# Adolescents and ACL Injuries: Current Research and Future Challenges

Robin Queen, Ph.D., FACSM

*monkeybusinessimages/iStock/Thinkstock*

National Youth Sports Health & Safety Institute

AMERICAN COLLEGE of SPORTS MEDICINE

SANFORD

**With the growing popularity of youth team sports such as soccer and basketball, there has been a substantial increase in the number of athletic injuries among adolescents. Each year, many high school students experience season- or even career-ending athletic injuries, yet surprisingly little is known about how to avoid these injuries or rehabilitate youth after such an injury.**

One of the most devastating and more common injuries in youth sports is an anterior cruciate ligament (ACL) tear. Nearly one in 60 adolescent athletes will suffer an ACL injury during their athletic career, and many of these athletes will undergo an ACL reconstruction. In adolescent athletes, girls are five-to-eight times more likely to tear their ACL when compared to boys. Many studies have compared the differences between girls and boys in an attempt to understand the difference in the injury rates. These studies have identified many anatomical, physiological and behavioral factors that differentiate boys and girls; however, the exact reason for the difference in injury rates is still unknown. The best approach to rehabilitating injured adolescents and getting them back onto the field remains unclear.

Differences in strength, landing mechanics, cutting mechanics, hormone levels and training programs have all been identified as possible risk factors for ACL injuries in adolescent athletes. In addition, many programs have been designed to try and prevent these injuries and have found some success. Probably the most well-known of these programs is the FIFA-11+, which is designed to help prevent soccer injuries in adolescent athletes over the age of 14. This program is designed in three parts: 1) warm-up consisting of running at low speeds, along with stretching and controlled partner drills; 2) six sets of exercises that focus on core and leg strength, as well as balance, plyometrics and agility with increasing difficulty; and 3) running exercises and drills that are completed at moderate-to-high speeds and incorporate planting and cutting movements. Following the implementation of this program, studies have reported between a 30 percent and 70 percent reduction in the number of injuries. While not all of these were ACL injuries, this type of program provides a basis for the development programs that are being examined to reduce ACL injuries by focusing on changing the way an athlete lands or cuts during sport. Motion capture technology, similar to that used for making video games, can be used to collect data on the way an athlete moves and then provide feedback on possible risk factors for ACL injuries. This feedback can be used by athletes and trainers in programs designed to improve strength and flexibility while retraining the athlete's natural movement style.

In addition to the prevention of the initial injury, it is important to consider how athletes return to sports following an ACL surgical reconstruction and physical therapy. When compared to an athlete without a previous ACL injury, adolescent athletes have a 15-times greater risk of sustaining a second ACL injury, either to the same leg or the other leg after returning to sports following an ACL reconstruction. Currently there are no definitive standards in orthopaedic surgery or physical therapy that guide decisions about when to return to sports, although evidence based recommendations have been suggested within each specialty. Instead, these decisions are made by the athlete's parents and coaches, primarily with input from the treating surgeon along with insights from the physical therapist. Physical therapy recommendations for return to sports following reconstruction include, not only strength and range of motion, but also the ability of the athlete to complete various sport-specific activities or tests. Recent research makes it clear that patients who have been allowed to return to sport often have residual muscle weakness and imbalances, as well as movement patterns that are different between the surgical and nonsurgical legs. This imbalance shows up in analysis of the tasks and self-reports from athletes. These data are essential to well-informed, safe decisions about return to sport. While youth athletes are anxious to return to sports quickly, it is vital that they and their parents understand the long-term consequences of returning before they are completely recovered.

Currently, the best advice for adolescent athletes is to warm up and condition appropriately before beginning a competitive season, and for coaches and parents to be aware of the risk factors for injury, which include movement and coordination differences between the legs, muscle weakness and poor conditioning leading to early fatigue. Adolescent athletes should be encouraged to participate in a variety of sports in order to develop coordination and strength throughout the body and avoid early specialization into a single sport that could lead to muscle strength imbalances and, potentially, increase the risk of injury. With ACL injuries being more prevalent in girls, it is important that girls begin to participate in physical activities at an early age to develop the strength and coordination that can help them move better and decrease their risk for ACL and other sports-related injuries.

Ultimately, all of these approaches can reduce sports injuries and increase athlete satisfaction, while decreasing the long-term impact of sports injuries and allowing athletes to enjoy sports throughout their lifetime.