

# ACL: The Curse of Women Athletes

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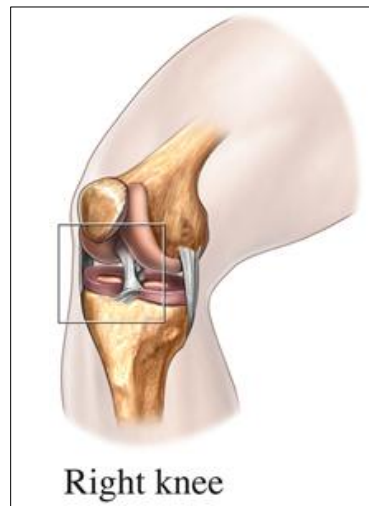
## Introduction

After hearing a rip in her right knee, Tiffany Woosley, a shooting guard for the University of Tennessee Lady Vols, knew she had torn her ACL, or anterior cruciate ligament. She was performing a simple jump shot and landed incorrectly—and her injury caused her to miss the rest of the season. This has become the story for too many women athletes, including Woosley's teammate Nikki McCray, an All-American forward who tore her ACL in a pickup game (McCallum and Gelin). Duke University's Monique Currie tore her ACL in a pre-season game, possibly ruining the team's hopes for a big season. And Brandi Chastain missed her 1987 and 1988 college soccer seasons after having surgery for the ACL in both knees (Patrick).

ACL tears are turning into an epidemic among women athletes at all levels of sports, especially among high school and college players. As the number of women competing in sports continues to increase, physical education professionals must understand the causes of this common injury in order to help athletes reduce their risk.

## What Is the ACL?

The anterior cruciate ligament, or ACL for short, is a ligament in the knee to which much of the stress of physical activity is transmitted. The knee depends so much on the ACL that it is one of the most vulnerable parts of the human body. When people run or walk, the knee bears the entire weight of the body, continually flexing and absorbing the shock of every step. Central to all this activity and stress is the ACL, which runs through the knee to form a cross connecting the thigh bone (femur) with the shin bone (tibia) (Wilkinson 68). (See Fig. 1.)



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Figure 1. A cross-section of the right knee shows the upper leg bone (femur) and lower leg bone (tibia). Ligaments are shown in gray.

The ACL keeps the femur aligned with the tibia when the knee is bent and prevents the tibia from sliding forward too much (Hawaleshka). It also stabilizes the knee while an athlete is running and changing directions. When an ACL tear occurs, the knee gives out and becomes unstable. (See Fig. 2.) This instability does not go away until the injury is treated through surgery and rehabilitation. Even after all this, athletes with torn ACLs may have problems with recurrent instability, further joint damage, and early arthritis.

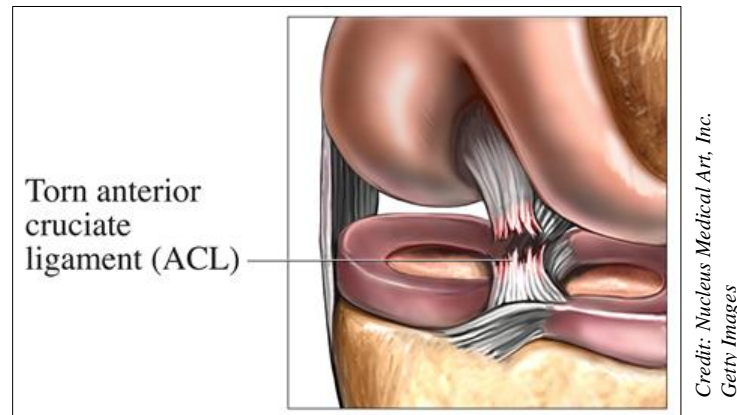


Figure 2. An illustration of a torn anterior cruciate ligament, or ACL.

### When Are ACL Injuries Most Common?

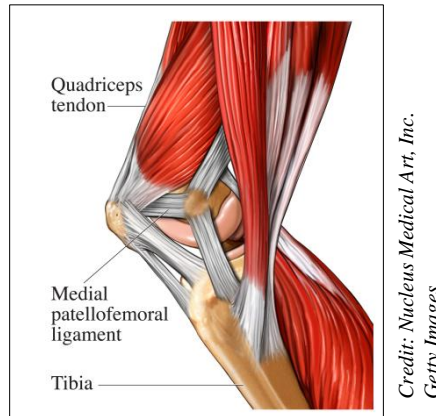
ACL injuries can happen at almost any time, but the majority of ACL injuries are non-contact, resulting from “planting” on one foot or making lateral movements such as changing direction suddenly. Other movements, such as straight-knee landings and one-step stopping while the knee is hyperextended, cause tears in the anterior cruciate ligament as well (Moeller and Lamb). The ligaments in the knee become extremely prone to injury when an athlete has exercised her quadriceps (muscles in the front of the thigh) and hamstrings (muscles in the back of the thigh) to fatigue. The muscular fatigue causes increased tibia movement at the knee and allows the knee to bend in ways it should not. When the ACL gives way, a player may feel and hear a pop in her knee as she collapses to the ground, unable to support her own weight.

As a player’s muscles become fatigued, the player also becomes mentally fatigued. When this happens, a player can lose sight of what her body can handle. As this occurs, the athlete often attempts maneuvers that her body cannot withstand. The combination of muscular and mental fatigue makes knee injuries most common in sports that involve frequent jumps, landings, rapid changes in direction, and abrupt deceleration and acceleration. Tears are most common in high-risk sports such as soccer, basketball, volleyball, field hockey, gymnastics, and skiing (Hawaleshka). Although this sort of injury can happen to both males and females, it is especially common among female athletes.

### Why Are Women at a Greater Risk?

The discrepancy in the numbers of women and men suffering from ACL tears is due partly to biological factors and partly to social factors. Anatomically, women are more prone to an ACL tear for several reasons. One is that women have a decreased hamstring-to-quadriceps strength ratio compared to that of men. Women’s hamstring muscles are usually about half as strong as their quadriceps, whereas men’s hamstrings are two-thirds as strong as their quadriceps. This muscle imbalance creates a stress on a woman’s ACL because the quadriceps can overpower the hamstring, causing the tibia to be pulled too far forward (Wilkinson 69). (See

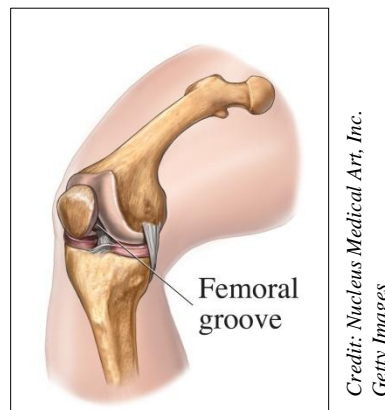
Fig. 3.) The body depends on the hamstring to stabilize the knee, so there is greater risk of strain and injury when the hamstring is much weaker than the quadriceps.



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Figure 3. An illustration of the relationship between the quadriceps tendon and the tibia.

Another anatomical difficulty is that women have wider hips than men, and a woman's femur, the bone connecting hip and knee, is shorter than a man's. Consequently, women's legs slope inward at the knees, placing additional stress on the anterior cruciate ligament (McCallum and Gelin 46). In women, the angle from hip to knee (the quadriceps angle, or Q-angle) is greater than the Q-angle in men. Men's Q-angles usually range from 11 to 13 degrees, whereas women's Q-angles can be up to 17 degrees (Moeller and Lamb). This means that in women's knees, the force of the body is not transmitted directly downward, but instead is directed at a greater angle than in men's knees. The greater the angle, the more strain on the knee and the greater risk for ACL injury. Tears can also occur when a woman's femur acts as a guillotine, shearing the anterior cruciate ligament if the knee is hyperextended (Hawaleshka). This occurs in women because of the size and shape of the femoral notch (or "groove"), the point through which the ACL passes in order to connect the femur to the tibia. (See Fig. 4.) In women, the femoral notch is narrower than the femoral notch in men. It also tends to be in the shape of an "A" whereas a man's femoral notch is shaped more like a "U." When the knee is overextended, more pressure is put on the ACL. The narrower arch, combined with its sharper angle, increases the risk that a woman's femoral arch will cut into the ACL, resulting in a tear of that ligament (McCallum and Gelin 46).



Credit: Nucleus Medical Art, Inc.  
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Figure 4. An illustration of the femoral notch, or "groove."

Female hormones can also have a significant effect on the anterior cruciate ligament. A 1998 University of Michigan study showed that most ACL tears occurred when estrogen levels in women were the highest (Harden and Spurgeon). Estrogen weakens the ACL cells by altering their metabolism and increasing the laxity of the muscular tissue so the ligament is easily stretched and torn (Simonian). Another study, done at UCLA, found that the anterior cruciate ligament has receptors that react to estrogen and weaken in its presence (Harden and Spurgeon). In addition, females are at a greater risk because their joints tend to be looser than those of males (Hawaleshka).

Not only does the female anatomy contribute to the high risk of ACL injury, but societal factors affecting body movement and muscle strength also make women more susceptible. For one thing, women generally have less exposure to physical activities and, on average, their conditioning is at a lower starting point than men's. Furthermore, many women are not taught simple motor skills early in their development and consequently maneuver the wrong way. For instance, males typically land using both legs, so that both knees absorb the impact, while females favor one-legged landings. "I'm not saying that a man would never make the same move the same way, but it's much more likely that he would've learned the right way to do it," states Iowa trainer Alex Kane. "Either because of budgetary constraints or philosophical reasons, that teaching is not going on in the physical education system. Therefore you have impaired neuromuscular coordination. The foundation is simply not there. Girls aren't taught it, and they aren't encouraged to learn it" (McCallum and Gelin 47).

### **How Can These Injuries Be Reduced?**

Currently, it is still unclear how to prevent anterior cruciate ligament injuries. But female athletes can reduce the risk of ACL tears by learning proper motor skills, wearing the right equipment, and undertaking a program of strength training. Mary Lloyd Ireland, MD, director of the Kentucky Sports Medicine Clinic, suggests that women should be encouraged to play sports as young girls and should be taught the proper athletic techniques for actions such as jumping and pivoting (Schnirring). Young women athletes also need to take advantage of programs that provide special training through local sports clinics, physical therapists, and athletic trainers.

The right equipment can also decrease the number of ACL tears. Recently, manufacturers have begun trying to create a shoe that reduces friction without eliminating grip. According to Dr. Bill Youmans, an orthopedic consultant for the University of Tennessee, wearing such shoes would reduce the number of ACL injuries for men and women alike (McCallum and Gelin 48). Shoe manufacturers are also trying to accommodate a woman's foot so that shoes fit better and provide ankle support that helps reduce excess tension on the knee. Finally, arch supports, known as orthotics, can help keep the foot balanced, reducing the strain on the knee.

The most important element in preventing ACL tears is appropriate strength training. Female athletes should be encouraged to begin weight training to establish a proper relationship between muscle groups, especially the hamstring and quadriceps. To establish this relationship, women should consider activities such as squats and lunges, which increase muscle strength while reducing the stress on the knee. Similarly, using the leg press machine, pushing the weight away from the body while lying down, is beneficial, strengthening the lower body while not placing any strain on the ACL. In addition, women can benefit from balancing exercises and Plyometrics, exercises that involve training for power and explosiveness using rapid muscle contraction.

Paying close attention to preventative measures can reduce the number of women suffering from ACL injuries and prolong their athletic careers.

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