Youth Sports Anterior Cruciate Ligament and Knee Injury Epidemiology: Who Is Getting Injured? In What Sports? When?

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KEYWORDS
• ACL • Knee Injury • Youth Sports • Epidemiology

The importance and benefits of exercise are well documented. With childhood obesity rates rising in most developed countries, encouraging outdoor play and sports participation may be one of several solutions for this problem. However, with the increased youth sport participation seen over the past 10 years, there has also been a need to monitor the risks of participation within this unique population. Unfortunately, only a few well-designed epidemiologic surveillance studies have been conducted thus far.

The pediatric and adolescent population is unique in that their skeletal system is still maturing, and thus, they may be susceptible to unique injury patterns and injury frequency. The frequency and severity of sports injuries can differ based on the type of exposure (competition vs practice), sport, gender, and age. Recording these variables is important to accurately determine risk and obtain reliable epidemiologic data. To do this, standard definitions for injury and exposure should be established and widely accepted.

Standardization of injury reporting will allow comparison of results across studies so the associated factors can be more thoroughly explored. The purpose of this article is to review the types and patterns of knee and anterior cruciate ligament (ACL) injuries for youth sports based upon recent research. Much of this review is based upon the extensive research of Comstock et al using data compiled from the National High School Sports-Related Injury Surveillance Study.[1] This article will focus on the

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Clin Sports Med 30 (2011) 691–706
doi:10.1016/j.csm.2011.07.004 **sportsmed.theclinics.com**
0278-5919/11/$ – see front matter

high school–aged athlete, aged 14-18 years, as the data for this age group are more robust than the data for younger age groups. This report will focus on 9 major sports played at the high school level: boys' football, soccer, basketball, baseball, and wrestling and girls' soccer, basketball, volleyball, and softball.

REVIEW OF THE LITERATURE

Definitions

When referring to the data obtained from the National High School Sports-Related Injury Surveillance Study,[1] "injury" and "athletic-exposure" were defined as follows:

> **Injury[1]:** (A) An injury that occurred as a result of participation in an organized high school competition or practice **and** (B) required medical attention by a team physician, certified athletic trainer, personal physician, or emergency department/urgent care facility **and (**C) resulted in restriction of the high school athlete's participation for one or more days beyond the day of injury **and (**D) any fracture, concussion, or dental injury regardless of whether or not it resulted in restriction of the student-athlete's participation.
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> **Athletic exposure (AE)[1]:** (A) One athlete participating in one practice or competition where he or she is exposed to the possibility of athletic injury.

Football (American)

Overview

In the United States, football remains one of the most popular sports with the largest number of high-school aged participants (over 1.1 million).[2] It also has one of the highest injury rates overall as well as the highest incidence of ACL injuries. Previous research reported the overall injury rates for football have been as high as 8.1 per 1000 exposures[3]; more recent data captured from a large nationwide surveillance study have shown a smaller but still relatively high rate of injury (3.81 overall, 12.96 competition, 2.06 practice[1]) (**Fig. 1**, **Table 1**). It is important to note that football has by far the highest injury rate per exposure during competition.

Injuries requiring surgery

Of the 9 sports studied, football has the second highest proportion of overall injuries that result in surgical intervention at 8.5% (**Table 2**).[1] In a recent unpublished study using the RIOS™ data, Allan et al reported that during the 2007-2009 seasons, football accounted for 69.5% of boys' ACL injuries and that approximately 60% of the ACL injuries recorded resulted in surgical intervention.[4]

Knee injury rates

The knee represents the second most common region injured during both competition (18.8%) and practice (13.6%) (**Tables 3–5**). Additionally, of the boys sports, football has the highest proportion of overall knee injuries than any other sport (16.5%).[1]

ACL injury rates

Overall, football has the second highest ACL injury rate (13.87 per 100,000 AEs) in the age group of 14-18 years old, ranking second to girls' soccer (14.08 per 100,000 AEs) (see **Fig. 1**) and has the fourth highest proportion of injuries with ACL etiology (3.64%) (**Fig. 2**).[5] Additionally, according to Allan et al's unpublished report, boys were 3 times more likely to sustain an ACL injury while playing football compared to any other sport discussed in this study.[4]