Hughston Health Alert

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Children's Fractures: Can they cause growth problems?

Children's bones have a unique structure known as the physis, or growth plate. Located at the end of every long bone, the growth plate is made up of layers of cartilage cells (Fig. 1). These cells are softer than the surrounding bone, making the growth plate more likely to fracture than bone. It is from these centers of growth that bones increase in length and width as the child grows. This process starts before birth and continues through adolescence.

Injuries to the growth plate during this growing period can interrupt normal development. About 1/4 of all childhood fractures involve a growth plate. When these fractures are left untreated, deformity and dysfunction of the joint can occur. Even with proper treatment, the initial injury can sometimes cause damage that slows or stops bone growth. Take, for example, an injury to the growth plate of one leg. While the injured leg is healing, the other leg is growing normally. This can cause one leg to be shorter than the other.

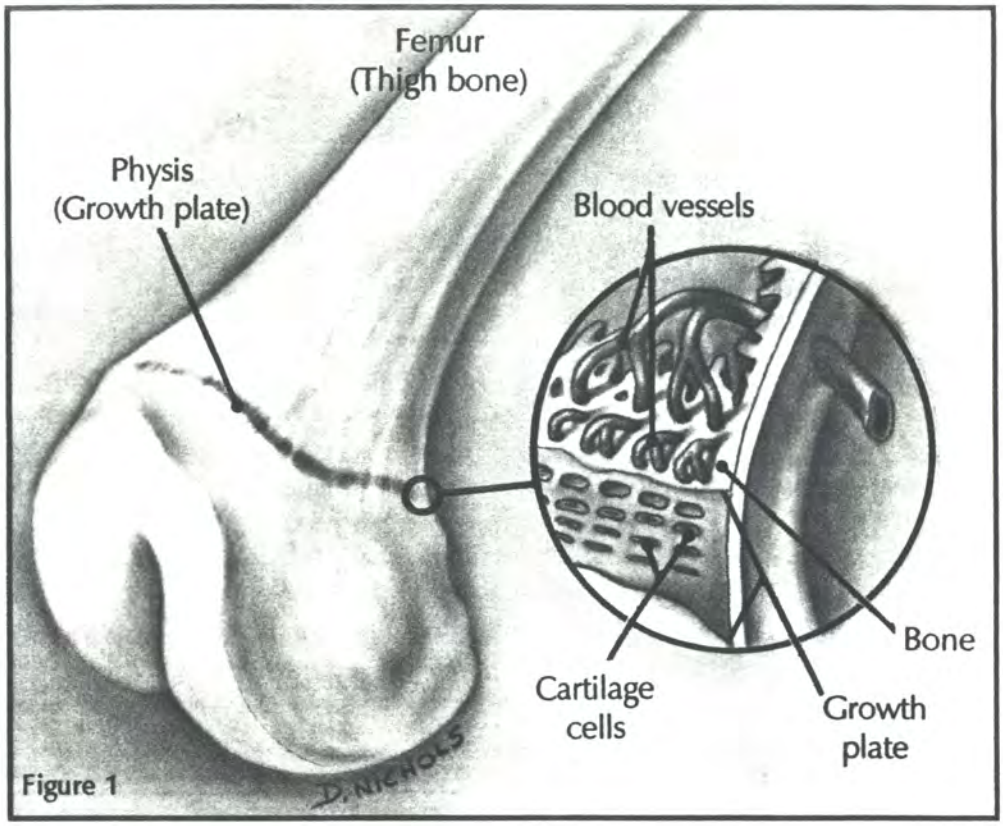

Figure 1

Problems with healing

The healing of growth plate fractures depends upon several things: the age of the child; which bone is fractured; the type of fracture; whether there is a good blood supply to the growth plate; the type of injury causing the fracture; and the treatment of the fracture. As a rule, fractures in children under the age of ten are more likely to reform into a normal bone. Growth plate fractures

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FRACTURE

in large bones such as those in the leg are usually more serious than those in the arm since it takes a more damaging force to cause a leg fracture than an arm fracture. Some types of fractures produce a fissure, or crack, across the growth plate. Careful treatment is needed to prevent a bridge of bone from forming in the crack, causing deformities or shortening. The type of fracture can be classified further based on the amount of damage to the growth cells themselves. Often, this is not evident until long after the injury has occurred, which is the reason orthopaedists often have a child return for check-ups and xrays for a year or more. Some growth plates, such as those in the bones of the hip and elbow, are at risk of having their blood supply disrupted. When their blood supply is inadequate, bone and cartilage cells can die. Other growth centers, such as those in the bones of the knee, are more prone to crushing injuries that can permanently damage growth cells and lead to deformity.

Understanding the risks of growth plate fractures is very important in their treatment. This means the physician must use the safest methods of setting a broken bone or, in some cases, must perform surgery to insert pins or screws to hold the bones and growth plate in the proper position for healing. When a growth problem becomes noticeable in the months or years following an injury, treatment is often possible to restore function of the limb. However, early recognition and treatment of growth plate fractures usually produces good results.

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Children and Sports

When To Start Participation

Although all children should have the opportunity to participate in sports, the question of determining what sport at what age is a bit harder. This is because children differ widely in the rate at which their bodies mature and in their ability to acquire the skills needed to be successful sports participants. Despite these individual differences, there are motor, learning, and visual skills that are characteristic of specific age groups. These developmental skills can be used to provide some basic recommendations for beginning sports participation.

No relationship has been found between skill training and sports performance in children less than five years old

Infancy (Birth to 2 years)

Motor skills during infancy are primarily reflexive in nature. These reflexes must become voluntary before other basic motor skills, such as reaching, walking, and climbing, can develop. Studies have been done to try to teach motor skills to this age group. Results reveal that infants show minimal, if any, effects from the training. Thus, there is little proof that structured infant swimming or exercise programs are beneficial. Children under two years of age should be provided with a supervised, unstructured play environment. Free play encourages normal, healthy development.

Early childhood (3 to 5 years)

These years are marked by the continued development of basic motor skills such as running, kicking, hopping, throwing, and catching. In addition, these children are also learning balance skills. If there are changes in the environment, such as an uneven playing surface, their attention is focused on controlling their balance which may slow the development of throwing or catching skills. Children at this age have extremely short attention spans and have difficulty tracking the speed and direction of moving objects. T-ball, where batters swing at stationary rather than thrown balls, was developed for children in this age group.

No relationship has been found between skill training and sports performance in children less than five years old. Training sessions for children in this age group who participate in sports should be short (15 to 20 minutes) and combined with an equal amount of play. To be most effective, coaching should be by demonstration in addition to verbal instruction. Competition with others may interfere with learning basic skills and should be avoided at this age. Walking, running, and swimming are good examples of activities that develop basic skills. Tumbling activities in gymnastics are also appropriate in this age group.

Running skills rapidly improve to mature levels by about age eight

Childhood (6 to 9 years)

Running skills rapidly improve to mature levels by about age eight. The rate of improvement for other basic skills varies. Eventually, most children in this age group master basic motor skills to permit participation in organized sports. However, the rapid decision making required in some sports may be difficult for these children because development of memory is limited. The attention span of a child in this age group is still relatively short. The child's ability to track moving objects is improved enough to allow for some success at skills such as kicking and catching.

Some children in this age group may be ready for participation in organized sports like soccer and baseball. However, sports such as football, basketball, and hockey will be difficult for many children because these sports require advanced motor skills and rapid decision making. Rules of team sports should be kept flexible to allow emphasis on perfecting skills rather than on win/loss records. Competition should be kept to a minimum. Swimming, running, and gymnastics continue to be good choices in this age group.

Late childhood (10 to 12 years)

Some children in this age group are able to master advanced motor skills and use memory well enough to compete successfully in sports such as football and basketball. By age 11 or 12, most children are able to process information from a number of sources and respond to verbal instruction. For safety reasons, participation in contact or collision sports, such as football and wrestling, should be based on categories of size or skill level. Practices should be short (less than one hour) and competition should be minimized in all sports programs.

Knowledge about normal physical development in children can help parents and coaches develop realistic expectations for a child's degree of success in sports participation.

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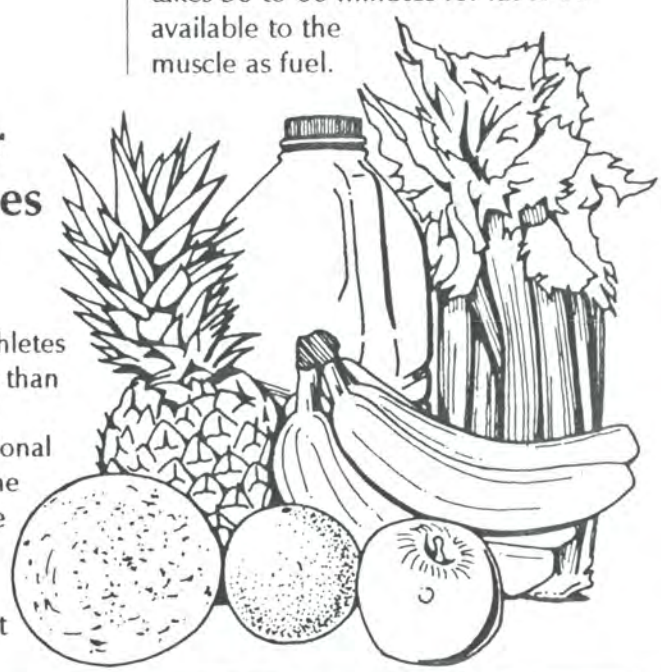
NUTRITION

Nutritional Requirements For Adolescent Athletes In Training

True or false? Adolescent athletes have greater nutritional needs than nonathletes. Surprisingly, this statement is false. Basic nutritional requirements are essentially the same. The only real difference is food intake prior to an athletic event. Because food intake before an athletic event affects performance, an athlete must consider the type of food, the amount of fluid, and the number of calories consumed. Otherwise, the following guidelines are appropriate for the adolescent athlete in training.

Energy requirements vary from athlete to athlete, depending on such factors as sex, size, and the type of training involved. Adolescents males who have a lot of muscle development require more calories than females who are generally smaller and have less body mass, i.e., muscle. Daily training increases the basal metabolic rate (amount of energy used at rest), which in turn creates a need for more calories.

The intensity and length of the exercise, combined with the athlete's fitness level, determines which source of energy the body will use. Carbohydrates and fats are the nutrients of choice for energy production. Since the body's store of fat is much greater than that of carbohydrates, energy produced from fats can be maintained for a long period of time. The longer the time spent exercising, the greater the contribution of fat as fuel. Most athletes do not work out long enough to burn significant amounts of fat. It takes 30 to 60 minutes for fat to be available to the muscle as fuel.



Glycogen

Glycogen (the body's storage form of carbohydrates) is the most important fuel for almost all types of exercise. A carbohydrate-rich diet is necessary for the production and supply of glycogen. During high intensity exercise, the body's ability to maintain long periods of activity is limited to the availability of glycogen and glucose (simple sugars). During the training period, ingestion of low carbohydrate fluids, such as diluted juices, can restore the athlete's blood glucose, thereby increasing endurance.

Protein

Whether the adolescent athlete needs more protein than the nonathlete is not clear at this time. It appears that only during periods of weight gain and muscle building should the protein intake be slightly higher than for the nonathlete. This need for additional protein can be fulfilled by including an extra ounce of meat or one additional cup of milk daily. If the diet is too high in protein, water loss may occur as the body rids itself of waste products produced by protein.

Minerals

Mineral requirements for the athlete appear to be similar to those of nonathletes. Anemia results from low iron content in the blood and adversely affects performance. Adolescents, especially females who do not consume a balanced diet, may need to pay attention to the iron content of their diet. Low-fat red meats, dried peas and beans, dried fruits, and fortified cereals and other grains should be eaten regularly.

Electrolytes

Electrolytes, including sodium, chloride, magnesium, and potassium play an important role in maintaining body fluid balance. There is no evidence that shows a need for more of these nutrients over and above the amount supplied in the typical diet. However, the athlete should include an adequate intake of fruits, vegetables, and low-fat dairy products, including milk, to ensure potassium and magnesium replacement.

Water

The body is made up of 60 to 70% water, which is why it is the most important nutrient to the athlete. Exercise can cause tremendous water and electrolyte loss. Losing large amounts of water can cause significant weight loss. In addition, body cells depend on water to produce energy. Water also transports waste materials, the by-products of energy production, to the kidneys for excretion.

Vitamins

The adolescent athlete's need for vitamins is very similar to that of the nonathlete, except for the requirement of additional B-complex vitamins necessary for energy production. Most athletes consume enough B vitamins because of their increased caloric intake. Whole grain products made from fortified flour are good sources of B vitamins. When the athlete consumes a balanced diet of complex carbohydrates with limited amounts of simple sugar, vitamin supplements are not necessary. Vitamins and minerals are not direct sources of energy. Unless there is a shortage of a particular vitamin or mineral in the diet, supplements will not improve the athlete's performance.

Whether you are an adolescent athlete or nonathlete, the key to proper nutrition is a balanced diet.

Jessie G. Wright, M.S., R.D., L.D.
Columbus, Georgia

A Balanced Diet for the Adolescent Athlete

FOOD GROUP	NUMBER OF SERVINGS/DAY	SERVING SIZE
Breads, Cereals and Other Grains	6 - 11	1 slice bread, ½ cup pasta or rice, 1 oz. ready-to-eat cereal
Fruits and Vegetables	2 - 4 3 - 5	1 medium piece fruit, ½ cup juice, ½ cup cooked vegetables
Lean Meat, Poultry, Fish and Alternatives	2 - 3 daily total of 5 - 7 oz.	2 - 3 oz. meat, poultry, fish 1 egg = 1 oz. meat 2 Tbsp. peanut butter, ¼ cup nuts
Dairy	4	1 cup milk or yogurt, 1 oz. cheese, ½ cup ice milk or ice cream

From the USDA Home & Garden Bulletin 232-1

ATHLETIC TRAINING CORNER

Batting Helmets

With the winter athletic season at an end, the spring season is the time for the popular team sports of softball and baseball. When participating in any sport, safety should be the first consideration, and the most important piece of protective equipment in softball and baseball is the batting helmet.

Whether they are participating at the little league, high school, collegiate, or major league level, it is mandatory for baseball players to wear a batting helmet. According to the National Federation of State High School Associations, baseball batters and runners are required to wear batting helmets while the ball is in play until they reach the bench or dugout. This ruling became effective with the 1992 baseball season, and it is expected to help prevent injuries. If the batting helmet is not worn, the player will be penalized.

Why is the batting helmet so important to the safety of the players? Imagine the danger to a player if struck by a pitched or batted ball traveling through the air at speeds of 70 to 100 miles per hour. The results would be devastating if the player is not wearing a protective batting helmet. The American Society for Testing and Materials and the National Operating Committee on Standards for Athletic Equipment are organizations that provide testing of batting helmets, as well as other athletic equipment.

The batting helmet is a hard plastic shell with ear holes and a visor. It is important for the helmet to fit properly; it should rest above the back of the neck and above the eyes on the forehead to prevent vision obstruction. The ear holes should be level with the wearer's ears to prevent hearing obstruction. The inside is lined with a medium-hard synthetic foam, and some helmets also contain a second layer of foam cushion. Usually, the cushioning is placed around the ear openings, front and back, sides, and crown of the helmet. Some helmets are equipped with wire masks or a clear plastic shield to provide protection to the mouth and face. The helmet is designed to protect both sides of the head.

So remember, when participating in softball and baseball consider safety first-- wear a batting helmet and PLAY BALL!

Jon Hay, M.Ed., A.T.,C.
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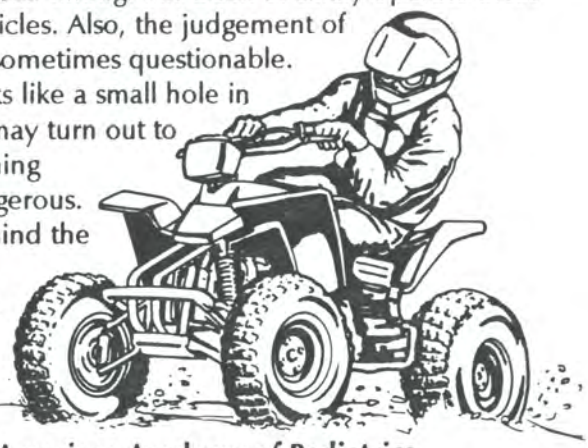
All-Terrain Vehicles:

Preventing Serious Injury

Let's go! The warm, breezy summer months are fast approaching and it's time to drag the ATVs (All-Terrain Vehicles) out of the garage and dust them off. But be wary, wild rider, because the next ride may be your last. Each month, more than 7,000 injuries and approximately 20 deaths are related to ATV use.

Injuries are extremely common since ATVs can reach speeds up to 70 mph and offer little protection in a crash. Concussions, lacerations, and fractures of the spine, legs, arms, and face are common. Because of the ATV's high center of gravity, most injuries result from rolling over and from front tumbles while going downhill. Drivers must be very good at shifting their weight at the slightest imbalance to avoid accidents. Although 4-wheelers are better balanced than their 3-wheeled counterparts, serious accidents are not uncommon. ATVs are especially dangerous for children. Their reflexes and their ability to balance are not advanced enough for them to safely operate these heavy vehicles. Also, the judgement of a child is sometimes questionable. What looks like a small hole in the road may turn out to be something more dangerous. Keep in mind the following safety tips when operating an ATV:



- **The American Academy of Pediatrics recommends that no one under 14 years of age be allowed to operate 2-, 3-, and 4-wheeled ATVs.**
- **Always have an adult rider accompany a younger rider.**
- **Always wear a helmet.**
- **Always wear goggles to protect eyes.**

Safety brochures and training information may be obtained by calling the referral service for the Motorcycle Safety Foundation at 1-800-447-4700. If you insist on having fun with ATVs, do it with safety in mind.

Tanya Hrabal, M.D.
Columbus, Georgia

Put On Your Walking Shoes...

Each day thousands of Americans are told by their physicians that they should be getting more exercise. In 1990, over 90 million Americans chose walking as their form of exercise. Knowing how to begin a safe and effective walking program is the first step to improved fitness through exercise.

Many people feel that walking does not provide the same amount of exercise as running or that running burns more calories. Actually, fast-paced walking (12-minute miles or faster) burns more calories and uses more energy than running, which is more efficient and thus uses fewer calories (see chart on opposite page).

Walking is also less stressful on the body than running. The force of your body weight is three to four times greater each time your foot strikes the ground during running than it is during walking. As a result, there are more running related injuries.

The Rockport Walking Institute and the National Institutes of Health (NIH), as well as many private clinics, have brochures on walking programs. By following guidelines outlined in the brochures, almost anyone can begin a safe and highly beneficial walking program. Whether you are young or old, fit or unfit, walking is an exercise you can continue for the rest of your life. The National Institutes of Health walking program is designed for anyone to use. (See chart for sample program).

The Rockport "Walking" brochure and "Fitness Walking Test" brochure provide more detailed information. Participants are divided by their age and relative fitness level. The relative fitness level is determined using the walking test in the brochure. The brochures can be obtained, free of charge, by writing to Rockport, 72 Howe Street, Marlboro, MA, 01752.

Whether you choose the Rockport Program or the NIH Program, the point is to get started.

Before beginning a walking program, you should obtain consent from your physician. A good pair of walking shoes is essential. The features of a good walking shoe differ from those of a running shoe. Walking shoes are generally all leather as opposed to running shoes which have nylon features added to help decrease the weight of the shoe. Shock absorbency in walking shoes is located in the heel and is evident by good heel cushions. Walking shoes are also designed specifically for forward motion rather than lateral (side-to-side) motion like an aerobic shoe.

If you would like more information on starting a walking program, read "Aerobic Walking" by Casey Meyers, Vintage Publishers or "Fitness Walking" by Robert Sweetgall, Rockport Publishers. The more you walk, the more reasons you will find to fit walking into your daily routine!

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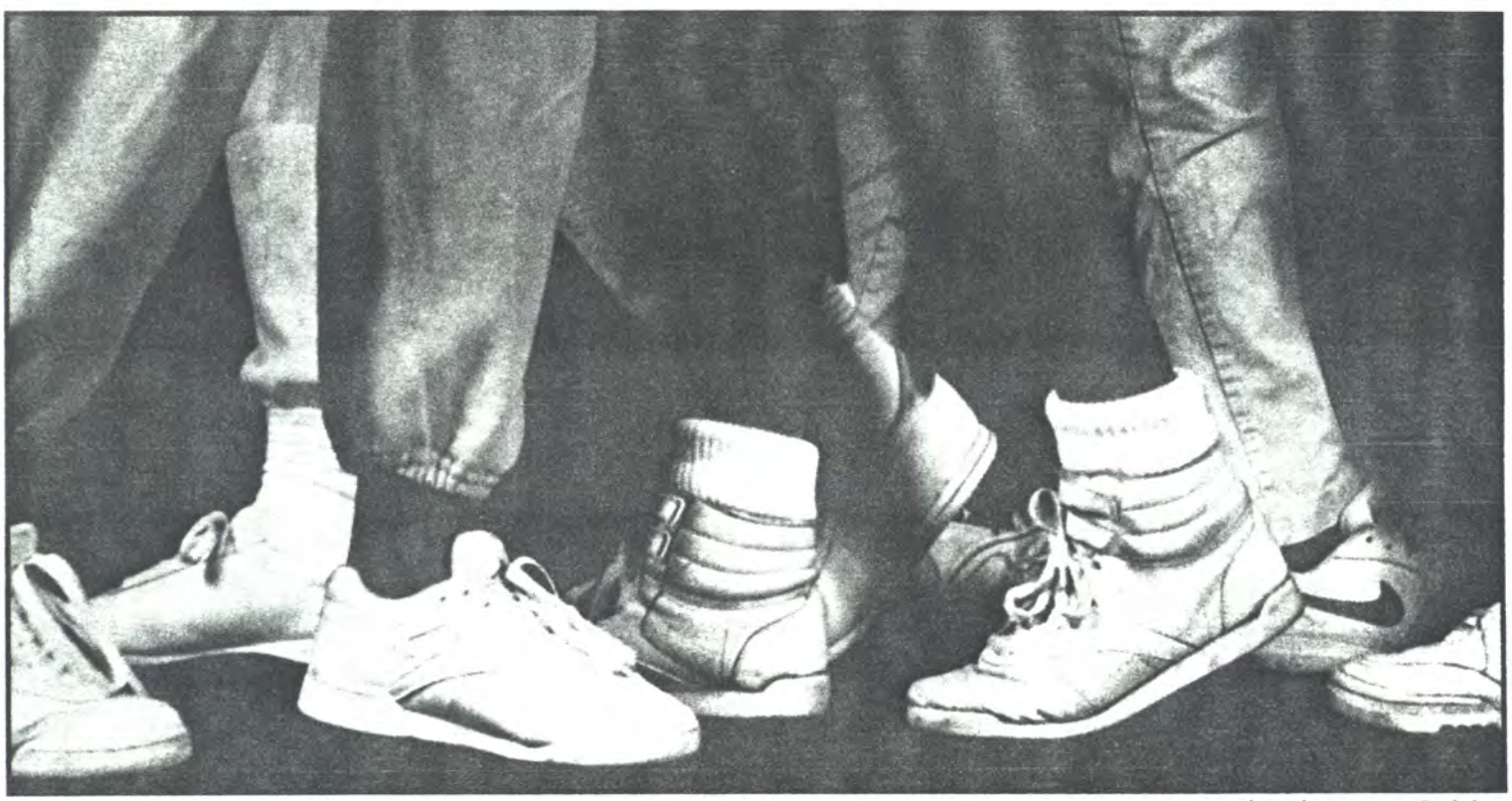

Photo by: Yvonne C. Ehrhart

CALORIES BURNED FROM WALKING

Pace	Calories/pound/minute
2 mile/hour (30 min. mile)	.023
3 mile/hour (20 min. mile)	.025
4 mile/hour (15 min. mile)	.037
4.5 mile/hour (13.3 min. mile)	.04

Calories burned = calories (from above) x weight (in pounds) x time (min. of exercise)

Example: Darlene walked at a 4 mile/hour pace for 35 minutes.

Calories burned = .037 x 134 lbs. x 35 min. = 173.53 calories

SAMPLE WALKING PROGRAM

Week	1	2	3	4	5	6	7	8	9	10
Warm Up (WALK SLOWLY)	5 minutes									
Target Zone (WALK BRISKLY)	5	7	9	11	13	15	18	20	23	26
Cool Down (WALK SLOWLY)	5 minutes									
Total time (minutes)	15	17	19	21	23	25	28	30	33	36

Adapted from the National Heart, Lung, and Blood Institute. "Exercise and Your Heart" NIH Publication No. 81-1677, May, 1981.

RESEARCH

New Technology For Knee Surgery:

Can the swelling and pain of knee surgery be reduced?

After arthroscopic knee surgery, patients usually have some degree of swelling and pain in their knee. The swelling is caused by inflammation of the synovium, either from irritation by blood in the joint or the surgical procedure itself. Swelling causes pain and slows down the rehabilitation process. Crutches may be needed for up to three weeks after surgery, and rehabilitation is slow until the swelling and pain are reduced.

The synovium is a layer of loose tissue that lines joints such as the knee and shoulder. It produces synovial fluid, which lubricates and protects the joint. An important part of synovial fluid is hyaluronic acid (HA).

During arthroscopic surgery, the amount of HA in the knee is reduced because large amounts of sterile fluid are used to wash out the joint. As a result, the protective properties of synovial fluid are decreased. The addition of the hyaluronic acid at the time of surgery will immediately restore these properties to the lining of the joint.

Hyaluronic acid has been extensively studied in two fields of medicine, ophthalmology (eye) and orthopaedics. In the orthopaedic area, several researchers have used HA for the treatment of traumatic (injury-related) and degenerative (wear and tear) arthritis of the knee. Reports on the effect of HA injections have been favorable. The injections significantly reduce the amount of swelling, as well as decrease pain and increase range of motion.

The Hughston Orthopaedic Clinic, along with several other national sports medicine centers, has been selected to study the effectiveness of sodium hyaluronate. This substance is used as a replacement for synovial fluid and is put into the knee joint after arthroscopic surgery. Goals for the study include the following: (1) to assess the safety of using sodium hyaluronate fluid after arthroscopic surgery; (2) to assess effectiveness of sodium hyaluronate fluid in decreasing postoperative pain and increasing range of motion; and (3) to assess the effect of sodium hyaluronate fluid in reducing postoperative swelling of the knee. Male or female patients over the age of 18 who have the symptoms of synovial disease and require arthroscopic surgery may be included. The results of this investigation will be used to gain FDA approval for the use of sodium hyaluronate fluid in arthroscopic surgery of the knee.

Stephen Liu, M.D.
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Does Exercise Relieve Stress?

April is associated with the stress of taxes and spring cleaning. Sometimes it feels as though just about everything in life causes stress. However, it's not the stress itself that causes health problems, but the way you respond to it. The human body responds to stress by increasing the amount of a group of hormones called catecholamines. If these hormone levels remain high, a person cannot relax and may experience a constant low-level strain on the cardiovascular system that could cause abnormal heart rhythms or even a heart attack.

Exercise helps to break down excess catecholamines so the body can return to a normal state. Increased muscle activity produces muscle relaxation after completion of physical activity.

Exercise also helps you sleep. Scientists cannot explain why exercise brings on deep sleep, but it does. Some people explain it this way: Exercise alleviates stress, and people who are free of stress and tension normally sleep deeply.

Research has shown that physical exercise such as walking, biking, swimming, etc., helps to break down catecholamines. A good workout of 30 minutes, three to four times per week, will help to relieve stress, relax the muscles, and provide you with more energy.

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OPENING DAY
April 8, 1992
Hughston Orthopaedic Clinic, P.C. announces the opening of its Atlanta office.
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