What Do You Have To Help Me?

Shortly after the birth of a child, mothers and fathers proudly accept compliments from friends and relatives regarding the appearance of the newborn, such as, "My, what a cute baby!" From this point on, the physical appearance of the growing child is important to the parents and relatives. Young children soon learn the cultural and societal importance of a pleasing appearance. The child who presents a pleasant appearance indicated by facial and selected body features may reap more social rewards such as acceptance by others than does the child who presents a less than pleasing physical appearance. This does not mean that beauty is the most cherished or important personal possession but that children soon learn certain positive and negative effects of appearance.
While it is commonly understood that physical appearance is strongly based on genetic factors, there are many indications that certain aspects are based on environmental factors. Some of the major physical factors that are influenced by genes are height, length of limbs, and facial features. The potential for the growth of the bones, limbs, and trunk are established at conception. The pattern of growth is also indicated by genetic factors. In many cases some phases of the growth and development pattern may be rapid in certain individuals and slow in others. This affects one's relationship to a group since a child might be a head taller than any of the other children in a class.

Growth patterns that can be controlled by environmental factors generally include body composition and posture. Body composition in this instance refers to the ratio of lean or fat-free weight to fat weight. Many recent studies indicate that the nutritional and exercise habits developed in infancy have an effect on such habits later in life. Those who eat poorly and rarely exercise in childhood often maintain these habits throughout life and thus maintain a body composition high in fat weight and low in fat-free weight. Yet body composition can be and is of great concern especially to school age children because it greatly influences peer acceptance and self-concept. For instance the obese child who faces negative comments from classmates about physical size not only endures such forms of rejection but also has to personally deal with the limitations an obese body type places on participation in some physical activities. Even the “skinny” child may face derogatory comments from peers. Although not faced with the same physical limitations the slender child may not have as much physical strength or endurance as other children.

How Do I Get It?

As a person matures, the most noticeable change is found in physical size; children become taller and heavier. There are other less obvious ways the body changes. The relative lengths of the arms, legs, and trunk change. The bones are growing as is the muscle tissue. The amounts of fat tissue and fat-free tissue in the body can also change as a child grows and develops. All of these changes may affect participation in physical activity. The extent to which one is active may in turn affect body appearance.

Growth patterns can affect relationships with peers.
The body also changes in a way not outwardly visible. This is the basis for motor development. The nervous system which controls body functions, thinking, and physical movements, increases in complexity. While babies are born with the greatest number of nerve cells they will ever have, the number of connections each cell makes with other nerve cells increases throughout childhood and into adolescence. The amount of myelin around some parts of the nerve cell also increases through adolescence and this change promotes the speed and integrity of nerve signals. These changes affect one's potential skill in physical activities. Skilled actions are determined through the processes of perceiving the goal to be attained, making decisions concerning the body response to the task, and then carrying out the response. How these factors change as one grows and which factors can be altered will be discussed in the following pages.

**How?**

Growth occurs in definite patterns. This pattern is illustrated in Figure 1. These patterns begin with very rapid growth from birth to two years of age followed by a period of consistent, stable growth until 8 or 9 years. Some time after this boys and girls enter a period of very rapid growth sometimes referred to as the “adolescent growth spurt.” The peak rate of growth comes on the average at 12 years of age for girls and 14 years of age for boys. After this peak, growth continues for at least 2 or 3 more years before stopping.

Although people follow the same general growth pattern, they have their own timing. Some children will be a year or two ahead of the average maturity level for their age while others may be a year or two behind. If one could X-ray the growing bones of each child, the level of skeletal maturation would be known. Since this isn’t advisable it is useful to know that body size is closely related to maturation. For example taller and heavier children tend to be early maturers while shorter and lighter children tend to be late maturers. Individual differences in maturation rates are present in preadolescence but the differences are highlighted when some enter the adolescent growth spurt and achieve sexual maturation at an earlier age than others.

**Figure 1: Distance curves for height, showing the adolescent spurt of males and females.**

At birth some parts of the body are closer to adult size than other parts. The head, for example, is approximately one-half its adult size but the legs are only one-fifth of their adult length. Some parts of the body must grow faster than other parts during childhood and adolescence to reach adult proportions, as shown in Figure 2. Of the body areas, the arms and legs grow the fastest between one year and puberty while the trunk grows most rapidly between puberty and mature stature.

There is very little difference in height and weight between girls and boys until girls enter the adolescent growth spurt. Girls usually begin their growth spurt between ten and one-half and thirteen years while boys begin their spurt between twelve and one-half and fifteen years. For several years girls may be taller than boys of the same age. At all ages the inter-sex differences are more noticeable than the intra-sex differences. Between the ages of thirteen and fifteen, boys generally pass the girls and will be, on the average, taller and heavier. The average boy is five feet nine and one-half inches tall and one hundred fifty two pounds by age eighteen while the average girl is five feet four and one-half inches tall and one hundred twenty five pounds.

No one can predict exactly how tall a child will be but height is greatly influenced by the genes received from one's parents. Parents pass on a "growth potential" or the probability of achieving a certain height. Whether or not one reaches this height is influenced by environmental factors which include nutrition and disease. A child of short parents will most likely be shorter than average and a child of tall parents will most likely be taller than average. While growth potential cannot be changed, good health and nutrition can be maintained.

What Else?

Mild exercise stress stimulates bone strength and growth

How do bones change during growth? Even though they are thought of as being hard the bones are really changing all the time. Throughout life new cells are constantly replacing old ones. When one is young and growing taller there are parts of the bones where new cells are laid down and calcified to increase the length of the long bones or the size of small, round bones. The blood supply to the bones is necessary for maintenance of normal bone strength and bone growth. Exercise which induces mild stress improves circulation of the

Girls' growth spurt is between 10½-13 years of age.

Boys' growth spurt is between 12½-15 years of age.
blood and influences bone strength and growth. On the other hand some activities put severe stress on the part of a bone where growth is occurring and may cause an injury to that area. One example of this comes in baseball; constantly attempting to throw a curve ball at a young age can injure the part of the upper arm bone near the elbow where some forearm muscle tendons attach to the bone. Some of these bone injuries may result in a disturbance of or even premature cessation of bone growth. Different bones stop growing at different ages. Once they stop and the center for laying down new cells no longer functions the bone will no longer grow. Once growth in the length and size of bones has stopped in late adolescence it cannot be started again.

What Else?

Muscle growth parallels general body growth

What about muscle growth? Muscle growth follows the same pattern as general body growth. After a rapid growth of muscle mass during the first two years there is a gradual, stable gain in muscle mass consistent with general body growth during childhood and pre-adolescence. This growth occurs through an increase in the size rather than the number of cells. Although boys have slightly higher estimates of lean body mass, or fat-free weight, the muscular differences between boys and girls before puberty are minimal. During adolescence boys experience a substantial increase in lean or fat-free weight largely due to an increase in muscle mass. Girls, on the other hand, experience a much smaller increase in lean or fat-free weight. By adulthood the average woman will have two-thirds of the fat-free body weight of the average male.

How Do I Get It?

Muscle size is influenced by the sex hormones and exercise

Can the size of the muscles be increased? As previously discussed the muscle cells increase in size as one grows. Muscles also respond to exercise by increasing in mass. This size increase is relatively small unless a hormone called testosterone is present in the body. In boys, testosterone is first produced in large quantities at the onset of adolescence. Pre-adolescent boys and girls and women do not have testosterone levels high enough to bring about a large increase in the size of their muscles with exercise. This does not mean they cannot increase the strength of their muscles because
muscle needn't be dramatically increased in size to increase strength. During adolescence and adulthood men can undertake certain kinds of training programs which may greatly increase the size of the muscles.*

**What Else?**

Fat content is influenced by eating habits and exercise.

The fat content of the body also influences appearance. Aside from a very small percentage of people with certain medical problems one controls the amount of fat weight in his body. This is accomplished by tracking the number of calories taken in and the number expended to maintain the body and carry out activities. If these are balanced, body weight is maintained. If one eats more than one uses, weight is gained. Growing boys and girls need to eat enough calories for their bodies to support the growth of new tissues as well as carry out normal body functions and activities. As one grows older and growth slows down fewer calories are needed for building new body tissues. The caloric needs per pound of body weight decrease. For example, the calories needed daily per pound of body weight decreases from 35 at age 4 years, to 28 at age 8, to 23 at age 12, and to 20 by adulthood. The total number of calories needed might rise because the body weight increases with growth. An 8-year-old girl weighing 75 pounds needs approximately 2100 calories per day, while a 12-year-old girl weighing 75 pounds needs approximately 1725 calories per day. Yet, a 12-year-old weighing 100 pounds needs approximately 2300 calories per day.

As the body grows and increases in size, the amount of fat one has increases. These increases are marked during the first year and following ages 6 to 8 years. During adolescence the hormone estrogen promotes the accumulation of fat in girls. This accumulation is greatest in the hips, buttocks, breasts and inner calves. Boys do not accumulate as much fat as girls during adolescence and it may be differently distributed. For example adolescent boys usually show an increase in the thickness of fat near their shoulder blades but a decrease in the upper arm.

Everyone’s body has some fat weight and it is necessary to balance exercise and caloric intake so that the proportion of fat weight doesn’t become too high. Exercise is very important in controlling the fat weight of the body. It promotes the amount of fat-free weight at the expense of fat.

**Why Does It Happen That Way?**

**Growth generally improves physical ability**

**Performance quality is influenced by maturity and experience**

**Growth in height and weight alters the mechanical nature of physical performance**

The body changes that occur prior to maturity can either be beneficial to participation in physical activity or can be detrimental to participation. In most instances skill will be improved through the increase in body size and strength and neuromuscular development. However it is possible for performance level to decrease as one grows. This might happen if the number of calories eaten is greater than the number used and excess body fat is accumulated or it may happen if one fails to regularly stretch the muscles and thus lose joint flexibility.

The number of physical activities in which a mature person will be able to participate successfully should be much greater than those of a small child. The performance quality should increase not only to the point of maturity but for many years thereafter due to increased performing experience. There are other reasons for the increase in the quantity and quality of physical performance to the point of physical maturity and beyond. Some of the reasons may be related to the opportunities for participation available to developing children. Included in these opportunities would be such factors as play and recreation equipment available at home, school, or in the community, motivation of the child and parents to participate in physical activity, interests and expertise of physical education teachers and sports instructors, and time and money available for participation.

In addition to these factors relating to opportunities for participation one must consider the factors relating to physical development. Physical development includes growth, neuromuscular maturation, and perceptual and sensory development. Successful participation in some physical activities is greatly enhanced by increased physical size. In other words a larger person would be able to perform some activities better than a smaller person. A person who is six feet tall should be capable of performing much better than a person who is four feet tall in a high jump event in terms of their absolute jump height. Growth in height and weight alters the mechanical nature of physical performance. The larger
person has longer limbs, more range of motion, and larger muscles. Little success can be expected in shooting baskets at a regulation ten-foot goal until the person is tall enough and strong enough to propel a regulation ball high enough to score. In other activities a small body size may be more desirable than a larger one. Just consider gymnastics where both men and women who excel in world-wide competition are shorter in height than the average for their age.

As physical growth and development occurs gradually and steadily, so does perceptual and sensory development. Such factors as visual discrimination, distinguishing visual stimuli, visual tracking, and following a moving stimulus are vitally important in most activities. In many activities the stimuli are in constant or nearly constant motion and the participant or participants constantly need to alter their positions to interact successfully with the stimuli. Participation in the game of soccer involves 22 players and one ball that may all be in simultaneous motion. The players must make split-second decisions regarding their relationship to the ball and to other players to determine what is the proper skill and strategy to use at that particular moment. With maturation of the nervous system, increasingly complex situations may be judged so that the best response may be selected and carried out. Perceptual and sensory development and decision-making are factors in the increasing ability to perform physical activities with increased effectiveness.

How?

Mature appearance is influenced by genetic and environmental factors

Some of our body features are determined by the genes inherited from our parents and little can be done to change them. Among these are body height, the length of the limbs, color of the hair and eyes, and facial structure. One also tends to have a body build or shape determined by heredity. On the other hand there are things about the body which reflect the exercise one obtains through activities. If one is active there is a tendency to have more fat-free weight and less fat weight in the body. In other words body composition reflects activity level.

There are differences in body shapes between males and females especially after the onset of adolescence. Many of these have been brought about by the different hormones manufactured by boys' and girls' bodies. Boys start their growth spurt later but it lasts longer. The growth centers in
their bones are active over a longer period of time and on the average, men are taller than women. They also have relatively longer legs than women. In adolescence, boys also increase in shoulder width while their hip width remains relatively narrow. Girls, on the other hand, increase in hip width. As mentioned before, girls add some fat tissue to the hips, breasts, buttocks, and inner calves. This is just enough tissue to give a girl a woman’s “figure” and there isn’t a great deal of fat if she eats sensibly and exercises. Boys have a marked increase in fat-free weight during adolescence while girls experience a much smaller increase in fat-free weight.

How Do I Get It?

Physical activity and exercise may improve appearance

Can one improve appearance? The answer to this has to be an equivocal yes and no. As was discussed earlier, certain genetic factors influence one’s appearance at maturity. Yet there are environmental factors that determine to some extent what one will look like at maturity. The genetic factors are determined at conception and generally cannot be altered but the environmental factors can be changed. How one looks at maturity and thereafter is also influenced by environmental factors.

Such physical characteristics as height, body proportion, and facial appearance are determined by genetic factors and cannot be easily altered for appearance improvement. Other physical characteristics such as muscular development and body composition can be altered. Physical activity is one of the factors that is the most significant in bringing about such desired changes. Nutrition and diet are other important factors. When proper nutrition and proper diet is combined with the proper type and amount of physical activity the muscular development and body composition can be greatly enhanced. Corrective exercises can improve the posture of an individual through the strengthening of certain muscles and the stretching of other muscles. These concepts are discussed in more detail in later sections of this book and in other books of this series.