

Non-contact ACL injuries: What you need to know

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Brandi Chastain, Shannon Boxx, Shannon MacMillan, Aly Wagner, Heather Mitts, Danielle Fotopoulos, and current U.S. National Team Captain Christie Rampone have all heard that dreaded pop in their knee when they suffered an anterior cruciate ligament (ACL) injury. These players also have something else in common; they all worked extremely hard during rehab and were able to return to playing soccer at the highest level on the U.S. Women's National Team. Unfortunately ACL tears are common to women's soccer, and not just at the elite level, but among younger players too. An ACL tear is no longer considered a career ending injury thanks to advances in surgical techniques and rehabilitation strategies, but injury prevention is now considered an essential component of training programs for all female soccer players.

The ACL is one of two ligaments in the knee joint that crisscross one other and connect the tibia (shinbone) to the femur (thighbone) (Figure 1). The ACL provides stability to the knee by preventing the shinbone from sliding in front of the thighbone and helping resist rotation when the knee is twisted. Researchers have analyzed game films of female athletes that have suffered a non-contact ACL injury and noticed several things almost always occur: the injured knee was relatively straight and rotated; the athlete was in a knock-kneed position; and the upper body was behind the knee when the injury happened. In other words, the ACL fails while doing its job because of the awkward body position the athlete is in when the injury occurs.

It is estimated that 80,000 ACL tears occur annually in the U.S. and of those related to playing soccer 67% are non-contact, meaning that the injury was not caused by contact from another player on the field. Those players who have had an ACL tear know 'there is typically an immediate onset of pain, swelling in the knee, and a feeling of instability in the knee' says Doug Richards, M.D., Medical Director of the Macintosh Sport Medicine Clinic at the University of Toronto. Richards adds that after the immediate on-the-field care, a physician will perform clinical tests to examine how much

movement there is at the knee and ask for X-rays and an MRI to confirm and determine the severity of the ACL injury.

Female soccer players are 3 times more likely to sustain an ACL injury compared to male soccer players. A recent report by the National Collegiate Athletic Association (NCAA) indicated that, despite all of the attention given to ACL injuries, the risk of ACL tears for college female soccer players has remained the same over the past 13 years. Although the exact reason for this finding is not clear, several proposals have been given for why female athletes are at a greater risk for non-contact ACL injuries compared to male athletes. Some are related to the environment, such as the type of surface (natural vs. synthetic turf) or the weather conditions (dry vs. wet), while other factors are related to the female athlete, such as having wider hips, a smaller ACL, or hormonal changes that occur during the menstrual cycle. However there is mounting evidence that the way female athletes perform basic motor skills, such as running and jumping, may pose the greatest risk for an ACL tear.

Before puberty boys and girls perform basic movement skills the same. In other words, there is no difference in the way they run, sprint, jump, land, or change directions. That all changes as individuals begin puberty when differences between male and female athletes become obvious. Specifically, many female athletes increase their risk of a non-contact ACL injury because they tend to:

- land from a jump with straighter legs (i.e., no bend in the knees or hips), commonly called a ‘stiff’ landing, which increases what’s known as landing force
- have knocked-knees when landing from a jump – medically called knee valgus – placing additional stress on the ACL
- stop or change directions when running using one large step – typically resulting in the body being behind the knee

- have flawed muscle activation patterns where the muscles in the front of the leg (the quadriceps) are activated before the muscles located on the back of the leg (the hamstrings) when landing from a jump – which is opposite compared to male athletes

Fortunately, female athletes can do something to reduce the risk of having an ACL tear by including certain drills into their workout routine that help improve these movement deficiencies. Injury prevention programs that include specific exercises aimed at teaching female athletes how to stop, change directions and land properly are extremely beneficial and should be performed regularly by anyone playing soccer. The most common techniques used in ACL injury prevention programs include:

- changing ‘stiff’ landings (Figure 2) into ‘soft’ landings (Figure 3) by having athletes bend their hips and knees when landing from a jump – this will reduce landing forces and may help correct the flawed muscle activation patterns
- instructing athletes to keep the hips, knees and feet pointed forward when running, coming to a stop, or landing from a jump – this will help maintain proper knee alignment and avoid the knock-kneed position
- replace the one step stop or change in direction with multiple, smaller steps while maintaining proper body alignment by keeping the upper body on top of (not behind) the hips, knees and feet (Figure 4) – this will help athletes avoid a high risk position.
- general strength and balance exercises

Several research studies have shown that programs using these simple techniques noticeably reduce the risk of non-contact ACL injuries in younger athletes. Several specific injury prevention programs are available: the Santa Monica PEP program, Sportsmetrics™, and the G.O.A.L.S. Training Series™. Regardless of which program is used, it is important to understand that one-size-does not fit

all when it comes to ACL injury prevention programs. Certain drills may be too advanced for younger or less experienced athletes, whereas advanced athletes should perform exercises that are more challenging and complex – in other words a program should be developmentally progressive.

The high cost of ACL replacement surgery (\$10-20,000), lost playing time, likelihood of re-injury, and the strong potential for long term pain makes prevention the strategy of choice. However it is inevitable that ACL injuries will continue to haunt many female soccer players. When an ACL tears completely the knee becomes less stable and according to Dr. Richards ‘fewer than 5% of athletes with ACL deficient knees can function in their sport without repair’. Therefore almost all athletes will require surgery to replace the ACL. While the healing process of the ligament takes about a year, athletes who are dedicated to their rehabilitation may be ready to return to play six months after the injury occurred – if everything progresses as expected.

Movement of the injured knee is limited after surgery and so during the early stages of rehabilitation range of motion is re-established, which is then followed by a strengthening phase, and gradually progresses to include simple and then complex movement patterns on the field – this type of progression challenges the newly replaced ligament gently at first, and more aggressively later, says Richards. The most important element of rehabilitation is having a therapist or performance professional that is adequately knowledgeable and creative so that the rehabilitation process is safe, but effective.

Some injuries in sport are unavoidable, but by becoming educated on how to identify movement flaws and implementing prevention strategies aimed at re-educating how female athletes perform basic movement skills we can start reducing the occurrence of non-contact ACL injuries in female soccer players.