
CHAPTER 11

THE SCHOOLCHILD'S PHYSICAL DEVELOPMENT

GROWTH DURING THE SCHOOL YEARS

Height and Weight
Nutrition and Growth

HEALTH AND ILLNESS

Problems with Health
Children's Understanding of
Health and Illness

MOTOR DEVELOPMENT

Growing Skills
Handedness

Curiouiser and curiouiser!" cried Alice (she was so much surprised, that for the moment she quite forgot how to speak good English). "Now I'm opening out like the largest telescope that ever was! Good-bye feet!" (for when she looked down at her feet, they seemed almost out of sight, they were getting so far off).

—Lewis Carroll, *Alice's Adventures in Wonderland*, 1865

"I'm big now," says 6-year-old Jason, and to prove it he reaches above his head, without standing on tiptoe, and easily unlocks the front door to his home. At 12 years of age Jason still thinks about his height. He has recently noticed that he can look his mother squarely in the eye, and he will soon be taller than she is. Slowly but steadily he has been growing throughout his school years; now, poised on the threshold of adolescence, he is ready for a sudden spurt.

Vicky too grows slowly but continuously during her first 7 years at school. At first her pace is about the same as Jason's, but later it becomes slightly faster. At 12 she is half a head taller than Jason, and a little heavier. The facial proportions of both children have also changed. In accordance with the cephalocaudal principle of development (see Chapter 5), during the early years the upper parts of their heads grew faster than the lower parts. Now the lower halves of their faces catch up, and their foreheads are not so high anymore. Their facial features become more prominent and more distinctly individual.

Both Vicky and Jason are in robust health, and they take for granted the increasing powers and coordination of their bodies. This stage is among the healthiest in the entire life cycle. Colds and sore throats are common, but debilitating diseases are rare.

In this chapter we examine physical growth, including predictions of height in adulthood and certain abnormal growth patterns. Normal growth depends on proper nutrition and good health, and so we'll also discuss health and illness. As part of our consideration of these issues we examine two subjects that overlap with discussions in other chapters. One is type A behavior, which can result in heart trouble later in life, illustrating the relationship between physical change and personality issues; the other is children's understanding of health and illness, which links physical and cognitive issues. These mixtures of physical, personality, and intellectual development remind us that despite the distinction often made between mind and body, the two are hard to separate. The final portion of the chapter considers motor development. At age 6, children are bundles of poorly focused energy. They run a lot, but not efficiently or smoothly. At 12 they run less, but more productively. We consider these changes and one of the more mysterious features of motor development, *handedness*, or the tendency to use one hand rather than the other. Let's begin by considering the fundamentals of growth during this period.

Growth during the School Years

HEIGHT AND WEIGHT

If we were to walk by a typical elementary school just after the ringing of the three-o'clock bell, we would see a virtual explosion of children of all shapes and sizes. Tall ones, short ones, fat ones, and skinny ones would be dashing helter-skelter through the school doors into the freedom of the open air.

We would see that these 6- to 12-year-olds look different from preschoolers. They're much taller and thinner. Most are fairly wiry, although the girls retain somewhat more fatty tissue than the boys, a physical characteristic that will persist through adulthood. We would see that the black children tend to be slightly larger than the white children (American Academy of Pediatrics, 1973).

During middle childhood, children grow about 2 or 3 inches each year and gain about 5 to 7 pounds. Late in this stage, usually between the ages of 10 and 12, girls begin their growth spurt. This change suddenly moves them physically well beyond boys in their class. Table 11-1 summarizes information about growth from age 6 to age 12. Notice that the changes in height and weight are not perfectly correlated. By the time girls are 9, after a slight dip, they have caught up with boys in height, but they fall steadily behind in weight until overtaking boys, at age 10 for nonwhite girls and at age 11 for white girls.

Variations in Growth

These figures, of course, are averages. Individual children vary widely—so widely that “if a child who was of exactly average height at his seventh birthday grew not at all for two years, he would still be just within the normal limits of height attained at age nine” (Tanner, 1973, p. 35).

The figures also vary for different groups. Table 11-1 shows that nonwhite boys and girls tend to be a bit bigger than white children of the same age and sex. There is also a difference between richer and poorer children. Children from more affluent homes tend to be larger and more mature than children

Table 11-1 Physical Growth, Ages 6 to Age 12 (50th Percentile)

AGE	HEIGHT, INCHES				WEIGHT, POUNDS			
	WHITE MALES	NONWHITE MALES	WHITE FEMALES	NONWHITE FEMALES	WHITE MALES	NONWHITE MALES	WHITE FEMALES	NONWHITE FEMALES
6	46	47	46	47	48	49	47	46
7	49	49	49	49	53	55	52	51
8	51	52	50	51	61	61	57	58
9	53	53	53	53	66	66	63	65
10	55	55	57	57	73	72	70	78
11	57	58	58	59	81	80	87	90
12	59	60	60	61	91	93	95	99

Source: Adapted from Rauh, Schumsky, & Witt, 1967, pp. 515–530.

* **Menarche** A girl's first menstruation.

from poorer ones. This difference arises from differences in nutrition. Later in the chapter we will discuss malnutrition, which usually hinders growth. Overnourished, or fat, children mature earliest of all, and heavy girls experience the *menarche*, or the first menstruation, earlier than their more slender classmates.

Ethnic differences also affect the average sizes of children. One study of 8-year-old children in different parts of the world yielded a range of about 9 inches between the mean heights of the shortest children (mostly from southeast Asia, Oceania, and South America) and the tallest ones (mostly from northern and central Europe, eastern Australia, and the United States) (Meredith, 1969). Although genetic differences probably account for some of this diversity, environmental influences also play a part. The tallest children come from parts of the world "where nutritious food is abundant and where the infectious diseases are well controlled or largely eliminated" (Meredith, 1969).

This wide variety in average sizes contains a warning. We must be careful about relying on observations of a child's physical growth and development when judging health or screening for abnormalities. We need to develop separate growth standards for different populations (Goldstein & Tanner, 1980). In the United States especially, where so many different ethnic groups live cheek by jowl, we should be cautious about making quick judgments.

Predicting Height

Jason's mother has never forgotten her thought that Jason might have real talent as a dancer. When he is 8 years old his mother thinks, "It's now or never," and enrolls him in dancing class. His teachers are impressed with his ability and enthusiasm. Should he receive special training, with the thought of a possible career in dance? The answer depends partly on how tall Jason will be as an adult. If he is too tall or too short, no important dance company will accept him. But Jason is only 8. Will he grow up to be the right height?

This question illustrates one practical reason for trying to predict height. The computer has made methods of analysis more sophisticated, but still we can predict height in adulthood with an accuracy of only plus or minus 2 inches. If we predict that Jason will grow to be 5 feet 10 inches tall, he may be as much as 2 inches taller (6 feet) or 2 inches shorter (5 feet 8 inches). This range of accuracy is not satisfactory for many concerns. The chief difficulty in accurate prediction is the uncertainty about the growth spurt in adolescence. It can make short people tall, and it can disappoint others who expected to become tall but who had only a small growth spurt (Tanner, 1973).

Children who suffer from abnormal growth can often be identified on sight because even at age 6 or 7 they are significantly shorter than their classmates. There are many different types of growth disorders. One of the most important arises from the body's failure to produce enough growth hormone. Why not give these children hormone injections? For two reasons: this therapy is expensive, and it carries risks of infection. Recently, however, biochemists have perfected a technique for inserting the genetic code for human growth hormone into bacteria, cloning the bacteria, and then allowing the bacteria to make the growth hormone. This method costs less and results in a purer hormone (Angier, 1982).

Would some ambitious parents try to use the hormone to turn their children of normal height into abnormally tall children? This might be dangerous, since we have no clear idea what the long-term effects on health are likely to be for a person who is genetically designed to be 5 feet 10 inches tall but who has been artificially "stretched" to 6 feet 3 inches. Yet even the possibility of worrying about such things is a startling sign of how much power the new understanding of biochemistry has given us. Because the use of growth hormone is so new and so filled with uncertainties, the American Academy of Pediatrics formed an ad hoc committee to consider the subject. The committee recommended that growth hormone be used only for children who are naturally deficient in the hormone. The committee also noted that since many of the handicaps associated with being short are psychological, even in experimental studies the use of growth hormone should be limited to children whose prospects for emotional improvement outweigh the problems of long-term hormone therapy (American Academy of Pediatrics, 1983).

NUTRITION AND GROWTH

During these middle years, average body weight doubles, and children's play demands a lot of energy. To support this steady growth and constant exertion, children need plenty of food. Children in this stage usually have good appetites and often eat rapidly. On average, they need 2400 calories per day, 34 grams of protein a day, and high levels of complex carbohydrates, such as are found in potatoes and cereal grains. Refined carbohydrates (sweeteners) should be kept to a minimum (E. R. Williams & Caliendo, 1984).

We have already seen that poor nutrition causes slowed growth, with the result that malnourished children are shorter than their well-fed classmates. It takes some energy and protein, just to stay alive and some more energy and protein to grow. When meals cannot adequately support both these processes fully, growth must be sacrificed in order to maintain the body. Of course, social behavior also needs nutritional support. Children cannot play and stay alert if they do not have enough food to permit this extra expenditure of energy. Do malnourished children suffer socially as well as physically?

Chronic malnutrition is a problem in the United States, and it is even more serious in many other parts of the world. An especially valuable longitudinal study in Guatemala has helped identify many long-term effects of malnutrition early in life. Researchers observed 138 schoolchildren, aged 6 to 8, in three farming villages. When they were smaller, these children had all been given dietary supplements to help raise their nutritional standards. The supplements, however, had differed. Some children received a mix of proteins, essential vitamins, and sources of extra calories. Others got sources of extra calories and vitamins, but no proteins. Children who as infants did not receive proteins tended to be passive, more dependent on adults, and more anxious, while the better-nourished children were happier, feistier, and more sociable with their peers (Barrett, Radke-Yarrow, & Klein, 1982).

Although this finding supports the conclusion that poor nutrition leads to less activity, the process is really more complex. The study found that a child's diet from birth to age 2 is a good predictor of social behavior from age



(Betsy Cole/Picture Cube)

Eating can be fun as well as nutritious. During middle childhood, children have good appetites and need plenty of food to meet their growth needs. They're better off indulging a "sweet tooth" with the natural sugars found in fruits than with those in heavily sugared foods.

6 to age 8. Why is there such a long-term effect? It may arise from a complex feedback system. Mothers may respond less frequently and less sensitively to malnourished infants because the infants lack the energy to engage their mothers' attention and get their mothers to interact with them. The infants develop poor interpersonal skills and a general lack of responsiveness, which in turn further reduces the desire of other people to interact with them (B. M. Lester, 1979).

This cycle grows worse if, as often happens, the mother is also malnourished. She too lacks the ability to engage the attention of others in her environment and get them to interact extensively with her. Both mother and child, then, support a cycle of passive unsociability (Rosetti-Ferreira, 1978).

Studies like the long-term one carried out in Guatemala indicate how the different domains of development—in this case, physical growth and personality—are related. Nutrition has physical effects and social implications.

Health and Illness

Vicky, aged 10, is home in bed with a cold, her second of the year. She sneezes, snoozes, watches every game show she can find on daytime TV, and relaxes in satisfaction at this break from the school routine. She's lucky. Apart from her two colds she has had no other illnesses this year. During middle childhood germs pass so freely among children at school or during play that many youngsters have six or seven respiratory infections a year (Behrman & Vaughan, 1983). Even children who do get a lot of colds, however, are healthier than their counterparts early in this century. As we pointed out in Chapter 8, the development of vaccines for many childhood illnesses has made this an extremely safe time of life for most children.

However, there are of course potential problems. We'll look at three areas of concern—type A behavior, dental health, and vision—and then consider children's understanding of health and illness in the years of middle childhood.

PROBLEMS WITH HEALTH

Type A Behavior in Childhood

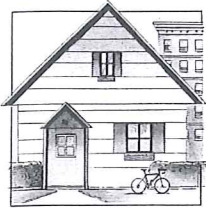
A major risk factor for developing coronary heart disease later in life seems to be the kind of personality that has become known as **type A**. Type A adults, who are aggressive, impatient, and competitive, are more apt to suffer a heart attack than **type B** adults, who are more easygoing and relaxed (Friedman & Rosenman, 1974). A considerable amount of recent research has focused on the kinds of personality traits exhibited by children that seem to predict type A behavior patterns later in life.

As early as 3 years of age some children show the kinds of behavior that seem to foreshadow the type A pattern. They're more aggressive to Bobo dolls (big rubber dolls often used in psychological laboratories to test children's aggressiveness) with less encouragement from the experimenter, and they're more likely to interrupt the experimenter, squirm, sigh, click their tongues, and show other signs of impatience and restlessness. Furthermore, they try

Type A personality A personality type which includes traits such as aggressiveness, impatience, and competitiveness and which is strongly correlated with coronary disease in adulthood.

Type B personality A personality type that is easygoing and relaxed.

A CHILD'S WORLD . . . THE EVERYDAY WORLD



How can we improve children's health? While this time of life is safe, it could still be much healthier. Recent studies analyzing the physical fitness of schoolchildren have found that today's youngsters are less healthy than children were during the mid-1960s. A nationwide survey of 8000 children aged 10 through 18 revealed that children are fatter today and that the fitness of their hearts and lungs is generally inferior to that of a typical middle-aged jogger (U.S. Department of Health and Human Services, 1984). It takes 11-year-old girls, for example, an average of almost 12 minutes to run a mile, and it takes boys the same age almost 10 minutes.

Why are these children in such poor physical condition? Partly because only half of all elementary school children take physical education classes as often as twice a week, fewer than half stay active during cold weather, and most are not spending enough time learning such lifetime fitness skills as running, swimming, bicycling, and walking. Many are spending too much time in front of a television set. Most physical activities in school and out are team and competitive sports and games. These don't promote fitness, will usually be dropped once the young person is no longer in school, and are generally engaged in by the fittest and most athletic youngsters, not those who need help the most.

Another study found that 98 percent of the 7- to 12-year-olds in a typical midwestern working-class community had at least one major risk factor for developing heart disease later in life. Their levels of body fat averaged 2 to 5 percent above the national unhealthily high average, 41 percent had high levels of cholesterol, and 28 percent had higher-than-normal blood pressure (Kuntzleman, 1984).

One study of nearly 7000 children between the

ages of 6 and 11 and a second study of 6500 adolescents found a clear link between obesity and watching television. The link is especially dramatic in the case of adolescents. Every hour spent before a television set each day increases the prevalence of obesity by 2 percent. Watching television increases snacking and decreases play, suggesting a direct causal relationship between too much weight and too much television (Dietz & Gortmaker, 1985).

Children can, however, improve their physical health by changing their everyday behavior. One educational and behavior modification program has been teaching 24,000 Michigan children how to analyze the foods they eat; how to measure their own blood pressure, heart rate, and body fat; and how to withstand peer and advertising pressure to smoke and to eat nutritionally unsound foods. It also encourages them to take part in physically demanding games. When researchers looked at the effects of the program on 360 second-, fifth-, and seventh-graders, they found heartening results: the children in the program had significantly improved the times in which they could run a mile; they had lowered their cholesterol levels, their blood pressure, and their levels of body fat; and the number of children without any risk factors for developing coronary disease had risen by 55 percent (Fitness Finders, 1984).

This program is in line with recent recommendations by a prominent group of pediatricians, who urge that schools provide a sound physical education program with a variety of competitive and recreational sports for all children and that there be an emphasis on activities that can be part of a lifetime fitness regimen, such as tennis, bowling, running, swimming, golf, and skating (American Academy of Pediatrics, Committee on Pediatric Aspects of Physical Fitness, Recreation, and Sports, 1981).

harder to excel at tasks that don't have clear criteria for performance, they tend to measure their own performance against scores of children who have done better, and they set higher standards for themselves. Finally, they talk louder, eat and walk faster, and are, in general, more competitive (Corrigan & Moskowitz, 1983; Matthews & Angulo, 1980; Matthews & Volkin, 1981; Wolf, Sklov, Wenzl, Hunter, & Berenson, 1982).

Where do such patterns come from? After analyzing the childhood behavior of 108 young adults who had been followed by the New York Longitudinal Study (described in Chapter 7), one psychologist concluded that certain inborn temperamental attributes shown early in childhood may lead to the type A behavior pattern in adulthood (L. Steinberg, 1985). The behaviors are

often different at different times in life. Thus, young children who show a predominantly negative mood but are fairly adaptable tend to strive for achievement when they grow up; young children who give up easily, who are not adaptable, and who react strongly to various sensory stimuli grow up to be angry, impatient adults.

We need to be careful in interpreting these correlations, however, says the researcher who discovered them. First, the information is based on a relatively small sample of upper-middle-class white families, and so we can't necessarily generalize it to other groups. Second, the information about traits in early childhood came from the children's parents, and therefore what they said may reveal more about how the parents saw their children than what the children were actually like. And finally, it's possible that parents who see their children as having certain traits behave differently toward them, so that child-rearing practices exert an influence (L. Steinberg, 1985). In one study, for example, mothers of type A boys encouraged their sons to keep reaching higher and higher goals, but they didn't set clear standards for determining when those goals had been reached (Matthews & Siegel, 1983). Probably what happens is that the home environment and the school environment interact with temperament to encourage the development of type A behavior.

This line of research may have vital practical benefits. If we can predict which children may be more vulnerable to becoming type A adults and if we can identify the adult behaviors that foster type A behavior patterns, we may be able to help parents and teachers change their own behavior to discourage this potentially life-threatening personality syndrome before it becomes strongly entrenched and harder to change.

Dental Health

Most of the teeth that we need to serve us for the rest of our lives arrive early in middle childhood. The "tooth fairy" makes its first appearance when children are about age 6—when the primary teeth begin to fall out, to be replaced by the permanent teeth at a rate of about four teeth per year for the next 5 years. The first molars erupt when the child is about age 6, followed by the second molars when a child is about 13 and by the third molars (the "wisdom" teeth) usually during the early twenties (Behrman & Vaughan, 1983).

Given the importance of sound teeth for nutrition, general health, and appearance, a major health concern in the United States today is the high rate of dental problems among children. A government survey of about 40,000 children aged 5 to 17 found that by the age of 5, children have an average of more than four decayed or filled surfaces in their first ("baby") teeth; by age 12, most children have more than four decayed, missing, or filled surfaces in their permanent teeth; and by age 17, they have more than 11 such dental problems. Girls and white children have more cavities than boys and children of other races, possibly as a result of differences in diet. The good news is that more than one-third (36.6 percent) of children aged 5 to 17 have *no* tooth decay (U.S. Department of Health and Human Services, 1981). With a regular program of careful toothbrushing, fluoride supplementation (either in the water supply or applied by a dentist), sound nutrition, and good dental care, this proportion should rise.

Fear of visiting the dentist first appears during middle childhood. Studies

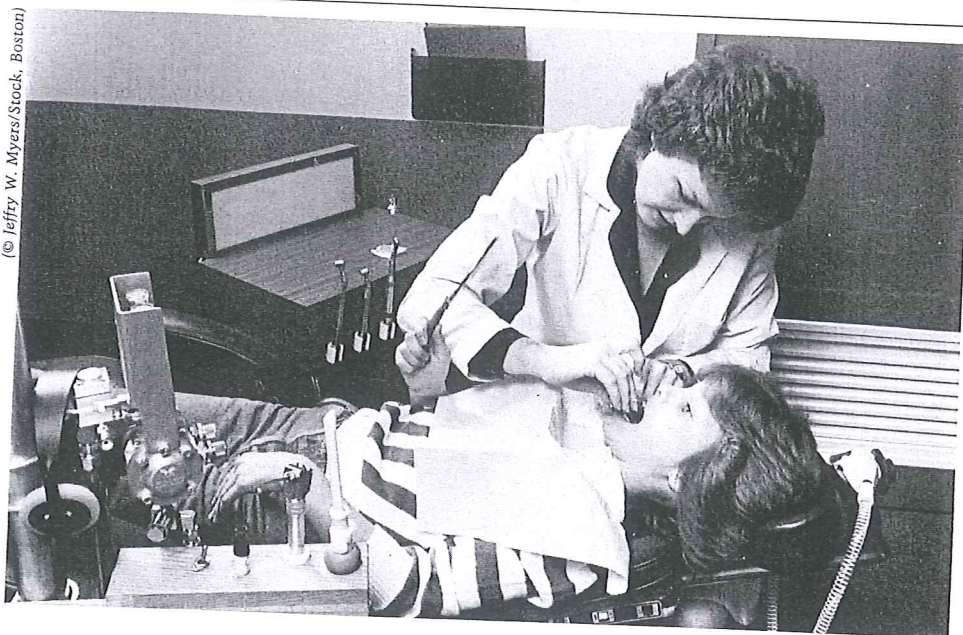
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Good dental care is important for long-term health. People with sound teeth eat better and look better. Parents who do not model anxiety themselves about going to the dentist, but portray it as one more aspect of good personal care, help their children develop good oral hygiene.

indicate that during early childhood, children are usually cooperative at the dentist's office, and over time they become even more cooperative and less anxious. But during middle childhood this behavior changes, and children become more fearful. One possible explanation for the change is that children have had more experience with dentists and have learned to fear them, but there is little evidence to support this hypothesis. A more likely cause is modeling of their parents' behavior. Children see that their parents are anxious about visits to the dentist and grow anxious themselves. In Chapter 10 we saw that fears can be reduced if a child sees another person fearlessly doing something the child is afraid of and also if the child is repeatedly and gradually exposed to the fear-producing stimulus. (This latter technique is called **desensitization**.) Experimental study indicates that both these techniques can significantly reduce the fear of going to the dentist (Winer, 1982).

Desensitization A technique for overcoming fear by gradually exposing a person to the fear-producing stimulus.

Vision and Visual Problems

In middle childhood, youngsters have much keener vision than they had earlier, because their organ systems are more mature. Children under 6 years of age tend to be farsighted, since their eyes have not fully matured and are different in shape from those of adults. By the age of 6, their *binocular coordination* (the ability of both eyes to work together) is well developed, enabling them to focus better.

Still, a number of children have problems with vision. By the age of six, 7 percent have defective binocular distant vision (20/40 or less, meaning that in order to see something that they should be able to see at 40 feet, they have to be 20 feet away from it), and 10 percent have defective near vision. By 11 years of age, 17 percent have poor distant vision, and 10 percent still have poor near vision. Yet many of these children have either no eyeglasses or inadequate ones (U.S. Department of Health, Education, and Welfare, 1976).

CHILDREN'S UNDERSTANDING OF HEALTH AND ILLNESS

Getting sick is a frightening experience at any age. For children, who understand so little of what is happening, it can be especially distressing and confusing. When Vicky overhears the doctor refer to *edema* (an accumulation of fluid), she may think that the problem is "a demon." Two separate studies found nearly identical stages of development of children's understanding of their own diseases (Brewster, 1982; Perrin & Gerrity, 1981).

When children start middle childhood, they are in Piaget's preoperational stage (see Chapter 9) and are incapable of abstract logic. During this period children tend to believe that illness is magically produced by human actions, often their own. These magical explanations can last well into childhood. One 12-year-old with leukemia said, "I know that my doctor told me that my illness is caused by too many white cells, but I still wonder if it was caused by something I did" (Brewster, 1982, p. 361). It would be hard for parents or professionals who overheard this remark to keep from rushing in and saying, "There, there, of course it wasn't anything you did." But this reaction may not be as supportive as one might think. Such egocentric explanations for illness can serve as an important defense against feelings of helplessness. Children may feel that if something they did made them ill, then perhaps they can do something else to get better. If a person can tell a child only that he or she is the arbitrary victim of a cruel lottery, then silence probably is golden. One investigator warns, "It is never wise to break down defenses until one is sure that more desirable concepts will take their place" (Brewster, 1982, p. 362).

As children grow beyond the preoperational stage, their explanations for disease change. They enter a stage in which all diseases are explained in terms of germs. These germs are hardly less magical than the demons and guilt of an earlier age. They automatically cause disease. "Watch out for germs," is the motto of children of this age. The only "prevention" is a variety of superstitious behaviors designed to ward off germs.

Last, as children approach adolescence, they enter a third stage, in which they see that there can be multiple causes of disease. Contact with the dreaded germs does not automatically lead to illness. They know that people can do much to keep themselves healthy.

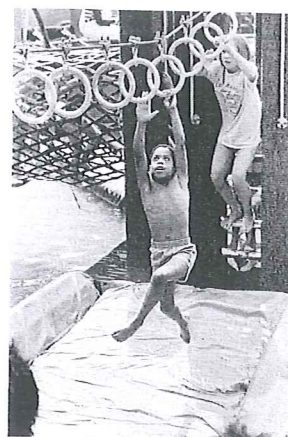
Research in this area shows dramatically how recent medical advances affect individual development. The germ theory of disease is relatively new, and effective methods of preventing disease are still more recent. Even today much of the world knows little about germs and less about public sanitation. The present epidemic of acquired immune deficiency syndrome (AIDS) illustrates the process all over again. When it first appeared, out of nowhere and completely unexplained, many people saw it as a magical punishment visited on homosexuals (one of the groups at high risk) for their actions. After researchers identified the AIDS virus, people superstitiously feared that any contact with the virus, with a person infected with the virus, or with a person related to a person infected with the virus could lead to AIDS. Thus we see that individual development occurs in a frame of social development and that when social development is stifled, the individual is limited.

Motor Development

GROWING SKILLS

If we were to follow a group of children on their way home from school, we'd be likely to see some of them running or skipping, and some leaping up onto narrow ledges and walking along, balancing themselves till they jump off, trying to break distance records—but occasionally breaking a bone instead. Many of these youngsters will reach home (or, often, a baby-sitter's house), not to emerge for the rest of the day. They could be outdoors honing their new skills in jumping, running, throwing, catching, balancing, cycling, or climbing—becoming stronger, faster, and better coordinated. Instead, like too many children today, they will be staying indoors watching television or engaging in quiet play.

Studies of 7- to 12-year-olds, done more than 20 years ago, when children seem to have been more physically active, suggest that children's motor abilities improve with age. (Examples of motor abilities are shown in Table 11-2.) These studies also showed that boys tend to run faster, jump higher, throw farther, and demonstrate more strength than girls (Espenschade, 1960); Gavotos, 1959). After age 13 the differences between the sexes become even greater; boys improve their motor abilities while girls stay the same or decline (Espenschade, 1960).



In middle childhood, motor development proceeds so quickly that children find themselves capable of doing all sorts of things which once seemed impossible.

Table 11-2 Motor Development in Middle Childhood

AGE	SELECTED BEHAVIORS
6	Girls are superior in movement accuracy; boys are superior in forceful, less complex acts. Skipping is possible. Can throw with proper weight shift and step.
7	One-footed balancing without looking becomes possible. Can walk 2-inch-wide balance beams. Can hop and jump accurately into small squares. Can execute accurate jumping-jack exercise.
8	Have 12-pound pressure on grip strength. Number of games participated in by both sexes is greatest at this age. Can engage in alternate rhythmic hopping in a 2-2, 2-3, or 3-3 pattern. Girls can throw a small ball 40 feet.
9	Girls can vertical-jump 8½ inches, and boys 10 inches, over their standing height plus reach. Boys can run 16½ feet per second. Boys can throw a small ball 70 feet.
10	Can judge and intercept pathways of small balls thrown from a distance. Girls can run 17 feet per second.
11	Standing broad jump of 5 feet is possible for boys; 6 inches less for girls.
12	Standing high jump of 3 feet is possible.

Source: Cratty, 1979, p. 222.

A CHILD'S WORLD . . .
AROUND THE WORLD



How does East Germany do it? Article 35 of East Germany's constitution proclaims the right of citizens to enjoy sports. This attitude goes a long way toward explaining the remarkable success that the country's athletes have enjoyed in the Olympic games. When the number of medals won by East German competitors is compared with the number won by entrants from the two superpowers, the East Germans' success seems fantastic. A comparison of the results of the 1976 Olympics in Montreal (the last time the United States and East Germany competed together at the Olympics) shows that in terms of the number of medals won per 1 million members of the population, East Germany's record was nearly 13 times better than that of the United States and over 11 times better than the Soviet Union's.

1976 Montreal Olympics

COUNTRY	MEDALS	POPULATION (IN MILLIONS)	MEDALS (PER MILLION)
United States	94	225	0.42
Soviet Union	125	258.9	0.48
East Germany	90	16.9	5.33

East Germany's success is based on a nationwide scouting system for evaluating and promoting athletic talent, which begins when children enter elementary school. Swimming is compulsory, and by the end of the second grade all children are expected to be proficient in at least two different swimming strokes. Athletic scouts find a few children even before first-grade age. The figure-skating and gymnastics sports clubs have members as young as 5 years old.

Sources: Childs, 1983; Kirshenbaum, 1976.

These East German clubs are not like the clubs and associations in the United States that are open to whoever wishes to join. They are for top athletes only and they give a special sports education to children who show unusual ability. It is an elite system that does not address the pressing problem of developing physical fitness among the majority of children, who show no special athletic ability.

The clubs operate boarding schools for the most promising children, and future champions leave the educational mainstream at about age 11 to enter these special schools. Other promising athletes whose skill is not considered to be of world-class caliber attend special sports high schools to learn how to coach and manage various sports.

Besides receiving extensive training, the growing children are put on special diets and special drugs to promote physical development. One swimming star, Renate Vogel, who later defected to the west, reported that special pills were first added to her diet when she was 10 years old. (The timing coincides with girls' growth spurt, discussed earlier in this chapter.) By the time she was in her middle teens, Renate was a world-class swimmer with the broad shoulders and deep voice of a man. Although the East Germans deny using body-building drugs, the masculine build of their female champions is widely recognized.

By his or her eleventh birthday, an East German schoolchild's physical development has been studied and evaluated. The coaching network has further encouraged and evaluated any children with exceptional talent. The clubs and sports schools offer the most promising children continued training during adolescence. By identifying the most talented children during their middle years, this national network of scouting, training, and diet management has produced a physical elite in numbers that would once have seemed unimaginable.

Today, however, the view of girls' abilities is changing. It now seems clear that much of the difference between the sexes' motor abilities has been due to different expectations and different rates of participation. When researchers study prepubescent boys and girls who take part in similar activities, they find that their abilities are similar.

When third-, fourth-, and fifth-grade boys and girls who had been in excellent coeducational physical education classes for at least a year were com-

pared on their scores on sit-ups, shuttle racing, the 50-yard dash, broad jumps, and 600-yard walk-runs, both sexes were found to improve with age, and the girls performed similarly to the boys on most measures. The girls who were tested in the third year of the program performed even better than the boys on a number of measures (E. G. Hall & Lee, 1984).

Such findings confirm statements by pediatricians that there is no reason to separate prepubertal boys and girls for physical activities. After puberty, however, the picture is very different, and girls should not be playing heavy collision sports with boys because their lighter, smaller frames make them too subject to injury (American Academy of Pediatrics, Committee on Pediatric Aspects of Physical Fitness, Recreation, and Sports, 1981).

HANDEDNESS

What is *handedness*? Vicky uses her right hand to draw with crayons. When she wants another crayon, she reaches for it with her left hand. Jason, who is now on a Little League baseball team, is learning to hit from either side of home plate. It is convenient to have two hands, because this enables us to respond to each situation as it arises. But for reasons that are not clear, we generally prefer to use one hand rather than the other. Children who favor the left hand are sometimes actively discouraged from using it, and left-handed children are frequently considered educationally at risk (Hardyck & Petrinovich, 1977).

Successful left-handed people include Benjamin Franklin, Michelangelo, Leonardo da Vinci, and Pablo Picasso. All these men were famous for their spatial imagination, a quality that may be stronger in left-handed people. It is

Handedness A preference for using one hand rather than the other; although the concept seems simple, not everyone uses the same hand for every task, and so determination of a person's handedness may be difficult.

A CHILD'S WORLD . . . AROUND THE WORLD

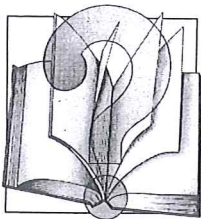


Are "lefties" handicapped? Some cultures have serious prejudices against favoring the left hand, or sometimes even against using it at all. In many Islamic societies the left hand is to be used for private washing, and any other use, such as for writing or serving food, is considered an offense against decency. Such an attitude is bound to affect behavior; not surprisingly, it is easier to find left-handed people in the United States than in Islamic countries. Yet left-handedness is never completely abolished. One study offers the following statistics on cultural "permissiveness" toward handedness and the prevalence of left-handedness: in "extremely permissive" societies 10.4 percent of the population is left-handed (about the proportion in the United States); 5.9 percent of the population is left-handed in "permissive" societies; and 1.8

percent is left-handed in "harsh, restrictive" societies (Hardyck & Petrinovich, 1977). Apparently, there are no societies that actively encourage left-handedness.

Most industrial countries are relatively permissive about handedness, but many Japanese parents still try to force their children to use the right hand, even going to such extremes as binding the left hand with tape ("Lefty Liberation," 1974). European civilization was once less permissive than it is today, and several pejorative English words began as references to the left. *Sinister* comes from the Latin word meaning "on the left," and *gauche* is the French word for "left." Meanwhile, of course, our word *right* has a host of favorable connotations. Perhaps French conservatives won a greater victory than they knew when, during the French Revolution, they first identified radical groups as "the left," a term that has remained in use to the present day.

A CHILD'S WORLD . . . AND YOU



- Because height matters so much to so many people, should parents be free to give their children growth hormone?
- Malnutrition early in life has long-term effects on physical and social development. How should society express its concern about this phenomenon?
- Although type A behavior is dangerous to a person's health, many people admire those with hard-driv-

ing, type A personalities and consider them the doers of society. Is it in society's interest to discourage type A behavior?

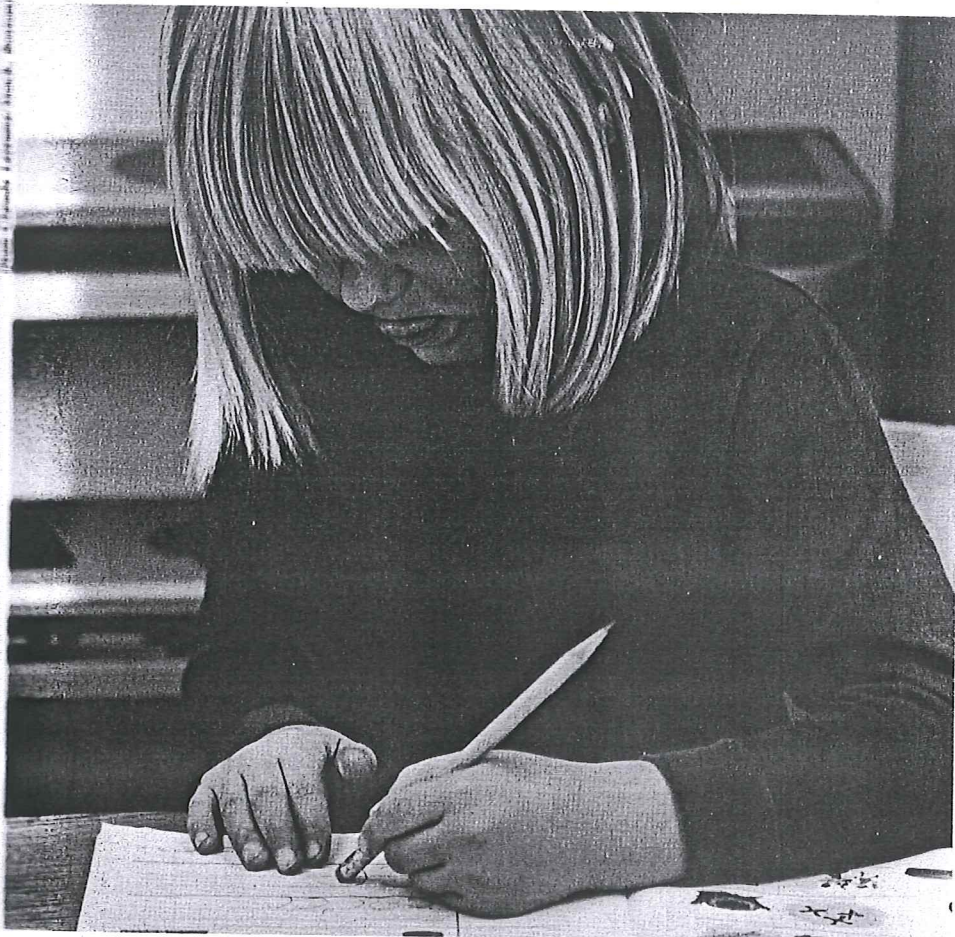
- Many people who consider themselves right-handed or left-handed are surprised, when they think about it, to realize that the situation is ambiguous. Do you consistently use the same hand to perform the following tasks: deal cards, unscrew a jar lid, shovel, sweep, thread a needle, write, strike a match, throw a ball, hammer, brush your teeth, swing a racket, and use scissors?

also true that left-handed athletes often do well, in part because their unusual way of throwing or catching a ball, for example, confuses the opposition. And left-handed people may actually be more likely to have special intellectual gifts. A study of over 100,000 children aged 12 and 13 identified nearly 300 who scored extremely high on the Scholastic Aptitude Test (SAT), an exam designed for people 4 and 5 years older. Twenty percent of this top-scoring group was left-handed, twice the rate of left-handedness found in the general population (B. Bower, 1985). It is unwise to jump to the conclusion that left-handed people are especially gifted, but any serious attempt to explain left-handedness as a symptom of underlying trouble must find a way to explain these successes.

There are many ideas about the causes of handedness, including environmental, anatomic, and genetic theories, but none of them have been able to settle the matter. A growing consensus favors the anatomic theories, especially those concerned with the brain's anatomy. The hypothesis has a compelling logic: the brain regulates motor behavior; left-handedness is a feature of motor behavior; therefore, the brain regulates left-handedness. To some extent this syllogism must be true, but we still don't know how much of the regulation depends on qualities inherent in the brain and how much depends on other factors. There is one well-established piece of evidence about involvement of the brain. In cases of severe injury to the brain, left-handed people tend to recover the damaged brain functions more quickly than right-handed people.

Researchers generally agree that there is a relationship between the brain's general organization, especially concerning dominance of the left or right side of the brain, and handedness, but the relationship is not precise and does not permit any easy generalizations about the thinking of left-handed people versus that of right-handed people. We should be especially cautious about concluding that left-handedness arises from an abnormal brain organization and, therefore, that left-handed people are more likely to think abnormally than right-handed people.

One team of researchers who surveyed the literature on handedness re-



In times gone by, this little girl's parents and teachers might have tried to discourage her from using her left hand for writing and drawing. Today, however, there's no evidence that being left-handed is a drawback; in fact, some research suggests that left-handedness may confer some advantages.

ported that this idea of a cognitive deficit associated with left-handedness has persisted "through generations of research workers. There is usually just enough of a relationship to suggest a possible link and never enough of one to establish firmly a solid correlation" (Hardyck & Petrinovich, 1977, p. 394). Their own conclusion was:

There seems to be no basis whatever for continuing to regard the left-handed with the appellations and stigmata that seem to have characterized them since Biblical times. In fact, a reasonable case can be made for the opposite viewpoint, since the evidence for deficit is minimal and advantages of recovery of function in the event of brain damage are considerable. (p. 399)

It is always prudent to doubt any suggestion of mysterious virtues in the majority and vague peculiarities among a minority. Sometimes such suggestions may be right, but they so often serve egos more than truth that they should be considered false until proved otherwise.

Summary

KEY CONCEPTS

- ✕ ■ Malnutrition hinders growth.
- ✕ ■ Both genetic and environmental differences account for the wide differences in the average sizes of children of the same age in different ethnic groups.
- ✕ ■ Good nutrition is important for growth, social activity, and maintaining the body. Inadequate nutrition can retard growth, reduces social activity, and interfere with maintenance of the body.

KEY FINDINGS

- Middle childhood is among the healthiest periods in the life cycle.
- Growth slows during this period.
- Heavy girls tend to experience menarche before more slender ones.
- During the middle years, average body weight doubles.
- ✕ ■ At ages 6 to 8 years, Guatemalan children who had been given a protein supplement during infancy were happier and more sociable than their peers who had not had the protein supplement.
- ✕ ■ Vision improves during middle childhood.
- Children's understanding of the causes of illness proceeds through several stages: before age 7 they believe that disease is a magical punishment for something they did; then, at around age 7, they enter a superstitious stage in which they think about all disease as being caused by germs; near adolescence, children understand that there are multiple causes of disease.
- Left-handedness occurs among about 10 percent of the population. There is no clear evidence linking left-handedness to cognitive disabilities.

KEY APPLICATIONS

- The best predictions of a child's height as an adult are accurate only to within plus or minus 2 inches.
- We can stimulate growth by the injection of growth hormone. Through biochemical techniques, we may eventually have access to a relatively inexpensive, biologically pure source of growth hormone.
- On average, children need 2400 calories per day. Sweets should be kept to a minimum.
- ✧ ■ There is no safety-related reason to separate prepubertal boys and girls for physical activities.
- When counseling seriously ill children, it's important to watch for any defense mechanism they use to help themselves accept their situation, and adults should avoid undermining these mechanisms without offering an equally valid substitute.

Suggested Readings

- Fincher, J. (1980). *Lefties*. New York: Perigee. A comprehensive study of handedness that explores theories explaining left- or right-handedness, examines societal customs and their implications for left-handed people, delves into historical attitudes toward left-handedness, and identifies a slew of famous "lefties."
- Pomeranz, V. E., & Schultz, D. (1978). *The mothers' and fathers' medical encyclopedia*. New York: New American Library. A source of up-to-date information about all aspects of children's health, including the prevention and treatment of ills that affect young people from the cradle to college.