Whatever you choose, at whatever level, your body will benefit and will, in turn, help you feel your best.

Mini-Activity

Who Are You? What are the five most distinguishing characteristics you see in yourself? What five characteristics might others select about you?

Good Health Habits

Besides good nutrition and exercise, what else helps you feel your best?

- Rest and sleep-Getting enough sleep will raise your energy level, reduce stress, and improve your overall health.
- Good personal hygiene-Keeping yourself clean will help you feel more fresh and energetic and will help keep viruses and bacteria away.
- Regular visits to the doctor-Annual visits to the doctor not only can make sure you are healthy, they also provide you with an opportunity to ask questions about your growth and development.
- Looking your best-Grooming, posture, and even ways of communicating, such as smiling more often, can improve your sense of attractiveness. To feel your best, you need to recognize and accept the range of your attractive qualities and highlight them.

In addition to what your body needs, there are a number of things your body doesn't need. Your body works best without chemical-altering substances such as drugs, alcohol, and smoking. These substances do change the balance of all your systems, the operations of every cell, and the way you feel. Abuse of these substances is frequently linked to low self-esteem, or how we feel about ourselves.

Mini-Activity

Beauty from the Inside Think about a girl at school you consider very attractive and think about a boy at school you consider very attractive. For each, identify three behaviors or personality traits in addition to physical attributes that make these individuals attractive. Are the traits different for boys and girls?

Psychological Health-Developing a Positive Body Image and Strong Sense of Identity

Taking good care of your body will help your body look and feel its best and enhance your body image.

Body image is how we see ourselves in our own mind. Adolescents, because they are changing so quickly, are very conscious of body image. They may spend a lot of time in front of the mirror, partly to keep track of body changes, and partly to see how they look.

Body image comes from our natural features and what we choose to do with them-for example, how we cut our hair or use makeup or tone our muscles. Clothing also enhances our natural features. Certain styles and colors may appeal to you for one reason or other and help you create the image you want other people to see. Clothing can make you feel like part of the crowd, or set you apart as an individual. Clothing, as well as a new haircut or starting an exercise program, can also make you feel good about yourself by accenting an attractive feature or part of your personality.

Did You Know?

What is beauty? In the Maasai culture, the longer the earlobes the more beautiful the person is considered. In some cultures, a long neck is a sign of beauty. Around 1700 in America, plumpness was a sign of physical health and beauty. Today, in this country, magazines show youthful, athletic, thin, and beautiful men and women-who never have acne.

As you can see, beauty can be many things. In every culture around the world, people are aware of the distinctions between those who possess those traits that have been selected for beauty and those who do not. But also in every culture, physical beauty is only one of many important traits in making up the person.

Attractiveness, however, is much more than how you look on the outside. It is also a function of how the outside elements work with the inside elements, such as your personality. Have you ever judged a person by his or her appearance only to change your mind after the person started talking and moving? Your opinion can change both ways-someone who is beautiful may not seem quite so attractive when rude remarks or a negative attitude surface. And someone who at first appears quite ordinary may turn out to be extraordinary when a certain disposition or sense of humor is added.

Mini-Activity

The Messages You Send Next time you are in a crowded place, or even at school, look around at people and ask yourself, "What messages do people send out about themselves and how they feel about themselves by virtue of what they wear and how they use their natural features?"

How can you improve your overall attractiveness? Look at other people to see what you find attractive. Then ask yourself, what is it about that person that makes him or her attractive? You will find that attractiveness can be many things and different things in different combinations. Simple things such as posture or facial expression tell you a lot about people. You might try changing one aspect of yourself and see how people respond to you.

Adolescence is a good time in life to try out new looks, new activities, new and healthy foods, new clothes, and even new friends to discover what you like and don't like, what you're good at and not so good at, and what makes you happy. Developing a strong sense about yourself-who you are-improves your outlook on life and helps you feel your best.

Activity 8-1: Healthy Bodies and Feeling Good

Introduction

Feeling good about ourselves is important, but it isn't always easy. Sometimes we try things that aren't healthy in an attempt to make ourselves feel better. Sometimes we are misled by images that we see around us. In this activity you focus on positive and healthy ways of making yourself feel better about your image and your appearance by creating an ad campaign called "Healthy Bodies and Feeling Good."

Materials

- Activity Report
- Old magazines
- Construction paper
- Scissors
- Markers or crayons
- Glue

- Props brought in by students

Procedure

Step 1 Your teacher will divide the class into teams.

Step 2 Each team represents a different advertising agency. You are competing for the right to produce a public-service advertising campaign called "Healthy Bodies and Feeling Good."

Step 3 First, conduct some research by reading the text. What are healthy ways of building self-esteem and improving your body image? What are negative or harmful ways of changing yourself? Record your data on the Activity Report. Use additional sources if you wish.

Step 4 Next, examine magazine ads to see how the bodies of men and women are frequently shown. Are the body images healthy? Are they extreme? Are they realistic? Are they unrealistic?

Step 5 Now make a plan. Outline an advertising campaign to promote healthy bodies and good self-esteem. How would you handle it? Would you just give the facts? Use scare tactics? Show improvements? Remember that you have to show truly healthy bodies, not unrealistic ones. How can you make reality seem attractive? How can you warn people about the dangers of trying to maintain an unrealistic or unhealthy body style? Write down your plans in a way that will convince the producers that you understand how to make people listen and learn.

Step 6 Complete three sample ads to show the producers. Choose from the following categories:

a. Poster or billboard

b. Magazine or newspaper ad

c. Radio jingle

d. Brochure or pamphlet

e. Television commercial

Step 7 You will perform any jingles or commercials and show any written or drawn ads to the producers (your teacher and fellow students)!

> **What Do You Think?**
> Do you believe in the underlying story of "Beauty and the Beast"? Why or why not?

"I don't think it's an awfully easy thing to discover you're yourself and nobody else can be you and you can't be anybody else. It's sort of lonely."

-Camilla

Your Feelings of Self-Esteem

We've talked about some of the many changes that occur during puberty, including your changing body, your changing feelings about your body, your feelings about being male or female, and your feelings about attractiveness. All of these feelings come together to form an image of yourself. As we discussed earlier, **self-esteem** is how you feel about yourself, or how you value yourself. Your self-value or self-esteem is based on many factors, including your feelings of attractiveness, your feelings about your body, your feelings about your personality, your feelings of accomplishment, your values, and your feelings about your interactions with people around you. It is also the result of family life, your ethnicity, social class, achievements, and other influences.

Self-esteem comes from how you feel about yourself as you are, compared to the self you wish to be. For some people, there is a big gap, and that gap bothers them. For others, that gap doesn't matter. Some people set realistic expectations for themselves and have a better chance to succeed than those who expect the impossible and evaluate themselves by that standard.

During this time of so many changes and new questions, it is important to think about your self-esteem and how it affects your behavior. Positive self-esteem can provide a lot of strength and confidence to stick to your decisions,

pursue your goals, or to be more giving and sensitive to others. Negative self-esteem may result in putting yourself down, limiting your options because of fear of failure, or shutting people out of your life.

In developing positive self-esteem, it is important to take an all-inclusive approach. As you evaluate yourself, look beyond what you see in the mirror and include your many skills and natural talents. Remember that attractiveness comes in many shapes and sizes. Do you have a friend who you think is really attractive-because of the whole package, not just because she is pretty-her looks, her personality, and her actions, all working together? You may wish you had long, thick, black hair-but you do have enthusiasm, kindness, and a knack for numbers and computers.

Mini-Activity

I Like Myself Because. . . Write down three attributes that you really like about yourself. Do others see those same positive qualities in you? If not, why not? What situations or environments might highlight those qualities?

You can change or improve many aspects of yourself. For instance, maybe you wish you were more outgoing and less shy. You can work on becoming more outgoing in many ways. Perhaps you start by identifying situations in which you feel more comfortable: and self-expressive and learn to increase the number of situations like that in your life. Or maybe you identify what makes you feel uncomfortable or less communicative and try to minimize those kinds of situations. Whether you work on these self-improvement tactics alone or with the help of someone, there are many examples of ways to work on a "weakness" and improve your self-esteem. These kinds of changes are those that you can control.

Mini-Activity

I'm Not Crazy About. . . Think of one or two qualities that you do not particularly value about yourself. Do others also recognize this weakness? How might you be able to improve on this aspect?

Have a good friend and a casual acquaintance each list three positive things they think about you. Are the views of the good friend the same as those of the casual acquaintance?

However, there are other characteristics you cannot control. Maybe you really wish you were good at sprinting, but you find that as much as you train and practice, you can't get your speed to improve significantly. If this ability is outside your control, you can turn your attention to something you can improve. For example, maybe you are a better endurance runner. Or maybe you are a talented artist or musician. It is important to recognize those changes that you can control and those that you can't.

Often the characteristics you can't control are genetic or biological. For example, maybe you are happy about the changes of puberty-you like the fact that you are taller or the fact that you are gaining some weight and filling out. Or, maybe you are having a hard time adapting to these changes. Try turning your attention to an important element of your life-developing your natural abilities, doing healthy things to enhance how you feel and look, and behaving in ways that you value.

"I really wanted to know if they felt like me. Sometimes I thought that some of the kids I knew and kinda knew, didn't feel the same way about things that I did. I don't mean they didn't like the Mets or anything like that, but they didn't feel sad about things that made me feel terrible. And things that made me happy sometimes didn't make other kids happy."

-Fast Sam, Cool Clyde, and Stuff

Walter Dean Myers

With all the changes during puberty, there is probably going to be a certain amount of self-consciousness or anxiety. Different parts of the body may grow at different rates or at different times, and it's natural to feel curiosity or

concern about the final result, or even the process! Often boys worry about not being tall enough, or girls may become preoccupied with their weight. It takes time to adapt to and feel comfortable with the new developments in you. Positive self-esteem built on your whole self, not just how you look, will help you accept these changes in puberty more easily.

Mini-Activity

Next Time I'll. . . The next time you find yourself "dwelling" on yourself, turn thought to action.

a. Do something positive for yourself.
b. Or do something positive for others.

Keep a list of the actions you take.

Ultimately, you have to accept yourself, including your body. It is true that as a person who is still growing, you do not even know what ultimate size or shape you will take. It is also true that what you look like to a considerable extent depends on you and how you take care of yourself. But there is a limit to your ability to change yourself. To be healthy and happy you must therefore accept who you are.

What Do You Think?

What makes people shy? Do you think shyness is biological (and therefore genetic) or a learned social behavior? What can you do about shyness?

Activity 8-2: What Makes You Special?

Introduction

Sometimes it's easier to focus on what is wrong than what is right. Many people find it difficult to give or receive a compliment, but we all need to know that we're appreciated and that we appreciate others. Now is your chance to let people know what you like about them.

Materials

- One set of blank note cards for each student

Procedure

Step 1 Write a brief note to each of your classmates, telling something that you appreciate about each of them. Some notes will be easier to write than others will. Comments could be about something the classmate has done for you, something you saw the classmate do for someone else, attitude, behavior, a positive change you've noticed, a neutral comment, the person's "style," sense of humor, hard work, and so on. The following rules apply.

a. All comments must be truthful.

b. All comments must be appropriate.

c. No teasing or put-downs are allowed.

d. You must fill out a note card for every classmate.

Step 2 You do not have to sign your note, but if you wish, you can put your name on the back.

Step 3 Turn the notes in to your teacher, who will distribute them.

Step 4 When you've had a chance to look at all the notes written to you, think about what your classmates have said. Is there a pattern to what they see about you? Is it a pattern that you like? Does it agree with your image of yourself? How did reading the notes make you feel?

Journal Writing

In your last journal entry you focused on the positive things you already are. Now add to this by writing about the kind of person that you would like to become. Think about all aspects of your life as well as how you relate with others.

Review Questions

1. What are three things you can incorporate into your daily life to improve how your body looks and feels?
2. What does "you are what you eat" mean?
3. What are three elements of good health habits?
4. How do self-esteem and body image work together?
5. What are some ways of building self-esteem?
6. How does taking control of your life relate to self-esteem?

CHAPTER 10 Your Changing Body Glossary - Student Edition (Human Biology)

CHAPTER OUTLINE

10.1 Your Changing Body Glossary

adolescence the time between being a child and becoming an adult when psychological and social development occur.

adrenal glands glands found on top of the kidneys. While most of the testosterone in males comes from the testes, the adrenals are the main source of testosterone in females.

aggression in one sense, to be assertive, active, bold, take the initiative, and persist; in another sense, to attack, fight, conquer, and cause pain.

anabolic steroids human-made hormones that can temporarily increase muscle size.

anemia a condition of insufficient red blood cells.

anorexia an eating disorder that involves severe dieting and weight loss.

averages (as they relate to growth and development) The ages at which adolescents reach certain stages of puberty are collected, added together, and then divided by the number of persons studied. For example, a girl may develop breasts on average by age 13, but the normal range includes ages 8 through 17.

axillary hair hair under the armpits.

body image how we see ourselves in our own mind.

bulimia an eating disorder characterized by periods of uncontrolled overeating usually followed by vomiting or the use of laxatives to avoid gaining weight.

chronic long-lasting illness.

chronological age how old you are or how many years you have lived.

development growing, as well as improving the function of a particular organ or part of the body.

developmental age how developed you are in a psychological and biological sense at a given time.

dysmenorrhea menstrual cramps.

ejaculation a sudden discharge of semen.

endocrine glands glands that produce hormones.

endurance ability to exercise hard, for a long time, and recover from the effects of exercise quickly.

environment everything around us, or the world in which we live.

estrogen a hormone that plays an important role in the sexual maturation, menstrual cycle, and reproduction.

exocrine glands a gland such as a sweat gland that releases a secretion through a duct.

follicle in the ovary, a small cavity that contains a developing egg.

follicle-stimulating hormone (FSH) a hormone produced by the pituitary gland that flows through the bloodstream and is picked up by the gonads. FSH stimulates an egg, or ovum, to mature in its follicle, or sac, in the female. In the male, FSH stimulates the production of sperm cells in the testes.

gender maleness or femaleness.

gender identity how you see yourself as masculine or feminine.

gender role how society expects you to behave because of being male or female.

gene a segment or a piece of DNA that codes for a specific trait.

genitals external sex organs.

gonadotropin-releasing hormone (GnRH) a hormone produced by the hypothalamus that acts on the pituitary gland to release FSH and LH.

gonadotropins (FSH and LH) hormones that control the gonads. The gonads, in turn, produce their own hormones.

gonads reproductive glands that produce sex cells (either eggs or sperm) and secrete hormones.

growth an increase in size.

growth hormone (GH) an important hormone produced by the pituitary that makes the body's bones and tissues grow larger.

heredity the process of passing on traits and variations from one generation to the next.

hormones chemical substances that the body's various systems need to perform their functions.

hypothalamus a portion of the brain that controls the pituitary gland, located right above the pituitary. It is part of the nervous system as well as part of the endocrine system.

larynx voice box.

life cycle stages in life that are predictable and repeated in each generation.

luteinizing hormone (LH) a hormone produced by the pituitary gland that flows through the bloodstream and is picked up by the gonads. In the male, LH acts on cells that are between tiny tubes where sperm are produced, causing the cells to produce testosterone, which helps develop pubic hair and build muscle.

masturbation self-stimulation of the genitals.

maturation a word commonly used to describe the development of physical, emotional, and behavioral characteristics through the growth process.

menarche a girl's first period.

menopause a stage reached when a woman no longer has menstrual periods and can no longer bear children.

menstruation the flow of blood, or the shedding of the lining of the uterus, from the vagina once a month.

nervous system the brain, spinal cord, and nerves.

nocturnal emissions semen ejaculated from the penis during sleep.

normal development a function of averages, a range within which most individuals develop in specific ways.

ovaries the female reproductive organs that produce eggs and sex hormones.

ovulation time when the egg bursts out of the wall of the ovary.

peers a group of people who are alike in age or grade level.

penis the male organ through which sperm is delivered and through which urination occurs.

physical environment the air we breathe, the food we eat, the sun that shines on us, and all else we come into contact with, whether or not we are aware of it.

pituitary gland a pea-sized gland that produces many hormones, including some of the hormones of puberty, located near the base of the brain.

premenstrual tension syndrome (PMS) symptoms that occur several days before menstruation, such as slight swelling of hands and legs, a bloated feeling in the abdomen, temporary weight gain, and headache. Other symptoms of PMS may be psychological, including moodiness, irritability, anger, trouble concentrating, and lack of energy.

progesterone a hormone that plays an important role in sexual maturation, the menstrual cycle, and reproduction.

proportion the relation of one part to another or to the whole in relation to quantity, magnitude, size, or degree.

psychological changes changes in how we think, feel, and behave as we become more mature.

puberty a period of time during which physical growth and development that lead to sexual maturity take place.

pubic hair hair around the sex organs.

receptors located either within the cell or on the cell surface that recognize and bind with hormones.

reproduce produce offspring.

scrotum the sac-like structure that contains the testes.

secondary sexual characteristics characteristics that do not directly involve the reproductive organs themselves but indicate sexual maturity and distinguish male from female.

self-esteem how you feel about yourself, or how you value yourself.

semen a whitish fluid of the male reproductive system consisting of sperm and nutrient fluids.

sex-discrimination law a law that says that men and women cannot be denied access to jobs, areas of study in school, sports, or other life opportunities on the basis of their sex.

social environment the people with whom we interact.

sperm the male sex cell.

steroids a group of organic compounds that include the sex hormones.

stress feelings of anxiety.

testes male organs where sperm cells and sex hormones are produced.

testosterone a hormone that helps develop pubic hair and build muscle.

toxic shock syndrome a condition associated with tampon use. Symptoms include high fever, vomiting, muscle aches, and a rash that looks like sunburn.

uterus a female organ for containing and nourishing the embryo during development previous to birth (also called a womb).