

For Women Only



Photo by Randy Smith, www.randyphotos.ca

Alison Heydorn is a professional soccer player who appeared on our Sept/Oct 2012 cover. Soccer is associated with one of the highest rates of ACL injury for women.

ACL Injuries and Women: What Coaches Need to Know

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The incidence of ACL injuries in young women is a serious problem today. Depending upon the sport, women are far more likely than men to injure their ACL. In fact, it's estimated that one out of 10 NCAA women will tear their ACL at some point in their college career – despite the higher level of coaching at the college level and access to sports medicine and strength and conditioning programs. The cost of treating ACL injuries in this country is estimated to be over \$1 billion! Can anything be done to improve the situation? Yes, and the solutions may surprise you.

As a starting point, consider that there are four major ligaments that stabilize the knee joint: the ACL, PCL, MCL, and LCL. The ACL runs diagonally across the middle of the knee. The ACL restricts the forward movement of the shins, and prevents excessive rotation and angulation of the knee. ACL injuries can occur when the knee is twisted, bent sideways, or bent backwards – the more of these actions that occur, the

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greater the risk. Approximately 70 percent of ACL injuries are a result of noncontact activities, especially during the landing of a jump or pivoting during a run. Further, according to a report from the American Academy of Pediatrics Council on Sports Medicine and Fitness, the risk to girls of ACL injury increases significantly after the ages of 12-13, and reaches its peak between the ages of 15-20.

One obvious way for girls and women to reduce the risk of ACL injuries would be to not participate in sports that present the highest risk. For example, women are up to eight times as likely as men to injure their ACL in sports such as soccer, volleyball, and basketball. However, as these are among the most popular sports for women, this is not a realistic option. A better approach is for coaches and athletes to look at research on the contributing factors in ACL injuries, and then take the appropriate steps to lower the risks.

From a physiological standpoint, research suggests several gender-related factors in women's higher susceptibility to ACL injuries compared to men's: a different pelvic structure (in women, the upper thighs come in more diagonally than in men's, resulting in higher angular stress), looser ligaments, size of the ACL ligament notch, and fluctuations of hormones such as estrogen and relaxin.

One important variable that is not related to gender is the structure of the feet. Says accomplished Canadian strength coach and posture expert Paul Gagné, "If the arches are fallen, a condition we call valgus, that will cause an unnatural internal rotation of the foot, ankle, knee, and hips that increases tension on the ACL."

From a strength and conditioning standpoint, one popular theory is that women tend to be quad dominant; that is, their quadriceps are relatively stronger than their hamstrings. Such an imbalance is associated with poor jumping and landing mechanics that can increase the stress on the ACL. One reason that BFS has always advocated the glute-ham raise as an auxiliary exercise is that it works both the hip extension and knee flexion functions of the hamstrings. "The hamstrings assist the functions of the ACL, so it's especially important for women athletes to perform additional hamstring exercises in their workouts," says Gagné. "I like the glute-ham exercise because it involves the knee at the same time as the hip – you might say it is a more functional exercise because this is how the lower body works in athletics."

Another key exercise to keeping knees healthy is squats, as they can help strengthen ligaments. However, the highest levels of stress on the ACL occur when the upper thigh bone is at 90 degrees, which is



Squats are a great exercise to strengthen knee ligaments and thereby help prevent ACL injuries, but they must be performed properly.

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why BFS recommends squatting to a point at which the upper part of the thigh is at least parallel to the floor. Squatting all the way down is fine, but athletes must be careful not to round their lower back in this position.

Ernie Rimer, BS, MED, is Director of Sports Science at the University of Utah. He has extensive experience in working with female athletes, including international-level athletes in sports such as skiing in which there is a high risk of injury. Rimer believes that although sport-specific training has its place, to reduce



Ernie Rimer, BS, MED, Director of Sports Science at the University of Utah

the risk of ACL tears and other knee injuries, young athletes need to participate in a balanced, year-round strength and conditioning program. “Learning the skills of a sport is different from developing the body,” says Rimer. He adds that although exercises such as the power clean may not be specific to the actions that occur in many sports, the exercise develops power and high-velocity muscular contractions, which are required of elite-level athletes.

Also being researched is a possible link between fatigue and ACL injuries. When the legs are fatigued with core exercises such as squats and deadlifts, this causes the hip adductors to function as hip extensors during eccentric activity; this change in biomechanics can result in the knees buckling, thus putting the athlete at greater risk of ACL tears. For this reason, athletes should not only develop strength but also train the energy systems to delay fatigue. Likewise, coaches must carefully monitor the training of athletes for signs of fatigue that results in altered movement patterns during jumping, running, and agility drills. One tool that Rimer has used to assess the fatigue level of his athletes is the OptoJump™, an optical measurement system that provides objective data on human movement.

Research has also looked at the influence of concussion on ACL risk, and the time difference between

tearing an ACL and having surgery (one study suggests that the sooner the surgery is performed, the less risk of reinjuring the ACL).

Another positive step in the fight against ACL injuries is to have young women participate in strength and conditioning programs before puberty. Rimer says that new research suggests that learning proper jumping and running mechanics at a young age will carry over into adolescence and adulthood, and these movement skills will help prepare athletes for high levels of sports participation as they mature. One such program designed to teach these skills is the BFS Readiness Program. Says Rimer, “The BFS Readiness Program is a great tool, especially if you can start it before puberty. I would go so far to say that strength training for prepubescent girls may be the single most effective approach to prevent ACL injury.”

A lot of exciting research has been conducted in the study of ACL injuries, but certainly much more is needed to help significantly reduce this major problem among young women. From what we know, the best approach seems to start year-round training at a young age by using comprehensive programs such as BFS.

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