Hughston Health Alert

6262 Veterans Parkway P.O. Box 9517 Columbus GA 31908-9517

VOLUME 8, NUMBER 4 | *For a Healthier Lifestyle* | FALL, 1996

Snowboarding Injuries

Have you ever tried to surf down a mountain? In 1995, thousands of people did. They were participating in the fastest growing winter sport — snowboarding.

Who snowboards? Since its beginnings in the early 1970s, this sport has involved people of both sexes and of all skill levels. Today, more men than women snowboard (a ratio of 3:1). It seems to be most popular among young adults; the average age of snowboarders (commonly called shredders) is 20 years. Sixty percent of the shredders on the slopes describe themselves as beginners. However, competitions, such as the U.S. Extreme Snowboarding Championships at Crested Butte, Colorado, draw experienced snowboarders who demonstrate the sophistication of the sport. The 1997 extreme competition at Crested Butte will be held from March 30 through April 3.

Ken Perkins snowboarding on Mt. Crested Butte

Photos courtesy of Crested Butte Mountain Resort and Tom Stillo, photographer

Equipment check

The design of snowboarding equipment, which includes snowboards, boots, and bindings, has seen many advances. Snowboards are 30 cm to 40 cm wide and 140 cm to 190 cm long and may be symmetric or asymmetric. The shape of the boards allows for versatility of snowboarding style. Shredders can position their feet on the board in different ways so they can snowboard alpine, all-around, or free-style.

Snowboard boots are available in three basic designs: hard shell, soft shell, and a mix of hard and soft shells. Hard-shelled boots are similar to ski boots. Soft-shelled boots are

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similar to Sorrels, which are soft, warm boots that end at the mid calf.

Snowboard bindings, which attach the boots to the board, may be soft-base plates (with straps above and below the ankle) or hard-base plates (like ski boot bindings). The bindings do not release when you fall — a design characteristic that can lead to a particular variety of injuries.

Who gets injured?

Nearly 90% of the injuries occur in men who are about 19 years old and who have less than 2 years of snowboarding experience. One-quarter of snowboarders are injured during their first day of snowboarding, and more than half are injured during their first season.

How do injuries occur?

Snowboarding injuries are typically the result of a heavy impact. The mechanism may be falling, losing control, or colliding with another person or an object. The most common injuries are wrist, ankle, and shoulder fractures and knee sprains.

Forty-four percent of snowboarding injuries occur in the upper extremity, which comprises the shoulders, arms, wrists, and hands. These injuries commonly happen when you fall forward and land on your outstretched arm. Because you do not use poles, you have nothing to break a fall except hands and arms. When the outstretched arm absorbs the full impact of a fall, a wrist fracture or sprain can occur.

Forty-three percent of injuries occur in the lower extremity, which comprises the hips, legs, knees, ankles, and feet. Most of the injuries involve the leading leg on the board. Equipment affects the type and location of injury. Shredders who wear hard-shelled boots are more likely to injure their knees or fracture their legs than those who wear soft-shelled boots.

Chris Cox getting "hospital air" on Mt. Crested Butte
Tom Stillo, photographer

Ankle sprains are more common in shredders than ankle fractures; however, ankle fractures do occur. The most common type of ankle fracture is commonly called snowboarder's ankle, which is an unusual fracture of the talus (an ankle bone). It is often the result of "flat landing" versus "angled landing" when skiers misjudge their jumps. This fracture constitutes 15% of ankle injuries in snowboarders. As with leg and knee injuries, equipment affects the location of the injury; snowboarders who wear soft-shelled boots are at the greatest risk for ankle injuries.

G. Van Dyke "hucking carcass" on Mt. Crested Butte
Tom Stillo, photographer

Aerial and other extreme maneuvers, such as getting "hospital air," or "hucking carcass," can result in head, chest, spinal, or pelvic trauma (12% of injuries) or can result in death. Pelvic injuries are usually the result of falling backward and landing on your buttocks, especially in snowboard parks and half pipes. Death can result when a snowboarder becomes buried head down in deep snow. As with avalanche victims, survival rate is inversely related to burial time: the longer you are buried, the less likely you are to survive. Before you snowboard, learn about the hazards of deep snow, tree wells, and unreleasable bindings.

Prevention

If you want to learn how to snowboard, take lessons from a qualified instructor and use well-adjusted equipment to have a safer, more injury-free experience. Appropriate pre-season aerobic and anaerobic conditioning, as well as good judgment, are important (Please see "Conditioning for the Ski Season" on p. 5). Remember, snowboard within your abilities and listen to your body; rest if you are tired. Finally, wearing a helmet and other protective gear, such as wrist splints and elbow and knee pads, can help prevent injury.

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The Female Athlete Triad

An athletic woman is not an unusual sight in the '90s; however, it has only been in the last 20 years that so many women have become active and competitive. The passage of Title IX in 1972 opened the athletic fields to women who choose to participate in competitive athletics by prohibiting discrimination on the basis of sex in educational institutions that receive federal funds. Because more women have been participating in sports, an increasing number of women's health issues have been brought to the forefront. Most women have reported overall health benefits from athletic participation, but risks do exist. Three of these risks appear to have some relation to one another and are collectively referred to as the ***female athlete triad.***

The female athlete triad consists of disordered eating, amenorrhea, and osteoporosis. In the hopes of improving her athletic ability, the female athlete may fall into a trap of **disordered eating**. This disordered eating pattern along with stringent training regime may lead to **amenorrhea,** which means the menstrual cycle is irregular or has stopped. Amenorrhea may lead to **premature osteoporosis**. These components interact to create significant health problems for the female athlete.

The first component of the female athlete triad is disordered eating. This problem is common in women who participate in appearance sports, such as ballet, gymnastics, figure skating, diving, and equestrian events. Two types of extreme disordered eating behaviors are bulimia nervosa and anorexia nervosa. Bulimia nervosa is characterized by binge eating 2 times a week for at least 3 months. A person with bulimia nervosa may also practice self-induced vomiting (purging) and may use laxatives.

Anorexia nervosa is characterized by a body weight that is 15% below the normal weight range for a given age and height. A person who has this disease has an abnormal body image; she always feels fat even when dangerously underweight. Some women who have anorexia nervosa may binge and purge like women who have bulimia nervosa. Disordered eating, however, is not just a problem in women who are bulimic or anorexic. Numerous patterns of disordered eating that are not this extreme but are problematic also exist.

Often when a female athlete falls into extreme patterns of disordered eating, she does not have menstrual periods. This condition — amenorrhea— is the second component of the triad. A girl who has not begun menstruation by age 16 has primary amenorrhea. A woman who has skipped three to six menstrual periods in a row or more than three menstrual periods in 1 year has secondary amenorrhea. Although other medical problems, such as thyroid disorder or pregnancy, can cause a women to stop menstruating, the training regime and eating patterns of the female athlete must be considered as causes.

Disordered eating and amenorrhea seem to be associated with the development of premature osteoporosis — the third component of the triad. Osteoporosis means that the bones are losing mass and becoming porous, thin, and weak. Sixty percent to 70% of a woman's peak bone mass develops during her adolescent growth spurt, which occurs between the ages of 15 and 19. Women normally begin to lose bone mass after the age of 35. If a female athlete is not taking in enough calcium — the building block for bones — when bone mass is developing, she may have an abnormally low amount of bone mass before any normal loss of bone mass occurs, or she may lose bone mass prematurely. This premature loss of bone may be associated with a greater risk of injury and stress fractures for the female athlete who is putting stress on her musculoskeletal system during athletic participation.

What does all this mean? As health care professionals, parents, and coaches, we must be on the lookout for the disorders of this triad in female athletes. Prevention is the key to decreasing the occurrence of these disorders. Normal body images and weights must be promoted; optimal body weight for performance and general health, not necessarily appearance, must be stressed. Athletes must adhere to adequate diets in order to optimize the "fuel content" needed for improved health and performance. In addition to these factors, a good look at the training schedule is imperative. Overtraining leads to increased risk of injury and decreased sports performance, neither of which is the goal of any sports program. A healthy body image, a sufficient diet, and the right amount of training can help prevent the female athlete triad and can help the female athlete excel in an athletic career.

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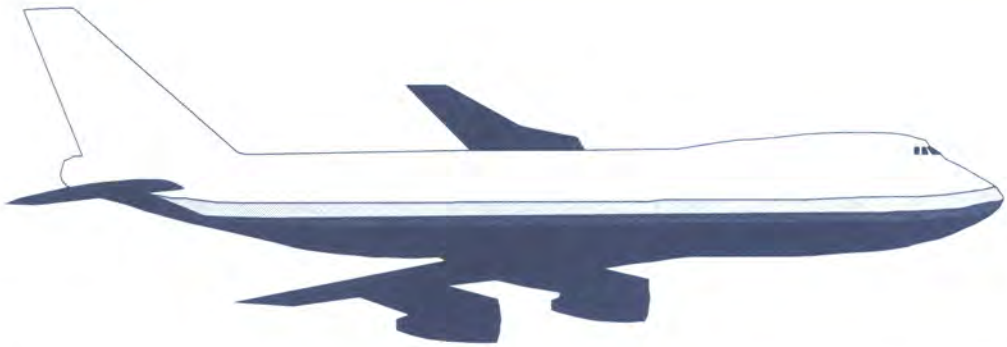
Altitude-Related Illnesses



With the recent development of improved airports located closer to major ski resorts, the recreational skier no longer undergoes a gradual ascent to high altitude. You can actually be skiing at over 10,000 feet above sea level within hours of leaving home. Although convenient,

this advance in travel has made altitude-related illness the most common medical ailment seen at ski-area clinics.

Most of the ski resorts in the Rocky Mountains are located at more than 8000 feet above sea level. At this altitude, your body must adapt to compensate for environmental differences, such as less oxygen in the air. To get enough oxygen into your blood and to your body tissues, you begin to breathe faster and deeper, which can lead to hyperventilation. Your heart rate and cardiac output (the amount of blood ejected with each heart beat) also increase. These adaptations help you increase the amount of oxygen that is taken in and delivered to the body tissues but, in so doing, seem to cause a fluid shift from inside the blood vessels to the surrounding tissues.

When the fluid increases in the tissues of the brain, it causes headaches and lightheadedness as well as nausea and sleep disturbance. Hyperventilation may contribute to these symptoms. Collectively, these symptoms are called acute mountain sickness (AMS). This condition is divided by severity into four classes ranging from mild symptoms that do not interfere with activity (class 1) to severe symptoms that often include swelling of the lungs or brain and necessitate immediate descent from the elevated area (class 4).

Most cases of AMS can be adequately treated with rest, fluids, and aspirin or acetaminophen (Tylenol). In some cases, treatment with oxygen is helpful but may postpone the adjustment process that ultimately must occur. The most

effective treatment is prevention, and the ideal preventative measure is gradual ascent. As previously mentioned, gradual ascent is seldom accomplished in 1996, so the following measures should be followed: drink plenty of fluids before and during your stay, especially while you are skiing; avoid salty foods and alcohol; and ease into activity at high altitude rather than skiing hard the first day. Your doctor may prescribe the medication acetazolamide, which has been found to be highly effective at preventing AMS.

In addition to AMS, pre-existing conditions, such as coronary artery (heart) disease and pulmonary (lung) disease may be intensified by sudden changes in altitude. Any condition that makes it more difficult for the heart muscle or any other vital organ to receive oxygen will be worsened by the decrease in oxygen accompanying ascent to high altitude. Anyone with heart or lung disease should discuss plans for a ski vacation with their doctor.

Skiing is an exhilarating sport enjoyed by enthusiasts of all ages in environments that are breathtaking — literally. Activity at such high elevations has inherent risks that must be taken seriously in order for skiing to be enjoyed to its fullest. Remember that when you head for your next ski vacation and your well-meaning friends say, "Don't break a leg," an equally helpful warning would be, "Don't let the high get you down."

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Conditioning for the Ski Season

With fall upon us and the winter ski season fast approaching, it is time to ready ourselves for the slopes. Each year, more and more people file into doctors' offices across the country with skiing injuries. The biggest cause of these injuries is lack of conditioning for the demanding sport. To prevent these injuries, you need to learn how to properly condition for skiing.

Identify your skill level and physical condition. Are you a beginning skier who uses bunny hills and green courses, an intermediate skier who uses blue courses, an advanced skier who uses black diamond courses, or an expert skier who uses black two-diamond courses? Are you in poor, fair, good, or excellent physical condition? How frequently and how long do you plan to ski each day and each week? What are your weaknesses, i.e., endurance or leg, low back, or shoulder strength?

After you have identified your abilities and your weaknesses, you can develop a strength and endurance training program that will prepare you for the slopes and help prevent 80% of skiing-related injuries. To get the most out of your program, begin at least two months before your first ski trip. Remember, conditioning goes beyond strength and endurance training. You need to stretch your muscles and eat nutritious meals, too.

Strengthening your muscles before you make your first run down the slopes is important. Many gymnasiums and health clubs have both weight machines and free weights that you can use for strengthening exercises. You should use mechanical weights if you do not have a trainer, if you do not have experience using free weights, if you are over 30 years of age, if you have a weak or injured lower back, or if you have any other musculoskeletal injury.

To strengthen the hip abductors, place an elastic strap around both thighs just above the knees, sit on a table, then spread the legs and let them come back together. Repeat.

These machines offer many exercises to strengthen the muscles in your legs, hips, back, abdomen, and shoulders. Using non-weighted machines can also help strengthen your muscles. Walking 10 minutes on a steep incline on a treadmill can strengthen your legs, and using a rowing machine can strengthen your back.

If you have a personal trainer or have experience working with free weights, you should include exercises with them to strengthen your joints, ligaments (tissues that connect two bones), and tendons (tissues that connect muscle to bone), as well as your muscles.

Strength training should be based on your ability to ski and on your fitness level. If you are a beginning skier who does not regularly participate in a strength training program, train for 3 weeks by doing 2 to 3 sets of 10 repetitions (reps) with low weight. Work on basic strengthening for the next 2 weeks by doing 3 sets of 5 reps with more weight. From week 6 through week 7, focus on developing strength and power by lifting more weight for 3 sets of 3 reps. During week 8, strive for power and peaking by doing 2 sets of 2 reps with more weight.

An intermediate skier should begin a strengthening program by doing 3 sets of 15 reps with low weight for the first three weeks. During the next two weeks, focus on basic strengthening by doing 4 sets of 5 to 8 reps with more weight. Work on developing strength and power for the next 2 weeks by lifting more weight for 4 sets of 3 to 5 reps. During week 8, strive for power and peaking by doing 2 sets of 4 reps with more weight. Advanced skiers should follow the same strengthening program.

Endurance training

To build endurance, participate in an aerobic activity, such as walking, biking, or swimming. Do this activity intensely enough to maintain your target heart rate for 20 to 40 mintues. The target rate is 60% to 70% of your maximum heart rate (Table). Like

Table

Computing Your Target Heart Rate

(220 - Age) X 65% = target heart rate

Example: If you are 50 years old, your target heart rate would be calculated as follows:

(220-50) X .65 = target heart rate

170 X .65 = 102 beats per minute

Therefore, if you are 50 years old, your target heart rate during exercise is 102 beats per minute.

strength training, the endurance training program is based on your level of ability as a skier.

During the first 2 weeks of this endurance program, a beginning skier should walk at an easy pace for at least 20 minutes each outing, three times each week. For the next 2 weeks, walk at a quicker pace for 30 to 40 minutes each outing. From week 5 through week 6, walk at a moderate pace for at least 20 minutes each outing, four times each week. Beginning with week 7, walk at a quicker pace for 30 to 40 minutes each outing.

If you are an intermediate skier, begin your endurance program with 2 weeks of walking or jogging at an easy pace for 30 minutes each outing, three times each week. For the next 2 weeks, increase your pace and exercise for 40 to 50 minutes each outing. For weeks 5 and 6, exercise at a moderate pace for 30 minutes each outing, four times each week. Beginning with week 7, increase your pace and exercise for 40 to 50 minutes each outing.

If you are an advanced skier, spend the first 2 weeks running at an easy pace for 20 minutes each outing, three times each week. Increase your pace and run for 30 minutes each outing for the next 2 weeks. For weeks 5 and 6, set a moderate pace for 20 minutes each outing, four times each week. Beginning with week 7, increase your pace and run for 30 minutes each outing.

Remember, everyone can start a strength and endurance program, but few can keep the routine once the ski season begins. If you continue your training throughout the season and into the off season, you will avoid serious injury and will remain strong for years to come. Good luck on the slopes and "don't break a leg."

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Why Are Women More Prone Than Men to ACL Injuries?

An increasing number of female athletes are tearing their anterior cruciate ligament (ACL) during sports participation. Most of these tears are caused by noncontact injuries in sports, such as basketball, soccer, gymnastics, and cheerleading, in the United States. In Europe, participation in snow skiing and team handball results in up to eight times more ACL injuries in women than in men.

What is the ACL?

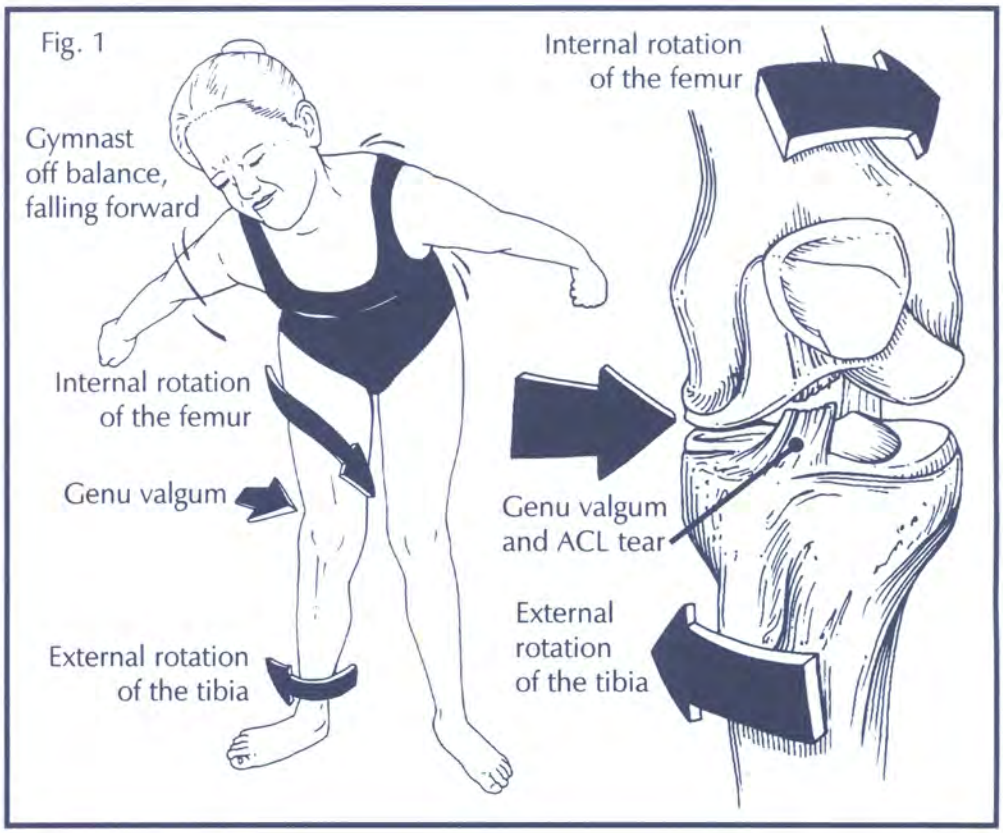
The ACL is located in the center of the knee joint and connects the femur (thigh bone) and the tibia (shin bone). Its primary purpose is to provide stability to the knee. It prevents the tibia from moving too far forward and from rotating too far inward under the femur.

How does the injury happen?

There are several ways noncontact ACL injuries occur, including stopping quickly, cutting sharply, and landing and changing direction with both feet planted. Most commonly in court sports, such as basketball, a **pop** is felt. This pop also refers to the way the athlete lands with both feet **p**lanted and **o**ut of control and feels a **p**op. It usually signals that the ACL is torn completely.

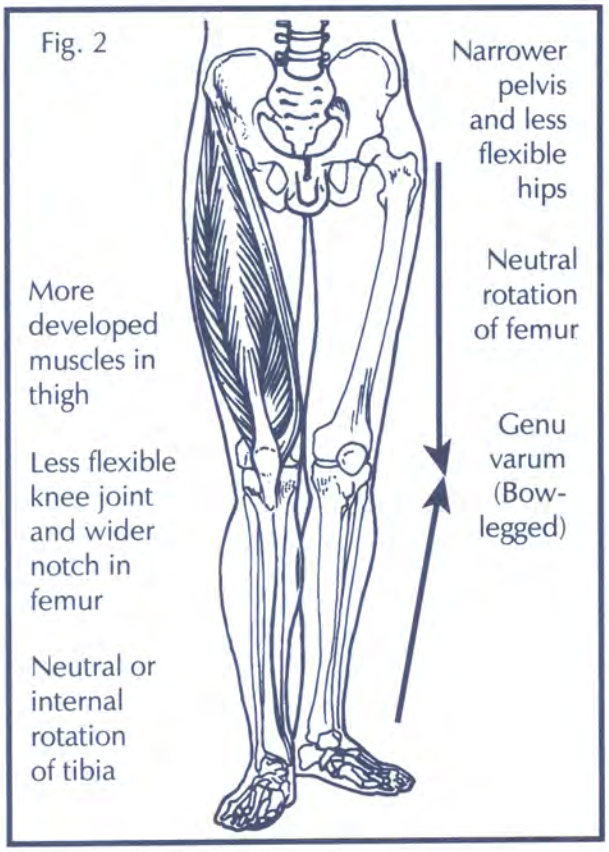
The gymnast in Figure 1 demonstrates this mechanism of injury as she tears the ACL in her right knee during a floor exercise. Notice that her hip is turned inward (internal rotation), her tibia is turned outward (external rotation), her knee is bent about 30°, she is knock-kneed (genu valgum), her foot is rolled inward, and her body is falling forward. This motion causes a very quick whip-type action in the knee that tears the ACL.

As mentioned, in Europe more female than male skiers injure their ACL. The mechanism of injury in



skiers is different than in court sport participants. When skiers injure the ACL, they are moving out of control with the knee bent or extended. The uphill arm is back, the body is off balance, the hips are lower than the knees, and the weight is placed on the inside edge of the downhill ski. Dr. Robert Johnson describes this mechanism of injury as the phantom foot ACL.

A knee joint with a torn ACL is abnormally loose, or lax. Because of this severe laxity, the female athlete is actually at greater risk for her knee giving way or pivoting without warning. The risk of other serious, and possibly irrepairable, knee damage also increases.



Anatomic differences

Naturally, women are built differently than men. These differences are evident when examining the muscles and bones of their hips and legs. Compared with men (Fig. 2), women have a wider pelvis (Fig. 3); their hips are more flexible and have more rotation; their femur is tilted forward more at the top and is angled more toward the knee; their lower leg is turned inward and angled more toward the knee, but there are forces pushing outward; they have less developed thigh muscles, making the knee more dependent on the ligaments for stability; they have increased flexibility and hyperextension in their joints; and they have a narrower notch in the femur where their smaller anterior cruciate ligament is attached.

Why do these anatomic differences cause women to be more prone than men to ACL injuries? Because the thigh muscles are lax, the ACL must serve as the main stabilizer of the knee. However, the small ACL often cannot handle the forces put on it during sports participation, so it tears. Other contributing factors are associated with the sport and with the physical make-up of a woman. Her position, coordination, skill, talent, and coaching affect the way the female athlete uses her body and can affect whether she is at increased risk for ACL injury. A poorly conditioned or overweight body puts more pressure on the knee joint and puts the athlete at greater risk for ACL injury. Hormonal levels at certain times during the menstrual cycle and extremely low percentage body fat cause the ACL to be more lax and, therefore, at increased risk for injury. Medical professionals are continuing to do research to find the exact reason for this problem in women and to find the best ways to prevent it.

In hopes of preventing ACL injury in female athletes, some experts have suggested that basketball players and other court sport participants try to land on two feet rather than jump stopping and try to round off turns rather than cutting sharply.

The female athlete is very competitive and the mental drive to be the best burns brightly within her. Upon returning to competition after ACL reconstruction, a University of Tennessee female basketball player stated that she would do anything to win a national championship including tearing her ACL. Competitive female athletes need to take measures to prevent ACL injuries. Finding ways to prevent ACL injuries will ensure longer, more active athletic participation for women.

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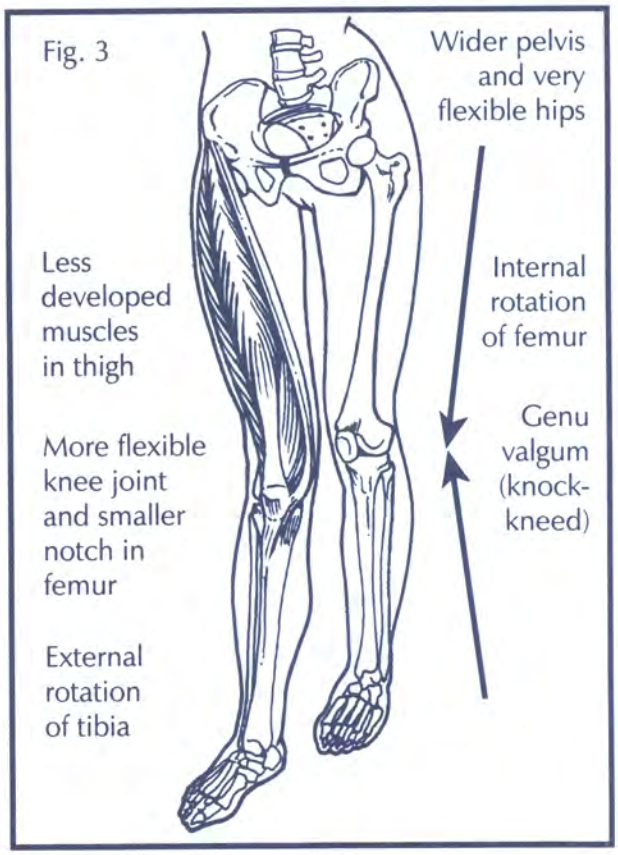

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Health Hints

- Despite its name, the medicine cabinet is not a safe place to store drugs. Heat and humidity may cause medicine to lose its effectiveness. Medicine should instead be stored in a cool, dry place.
- For 4 to 6 hours after exercising, your metabolism is increased and your ability to concentrate is better.

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