

AMERICAN ACADEMY OF PEDIATRICS

Committee on Sports Medicine and Fitness

Injuries in Youth Soccer: A Subject Review

ABSTRACT. The current literature on injuries in youth soccer, known as football worldwide, has been reviewed to assess the frequency, type, and causes of injuries in this sport. The information in this review serves as a basis for encouraging safe participation in soccer for children and adolescents.

Soccer is one of the most popular team sports in the world and continues to provide many young people an opportunity for healthy exercise. In the United States, it is estimated that 12.5 million¹ to 18.2 million² people participate in soccer. Of the total number of participants, approximately 3 million are registered in high school or youth soccer associations. Soccer is also a growing sport, with reported increases in participation ranging from 11.4% to 21.8% annually.²

The US Consumer Product Safety Commission, through its National Electronic Injury Surveillance System, estimated between 146 000 and 160 000 soccer-related injuries annually for the years 1992 through 1994.³ Approximately 85% of these injuries occurred in participants through 23 years of age, with approximately 45% occurring in participants younger than 15 years. Many factors, including level of competition, level of exposure, and definition of injury, have resulted in wide variations in the incidence of soccer injuries and have made comparative analysis problematic.

Nonfatal soccer injuries in young athletes have been reported to occur in 2.6%⁴ of players per season and up to 5.2%⁵ of players in one large youth soccer tournament. Injury rates per 1000 player-hours range from 0.6 to 19.1 per 1000, depending on the level of play and the definition of injury. The male-female ratio of injuries overall is 1:2 for similar levels of exposure. However, selected injuries, such as fractures, occur with equal frequency in male and female players.^{6,7}

Studies comparing indoor⁸ with outdoor⁹ soccer injury rates indicate that indoor soccer players encountered injuries 6.1 times as frequently as outdoor soccer players with comparable hours of playing time. Higher injury rates in indoor soccer may be attributable to many factors, including the playing surface and collisions between players and the walls bordering the field of play. Differences between artificial turf and natural grass playing surfaces ac-

count for variable injury rates among adult soccer players playing outdoors.¹⁰ In youth soccer, the relationship between playing surfaces and injuries has not been studied sufficiently to make specific recommendations about safety.

Injuries resulting from player-to-player contact vary from 31%⁸ to 70.3%⁹ of injuries in indoor soccer. In outdoor soccer, the percent of injuries resulting from player-to-player contact varies from 43%¹¹ to 60.9%⁹ of the injuries reported. In a study that recorded injuries from player-to-player contact, 48% of all injuries occurred during tackling.¹¹ With the exception of a single study in which the goalie position accounted for a disproportionate share of the total injuries recorded,⁴ the risk of injury does not seem to vary consistently according to player position.

Selected rule changes in sports have been prompted by a desire to reduce the risk of injury. The decrease in cervical spine injuries in American football after the reduction in the use of the helmet for blocking (the "spearing" rule) is a commonly used example. In other sports, changes in equipment requirements (eg, helmets in youth ice hockey) and rules of play have provided mixed safety results.¹² In youth soccer, rule changes to reduce aggressive contact leading to ball control may have a potential for decreasing injury.

Researchers have studied the relation of soccer injuries to age. Higher rates of injury occur in the older male (16–18 years). In age-matched players, relatively poor muscular strength has been shown to be associated with higher rates of injury.¹³ In one study involving male and female players, the highest injury rates were reported for the oldest girls (17–19 years), and the lowest rates were reported for the youngest girls (9–13 years).⁴

Fatalities from soccer-related injuries are associated almost exclusively with traumatic contact with goalposts. From 1979 to 1993, falling soccer goalposts accounted for 27 injuries, of which 18 were fatal.¹⁴ The mean age of the 27 subjects in this series was 10 years. Data from January 1993 through July 1994 documented 3 additional fatalities involving children killed by falling soccer goalposts (US Consumer Product Safety Commission, personal communication, April 1995). These findings have prompted specific recommendations from equipment manufacturers^{15,16} and from the US Consumer Product Safety Commission¹⁷ to ensure that soccer goalposts are adequately secured during play and when not in use.

The most common type of nonfatal soccer-related injury is soft-tissue contusion. Fractures are rela-

The recommendations in this statement do not indicate an exclusive course of treatment or serve as a standard of medical care. Variations, taking into account individual circumstances, may be appropriate.

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tively uncommon, accounting for only 3.5%¹⁸ to 9%¹¹ of the injuries. Other injuries, such as sprains, strains, contusions, fractures, dislocations, tendinitis, overuse injuries, and heat-related injuries, occur in soccer but are not unique to soccer or seen in disproportionate numbers among soccer players.

In skeletally immature soccer players, calcaneal apophysitis, or Sever disease, is commonly observed. This repetitive traction injury to the calcaneal apophysis is attributable to high levels of running in cleated shoes without adequate heel cushion or arch support. Once identified, this overuse injury can be treated by reducing the amount of running and impact demands, improving calf flexibility, and using a heel pad or heel cup in the soccer shoe.

In the analysis of injuries by anatomic site, lower extremity injuries account for 61%⁷ to 80.9%⁵ of all injuries. Studies that further delineate lower extremity injuries show groin injuries accounting for 2%⁴ to 7.1%⁶ of total injuries; hip and thigh injuries accounting for 1.8%⁶ to 21%¹¹; knee injuries accounting for 10%⁴ to 26%⁶; ankle injuries accounting for 13%¹¹ to 23.1%⁶; and foot injuries accounting for 0.3%⁶ to 28%⁵ of all soccer-related injuries.

Upper extremity injuries represent 2.3%⁴ to 7.7%⁶ of total injuries, while the shoulder was the site of injury in 1.8%⁴ to 2.6%¹¹ and the hand in 6.3% of total injuries.⁴ Fractures occur more frequently in the upper extremity than in the lower extremity.⁶

Head and facial injuries account for 4.9%⁵ to 22%⁹ of soccer injuries, of which approximately 20% are concussions.¹⁸

The cognitive consequences of "heading" the ball have come under closer scrutiny by researchers, including "heading" the ball. Compared with matched controls, adult soccer players in Norway who began playing soccer in youth leagues (and excluding players with a history of head injury unrelated to soccer) showed mild to severe deficits in attention, concentration, and memory in 81% of the players tested. Players who headed the ball more frequently during competition had higher rates of cognitive loss than players who used the technique less often.¹⁹ Other researchers²⁰ have expressed concern about cognitive deficits appearing in youth soccer participants after much shorter exposure time to heading the ball. Further study is needed before a conclusion can be made about the safety of heading by young soccer players.

Eye injuries are another subset of soccer-related head injuries.²¹ In a series studying eye injuries caused by soccer ball impact, 50% of the injuries resulted in hyphema. In Great Britain, the largest number of sport-related orbital blowout fractures occurred in soccer.²³ The frequency of eye injuries in soccer has contributed to the recommendation by the American Academy of Pediatrics' Committee on Sports Medicine and Fitness and the American Academy of Ophthalmology Committee on Eye Safety and Sports Ophthalmology that protective sports eye equipment using polycarbonate lenses be worn during soccer practice and competition.²⁴

Soccer is the second leading cause of orofacial and dental injuries in sports, preceded only by basket-

ball.²⁵ Use of protective mouth guards has been advocated to reduce the number of such injuries.²⁶

The frequency and types of injuries observed in youth soccer are comparable to other sports that require running or involve contact and collisions. Most injuries are to the soft tissue and occur most frequently in the lower extremities. There is no compelling evidence to suggest that age, player position, techniques, or surface characteristics are associated with specific injuries or overall injury rates.

RECOMMENDATIONS

1. Protective eyewear and mouth guards may help reduce the number of some nonfatal head and facial injuries.
2. Further research is needed to determine if rule changes, equipment modifications, or further safety interventions can reduce the number of other injuries.
3. Because soccer-related fatalities have been strongly linked with head impact on goalposts, goalposts should be secured in a manner consistent with guidelines developed by the manufacturers and the US Consumer Product Safety Commission.
4. The potential for permanent cognitive impairment from heading the ball needs to be explored further. Currently, there seems to be insufficient published data to support a recommendation that young soccer players completely refrain from heading the ball. However, adults who supervise participants in youth soccer should minimize the use of the technique of heading the ball until the potential for permanent cognitive impairment is further delineated.
5. Violent behavior and aggressive infractions of the rules that tend to decrease broad participation in youth sports should be strongly discouraged. Parents, coaches, and soccer organizations should work to promote enforcement of all safety rules and strongly encourage sportsmanship, fair play, and maximum enjoyment for the athletes.
6. Pediatricians should encourage efforts to increase participation in all forms of physical activity, including youth soccer. Because soccer is a valuable component of physical activity and fitness for youth in the United States, pediatricians should work with other members of the community to make it safer for young people.

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REFERENCES

1. National Sporting Goods Association. March 1995. Mt Prospect, IL 60056
2. Soccer Industry Council of America. September 1995. North Palm Beach, FL 33408
3. US Consumer Product Safety Commission. *National Electronic Injury Surveillance System Data* (January 1992 through October 1994). Washington, DC: US Consumer Product Safety Commission; 1995
4. Sullivan JA, Gross RH, Grana WA, Garcia-Moral CA. Evaluation of injuries in youth soccer. *Am J Sports Med.* 1980;8:325-327
5. Schmidt-Olsen S, Bunemann LKH, Lade V, Brassoe, JO. Soccer injuries of youth. *Br J Sports Med.* 1985;19:161-164
6. Schmidt-Olsen S, Jorgensen U, Kaalund S, Sorensen J. Injuries among young soccer players. *Am J Sports Med.* 1991;19:273-275
7. Maehlum S, Dahl E, Daljord O. Frequency of injuries in a youth soccer tournament. *Physician Sports Med.* 1986;14:73-79
8. Lindenfeld T, Schmitt D, Hendy M, Mangine R, Noyes F. Incidence of injury in indoor soccer. *Am J Sports Med.* 1994;22:364-371
9. Hoff G, Martin T. Outdoor and indoor soccer: injuries among youth players. *Am J Sports Med.* 1986;14:231-233
10. Ekstrand J, Nigg B. Surface-related injuries in soccer. *Sports Med.* 1989; 8:56-62
11. Kibler B. Injuries in adolescent and preadolescent soccer players. *Med Sci Sports Exerc.* 1993;25:1330-1332
12. Tator C. Neck injuries in ice hockey: a recent, unsolved problem with many contributing factors. *Clin Sports Med.* 1987;6:101-114
13. Backous D, Friedl K, Smith N, Parr T, Carpine W. Soccer injuries and their relation to physical maturity. *Am J Dis Child.* 1988;142:839-842
14. United States Consumer Product Safety Commission. Injuries associated with soccer goalposts: United States, 1979-1993. *MMWR Morb Mortal Wkly Rep.* 1994;43:153-155
15. Coalition to Promote Soccer Goal Safety. North Palm Beach, FL 33408; January 1995
16. Caruso A. *Goal Safety Checklist.* Quakertown, PA: Kwik Goal Limited; July 1996
17. US Consumer Product Safety Commission. *Guidelines for Moveable Soccer Goal Safety.* Washington, DC: US Consumer Product Safety Commission
18. Nilsson S, Roaas A. Soccer injuries in adolescents. *Am J Sports Med.* 1978;6:358-361
19. Tysvaer A, Locher E. Soccer injuries to the brain. *Am J Sports Med.* 1991;19:56-60
20. Sherman C. "Heading" poses uncertain risk. *Pediatrics News.* 1995;(10):8
21. Prevent Blindness America. *1993 Sports and Recreational Eye Injuries.* Schaumburg, IL: Prevent Blindness America; 1994
22. Burke M, Sanitato J, Vinger P, Raymond L, Kulwin D. Soccerball-induced eye injuries. *JAMA.* 1983;249:2682-2685
23. Jones N. Orbital blowout fractures in sport. *Br J Sports Med.* 1994;28: 272-275
24. American Academy of Pediatrics, Committee on Sports Medicine and Fitness, and the American Academy of Ophthalmology Committee on Eye Safety and Sports Ophthalmology. Protective eyewear for young athletes. *Pediatrics.* 1996;98:311-313
25. Flanders R, Bhat M. The incidence of orofacial injuries in sports: a pilot study in Illinois. *J Am Dent Assoc.* 1995;126:491-496
26. American Dental Association. Counsel on Dental Materials. Mouth protectors and sports team dentists. *J Am Dent Assoc.* 1984;109:84-87

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