

Physical Therapy Corner: Knee Injuries and the Female Athlete



Figure A

Knee injuries, especially tears of the **anterior cruciate ligament**, are becoming more common in female athletes. Interest in women's athletics at the college and professional level has changed the face of sports. Greater participation has heightened appreciation of health and medical issues specific to the female athlete. Studies comparing male to female susceptibility to injury of the anterior cruciate ligament have shown women to have considerably higher rate of injury. The National Collegiate Athletic Association (NCAA) has gathered statistics over a three year period in the early 90s showing that women suffered anterior cruciate ligament injuries more often than men, nearly 4 times as often in basketball, 3 times as often in gymnastics, and nearly 2 and a half times as often in soccer. Orthopedic doctors, physical therapists and athletic trainers are concerned and have suggested many reasons so many more women tear their ACL.

The anterior and posterior cruciate ligaments cross each other and are the primary stabilizers of the knee (Fig. A). Together they maintain the rotary stability of the knee and prevent the lower leg (tibia) from moving either too far forward or backward on the upper portion (femur) of the leg at the knee. The **posterior cruciate ligament (PCL)** is the larger of the two ligaments which may be part of the reason why the **anterior cruciate ligament (ACL)** in general, is torn more often.

Many factors have been discussed as the source of women's tendency to tear their ACL more often. Some are based on anatomical realities such as a narrower femoral notch, increased Q angle, increased ligamentous laxity, inadequate strength, and impaired neuromuscular coordination. Extrinsic factors such as techniques and skill of the player, improper shoe wear, and the playing surface may also contribute to injury rates.

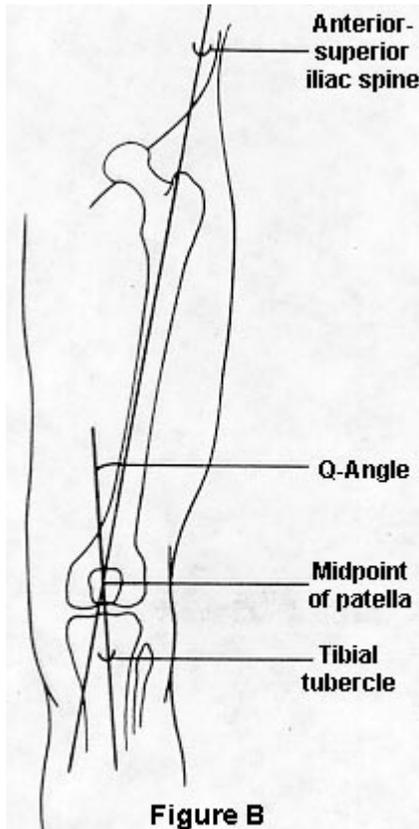
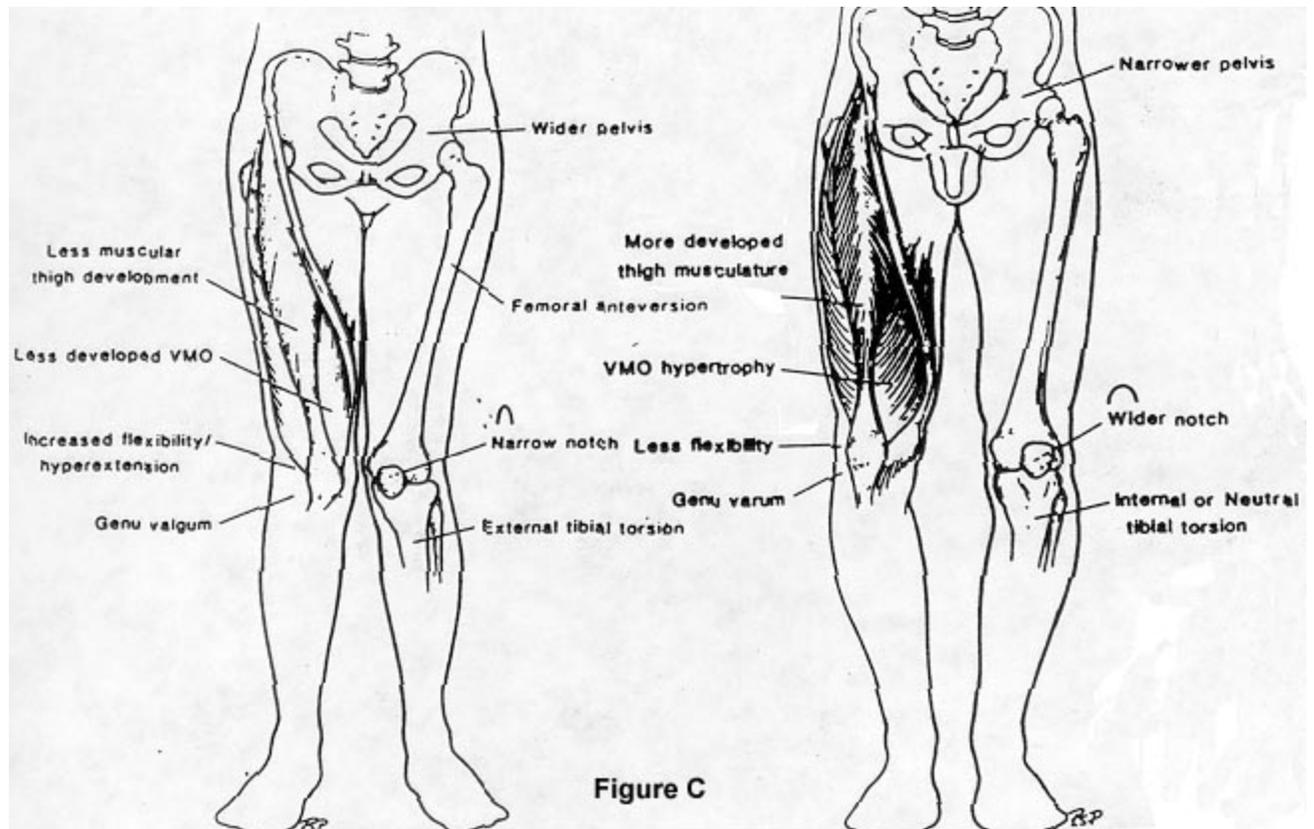


Figure B

A **narrower femoral notch** (the space at the bottom of the femur through which the ACL runs) in women is being suggested as a culprit in ACL injuries (Fig. A). The tight fit may cause a "shearing" effect on the ACL by the femur.

The **Q angle** is a measure of the angle between the quadriceps muscle on the front of the thigh and the patellar tendon at the knee (Fig. B). This angle is greater in the female due to her wider pelvis. Therefore, a women's knee is made with a naturally greater angle (Fig. C) between the femur and the tibia predisposing it to greater stress. And further, aggravating the tendency to injure the knee is the more pronated or flattened foot that is created by the increased Q angle.

Strength training for women is critical with an emphasis on being in shape before they play their sport. Women tend to be generally more flexible than men, but a program that consists of strengthening and stretching is essential for all athletes involved in sports. Non-competitive balance and agility training may enhance proprioceptive function and help to reduce the rate of injury as well.



Boys have historically been trained from an early age to use their body in sports activities. Their training includes footwork drills, eye-hand coordination skills, catching and throwing balls which develop their **neuromuscular systems**. Girls are not exposed to this early motor learning at a young age, putting them at a distinct disadvantage when they decide to get involved in sports in high school. Especially if they want to play competitively where there is a higher level of play and greater stress on their body. More and more colleges have developed new teams for women, but this brings players with less experience into athletics. It is essential for girls to receive training early, to play competitively later.

Studies have shown that **intensity is a factor** in injury of the ACL. Injuries were seven times more likely to occur during games than practices. However, physical contact with other players appears to be unrelated in the occurrence of injury. *The ACL is most often injured with an abrupt change of direction or a jump and usually with an activity they have done many times before.* The athlete will describe having "felt a pop", swelling within a couple of hours and knowing there is something wrong with their knee. If the injury is less severe, the athlete may not know they have been injured. Over time they may describe their knee as being unpredictable, giving way sometimes or a having an unsafe feeling with rotational movements. Years ago an ACL injury could have been an end to the career of a professional or collegiate

player. In recent years, doctors have learned more about surgical techniques, while coaches and physical therapists are learning more about rehabilitation. Furthermore, rehabilitation methods have become more aggressive thus shortening the length of recovery periods.

It's an exciting time in women's sports! Participation in physical education for girls is essential for their development. Women should be encouraged to play, but play smart and listen to their bodies.

Summary: Why Girls are more Prone to ACL Tears

1. Increased Q angle,
 2. Narrower femoral notch
 3. Increased ligamentous laxity,
 4. Inadequate strength, and
 5. Impaired neuromuscular coordination
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References:

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Osgood-Schlatters Disease

What causes Osgood Schlatters disease?

The patella tendon inserts at the tibial tuberosity and through overuse can tug away at the bone causing **inflammation**. It is seen more often in children involved with running and jumping activities which put a much greater strain on the patella tendon. With repeated trauma new bone grows back during the healing which causes a bony lump which is often felt at the tibial tuberosity. It mainly affects boys aged 10 to 15 years old and should clear up when they stop growing and the tendons become stronger, however, it can occasionally persist into adulthood

What are the treatments for Osgood-Schlatters disease

The most important treatment is rest and restriction of sporting activities. Knee pads or a knee immobiliser combined with an isometric exercise program, in which the joints do not move, may also help. It can also help to do exercises to increase the flexibility of the hamstrings and quadriceps. Symptoms may reoccur occasionally while the tibial tubercle is healing, a process which can take 18 - 24 months to complete. Ice or cold therapy can help with the pain and inflammation. Knee supports can help by reducing tension on the knee: a simple patella tendon strap will work, but heat-retaining supports are also available that can speed up recovery. Non-steroidal anti-inflammatory agents (such as aspirin or ibuprofen) can also help with the pain, but care must be taken to avoid stomach or kidney problems

The HarmoKnee Preventive Training Program

	Component	Duration
A	<p>Warm-up</p> <p>During each of the warm-up exercises we encouraged straight alignment hip-knee-foot; low center of gravity; lightly flexed knees; and soft and controlled landing. Optionally, ball and passing drills can be introduced where appropriate.</p> <ul style="list-style-type: none"> ○ Jogging (4-6 min) ○ Backward jogging on the toes (Approximately (1 min) ○ High-knee skipping: skip with an exaggerated motion by driving the left knee and the right arm toward the sky with soft landing on the right foot. The sequence is repeated using the opposite leg and arm. No need to jump high or long. (Approximately 30 sec) ○ Defensive pressure technique: sliding slowly, zigzag backward. (Approximately 30 sec) ○ One and one: alternating forward zigzag running and pressure technique zigzag backward. (2 min) 	10 min.
B	<p>Muscle Activation</p> <p>During each of the muscle activation exercises we encouraged carefully holding and contracting the muscle for approximately 4 s, focusing on “finding” your muscles. We recommend stretching only in cases of limited range of motion; stretching is not recommended for players with joint laxity.</p> <ul style="list-style-type: none"> ○ Activation of calf muscles (4 sec for each leg/side) ○ Activation of quadriceps muscles (4 sec for each leg/side) ○ Activation of hamstring muscles (4 sec for each leg/side) ○ Activation of hip flexor muscles (4 sec for each leg/side) ○ Activation of groin muscles (4 sec) ○ Activation of hip and lower back muscles (4 sec for each leg/side) 	<i>2 min</i>

C	<p>Balance</p> <p>Proper landing and take off in a jump is the most important movement in this exercise.</p> <p>We encouraged straight line hip-knee-foot; standing with feet shoulder-width apart; soft and controlled landing with flexed knees; freezing the landing before taking off again; and keeping a low body-center of gravity. Contract and hold stomach and buttocks during the whole exercise. Perform exercises slowly; no need to jump high.</p> <ul style="list-style-type: none"> ○ Forward and backward double leg jumps (Approximately 30 sec) ○ Lateral single leg jumps (Approximately 30 sec) ○ Forward and backward single leg jumps (Approximately 30 sec) ○ Double leg jump (with/without ball optional) (Approximately 30 sec) 	2 min
D	<p>Strength</p> <ul style="list-style-type: none"> ○ We encouraged soft and controlled landing; contracting stomach and buttocks; straight line hip-knee-foot. ○ Walking lunges in place (Approximately 1 min) ○ Hamstring curl (in pairs) (Approximately 1 min) ○ Single-knee squat with toe raises (Approximately 1 min) 	4 min
E	<p>Core Stability</p> <p>We encouraged contracting stomach and buttocks; straight line through the body; if there is back pain, stop or modify the exercise (do not hold your breath).</p> <ul style="list-style-type: none"> ○ Sit-ups (Approximately 1 min) ○ Plank on elbows and toes (Approximately 1 min) 	3 min

- Bridging (Approximately 1 min)

Bridging: Method: Lie flat on the floor with your hands resting by your sides, feet flat on the floor, shoulder width apart and knees bent. Now, contract your abdominals, lower back and gluts and slowly lift your midsection to form a bridge from your knees, through your hips to your shoulders. Hold this position for a few seconds, and then slowly lower.



Single knee squats



Start position: Standing on one leg, other leg out in front
Bend standing knee over 2nd toe, keep back straight and heel on the step; curl toe of out stretched foot back toward shin