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Low Risk of Injuries Among Children Playing Organized Soccer

A Prospective Cohort Study

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Background: The injury rate in soccer is high, and studies have shown that the injury rate among players aged 16 years or older approaches that of adult players. However, little is known about the injury risk among the youngest players, that is, players between 6 and 12 years.

Purpose: To examine the risk of injuries in children 6 to 16 years old playing organized soccer.

Study Design: Descriptive epidemiological study.

Methods: Injuries were recorded prospectively throughout 1 season among 121 soccer teams (1879 players, aged 6-16 years) from 2 communities in the southeastern part of Norway.

Results: A total of 159 players sustained 200 injuries, corresponding to an overall injury incidence of 2.2 per 1000 playing hours (95% confidence interval, 1.8-2.6) among boys and 2.0 injuries per 1000 hours (95% confidence interval, 1.4-2.5) among girls. The overall injury incidence was significantly higher (relative risk, 1.7; 95% confidence interval, 1.3-2.2) among older players (13-16 years; 2.6 injuries per 1000 hours, 95% confidence interval, 2.2-3.0) than among younger players (6-12 years; 1.6 injuries per 1000 hours, 95% confidence interval, 1.2-1.9). The injuries recorded in the youngest group were few and mainly mild.

Conclusion: The injury risk among young players (6-12 years) playing organized 5- or 7-a-side soccer is low, lower than that of adolescents and much lower than at the elite level. Soccer is a safe sport for children.

Keywords: football; children; injury incidence; injury severity; soccer

Soccer is one of the world's most popular team sports, and its popularity continues to increase, especially among the youngest players, those younger than 12 years.[3] In 2006, there were 16 271 soccer players in the age group from 6 to 12 years in Norway; an increase of 5.3% from the 2005 season.[15] Unfortunately, studies have identified soccer as one of the leading causes of sports injuries.[3] Partly, this can be explained by the popularity of the sport, but at least for adult soccer, it is well documented that the incidence and severity of injuries are high, both for male and female players[1,26,27] and compared with other Olympic team sports.[8]

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However, less research is available on the injury risks associated with youth and children playing organized soccer. Studies on injuries among the youngest soccer players, those younger than 12 years, have been done in school settings or were based on retrospective injury data from emergency department or physician office visits.[20] There is only one recent prospective study on young soccer players,[19] which followed 38 English soccer club youth academies (age 9-19 years) for 2 competitive seasons. In contrast, several prospective studies have documented the injury incidence and patterns in players older than 12 years,[6,7,9-14,18-20,28] where the incidence seems to increase with increasing age.[4] Players in the 16- to 18-year age group appear to have injury incidences comparable with those of adult players.

Because of the paucity of data on injuries among children playing organized soccer, we wanted to investigate whether there are differences between children aged 6 through 12 years playing 5- or 7-a-side soccer and adolescents aged 13 through 16 years playing regular 11-a-side soccer.

MATERIALS AND METHODS

In February 2005, all soccer clubs with teams in the age group from 6 through 16 years in the districts of Hamar (population approximately 29 000) and Gjøvik (population approximately 27 000) were invited to take part in the study. Information meetings for coaches, where the aims and procedures of the study were described, were held in Hamar and Gjøvik. Of 129 eligible teams, 121 (94%) agreed to participate. These 121 teams consisted of 1879 players, 1260 boys and 619 girls, born between January 1, 1989, and December 31, 1999. Among the boys, 870 were in the age group 6 through 12 years playing 5-a-side (with 5 players on each team—1 goalie and 4 outfield players—playing on a smaller pitch with unlimited substitutions) or 7-a-side soccer (7 players on each team, somewhat larger pitch [usually half of a regular pitch], also with unlimited substitutions), and 390 players were 13 through 16 years old mainly playing 11-a-side soccer (regular FIFA rules, regular pitch size, with unlimited substitutions). The corresponding figures for girls were 350 and 269, respectively.

To monitor injuries and exposure, 13 research physical therapists were assigned to the teams during the study period from April 1 through October 31, 2005. Nine of the physical therapists were responsible for about 10 teams each, whereas 4 physical therapists only covered 2 to 3 teams each. The coaches of each team were asked to keep a running record of all injuries. They were contacted once a month by the physical therapist responsible for their club by telephone and/or e-mail and interviewed about all injuries that had occurred in their team the previous month. In addition, all organized training and matches (ie, official league, tournament, and training matches) were recorded. The physical therapists interviewed injured players and their parents by telephone to assess aspects of the injury based on a standardized injury questionnaire. The information was registered using a Web-based injury recording system.

The study was approved by the Regional Committee for Medical Research Ethics, Region Sør-Norge, as well as the Norwegian Social Science Data Services. Because all the players were under the legal age of consent, consent forms were completed by the parents for each player who was injured during the study period. In almost all cases of moderate and major injuries, the players were seen in a medical center to diagnose the injury by clinical tests, imaging studies, or surgery. In cases of minor injuries, the players were examined by a local physical therapist, by the coach, or not at all. None of the injured players were examined or treated by any of the authors or injury recorders involved in the study.

An injury was registered if it occurred during a scheduled soccer match or training session, causing the player to miss part of or the rest of the match/training session or required medical treatment. Injuries were classified as either traumatic or overuse in accordance with the FIFA consensus report on injury recording in football (soccer).[5] Traumatic injuries were defined as injuries with a sudden onset associated with a known trauma, whereas overuse injuries were defined as injuries with a gradual onset without any known trauma. Time-loss injuries were defined as injuries causing the player to miss 1 day or more of team activities following the day of injury (match and training session). Injuries were classified into 3 severity categories based on the duration of the absence (ie, until the player was fully fit to take part in all types of organized soccer play), as minor (1-7 days), moderate (8-21 days), or major (>21 days). In addition, the injury type, localization, and characteristics of the incident (tackling, running, collision) were recorded.

Exposure was recorded as match, training, and total exposure on a team basis. An exposure was defined as any game or organized practice during which an athlete was exposed to the possibility of an injury. The coaches reported the number of training hours, the average attendance for training sessions, and the number and duration of matches. The monthly training exposure for each team was calculated based on the number of training hours multiplied by the average training attendance for each team. Match exposure was calculated as the number of matches multiplied by the duration of each match (eg, 2 × 25 minutes) multiplied by the number players on the pitch (ie, 5, 7, or 11 players), and the sum in minutes was divided by 60 to get match exposure in hours.

Injury incidences were calculated as the number of injuries during the study period and divided by sum of exposure expressed as 1000 player hours of match, training, or total exposure, respectively. Injury incidences are presented with their 95% confidence intervals (95% CI). SPSS for Windows (version 13.0) was used to compute descriptive statistics. A z test based on the Poisson model was used to compare the rate ratio between gender (male vs female) and age groups (children vs adolescents). Rate ratios are presented with their 95% CI.

RESULTS

During the 2005 season, there were 200 injuries affecting 159 (8.4%) of the 1879 players covered by the study. Of these, 153 (76.5%) were traumatic injuries. A total of 147 (73.5%) injuries were reported among boys, of which 115 (78.2%) were traumatic injuries. Among the girls, a total of 53 (26.5%) injuries were reported during the season, and of these 38 (71.7%) were traumatic injuries.

Boys had an overall incidence of traumatic injuries of 2.2 (95% CI, 1.8-2.6) injuries per 1000 playing hours, whereas girls had an overall incidence of traumatic injuries of 2.0 (95% CI, 1.4-2.5) per 1000 playing hours (Table 1).

The injury rate was significantly higher for both genders during matches than during training (overall rate ratio match vs training, 11.9 [95% CI, 8.0-17.6]; boys, 12.4 [95% CI, 7.8-19.7]; girls, 10.5 [95% CI, 5.0-22.3]; all with $P < .001$), whereas no gender difference was found (rate ratio boys vs girls, 1.2 [95% CI, 0.8-1.8], $P = .23$; for matches, 1.2 [95%, 0.8-1.8], $P = .23$; training, 1.0 [95% CI, 0.5-2.2], $P = .31$).

The overall injury incidence was significantly higher (relative risk, 1.7; 95% CI, 1.3-2.2) among older players (13-16 years, 2.6 injuries per 1000 hours; 95% CI, 2.2-3.0) than among younger players (6-12 years, 1.6 injuries per 1000

TABLE 1
Exposure, Number of Injuries, and Injury Incidence for Traumatic Injuries in Matches and Training Sessions Among Female (n = 591) and Male (n = 1288) Players During the 2005 Season

	Match			Training		
	Exposure, h	No. of injuries	Incidence[a]	Exposure, h	No. of injuries	Incidence[a]
Boys	16 960	92	5.4 (4.3-6.5)	50 097	23	0.5 (0.3-0.6)
Girls	6349	29	4.6 (2.9-6.2)	20 769	9	0.4 (0.2-0.7)
Total	23 309	121	5.2 (4.3-6.1)	70 866	32	0.5 (0.3-0.6)

[a]Incidence is reported as the number of injuries per 1000 player hours with 95% confidence intervals.

TABLE 2
Distribution of Injuries Among Boys and Girls With Respect to Age Groups[a]

	Boys			Girls		
	6-12 y[b] (n = 894)	13-16 y[c] (n = 394)	RR	6-12 y[b] (n = 298)	13-16 y[c] (n = 293)	RR
All injuries, n	52	95		15	38	
Incidence	1.6 (1.2-2.0)	2.8 (2.2-3.3)	1.8 (1.3-2.4)	1.4 (0.7-2.2)	2.3 (1.6-3.0)	1.6 (0.9-1.9)
Traumatic injuries, n	44	71		11	27	
Incidence	1.3 (0.9-1.7)	2.1 (1.6-2.6)	1.6 (1.1-2.3)	1.0 (0.4-1.7)	1.6 (1.0-2.2)	1.6 (0.8-3.1)
Overuse injuries, n	8	24		4	11	
Incidence	0.2 (0.1-0.4)	0.7 (0.4-1.0)	2.9 (1.3-6.4)	0.4 (0.0-0.8)	0.7 (0.3-1.1)	1.7 (0.6-5.5)

[a]Injury incidences are reported as the number of injuries per 1000 player hours with 95% confidence intervals (CI) indicated in parentheses. Relative risks (RR) between the youngest and oldest age groups are calculated with 95% CIs in parentheses.
[b]Players in these age groups played mainly 5- and 7-a-side soccer.
[c]Players in these age groups played mainly 11-a-side soccer.

hours; 95% CI, 1.2-1.9). There was also a significantly higher injury incidence of all injuries and of traumatic injuries among the older boys compared with the younger boys, and a similar trend was seen among the girls (Table 2).

The distributions of injuries by body location, injury type, and injury mechanisms are shown in Table 3. For all groups, injuries to the lower body dominated. There were no significant differences between the older and younger boys with respect to body location, contact and noncontact injuries, injury types, and injury mechanisms, nor were there any significant differences in distribution between the older and younger girls. When the older boys and older girls were compared, we found that groin injuries were more common among boys ($P = .05$). Otherwise, there were no significant differences between the older boys and the older girls with respect to body location, contact and noncontact injuries, injury types, or injury mechanisms. In the youngest group, upper body injuries were more common among girls ($P < .05$). Except for this, there were no differences between the younger boys and the younger girls in body location, contact and noncontact injuries, injury types, or injury mechanisms (Table 3). The severity of traumatic injuries is shown in Table 4. In all groups mild injuries with a time loss of 1 to 7 days dominated, but the distribution differed significantly between age groups, with fewer major injuries among younger players ($P = .03$). The distribution of injury type versus injury location for the 27 major, traumatic injuries is shown in Appendix 1 (available in the online version of this article at http://ajs.sagepub.com/supplemental/). There was only one ACL injury, to a girl in the oldest age group.

There were a total of 47 overuse injuries, 32 among the boys and 15 among the girls (see Table 2). The most common overuse injury type among the boys was knee injury (n = 17). Among the girls, the knee (n = 4) and the calf (n = 4) were the most common locations of overuse injuries. Of the 45 overuse injuries recorded, 39 (87%) caused time loss from training and/or competition; 11 for 1 to 7 days, 6 for 8 to 21 days, and 22 for more than 21 days.

DISCUSSION

The main finding of this study was that there were few injuries among children and adolescents playing organized soccer in the districts of Hamar and Gjøvik during the 2005 season, especially in the age group 12 years or younger. In fact, only 4 serious injuries (ie, causing an absence from sports of ≥21 days) were reported among 1192 players younger than 12 years during the entire soccer season. These are important findings, because numerous reports have documented that the injury risk among elite and professional players is very high,[1,2,8,26,27] and this may dissuade parents from allowing their children to play soccer. The

TABLE 3
Distribution of Traumatic Injuries in Boys and Girls Shown by Age Groups[a]

	Boys (n = 1288)		Girls (n = 591)	
	6-12 y (n = 894)	13-16 y (n = 394)	6-12 y (n = 298)	13-16 y (n = 293)
Body location				
Head	7 (16)	9 (13)	1 (9)	2 (7)
Upper body	2 (5)	7 (10)	3 (27)	6 (22)
Lower body				
Hip	0	1 (1)	1 (9)	0
Groin	2 (5)	9 (13)	0	0
Thigh	4 (9)	14 (20)	0	3 (11)
Knee	7 (16)	5 (7)	3 (27)	5 (19)
Calf	5 (11)	8 (11)	1 (9)	0
Ankle	12 (27)	10 (14)	1 (9)	7 (26)
Foot	5 (11)	8 (11)	1 (9)	4 (15)
Player interaction				
Contact	28 (64)	44 (62)	7 (64)	16 (59)
Noncontact	16 (36)	27 (38)	4 (36)	11 (41)
Injury type				
Contusion	17 (39)	33 (46)	5 (45)	8 (30)
Sprain	10 (23)	14 (20)	3 (4)	12 (44)
Strain	7 (16)	16 (23)	1 (9)	2 (7)
Fracture	3 (7)	3 (4)	0	2 (7)
Other	7 (16)	5 (7)	2 (18)	3 (11)
Injury mechanisms				
Tackling duel	19 (43)	19 (27)	6 (55)	8 (30)
Heading duel	0	5 (7)	0	1 (4)
Running	10 (29)	20 (28)	0	7 (26)
Collision with other player	7 (13)	15 (21)	0	6 (22)
Collision other	1 (2)	0	0	0
Falling	1 (2)	4 (6)	1 (9)	1 (4)
Other	6 (14)	8 (11)	4 (36)	4 (15)

[a]The exact numbers of injuries are indicated, with percentages in parentheses.

TABLE 4
Severity of Traumatic Injuries Shown by Gender and Age Groups[a]

	Boys		Girls	
	6-12 y (n = 894)	13-16 y (n = 394)	6-12 y (n = 298)	13-16 y (n = 293)
No absence	15 (34)	2 (3)	1 (9)	0
Mild (1-7 d)	19 (43)	36 (51)	6 (55)	11 (41)
Moderate (8-21 d)	6 (14)	17 (24)	4 (36)	9 (33)
Major (>21 d)	4 (9)	16 (22)	0	7 (26)

[a]The exact numbers of injuries are indicated, with percentages in parentheses.

current results suggest that organized 5- or 7-a-side soccer for children 12 years or younger is associated with a very low risk of injury.

One possibility is, of course, that we have underestimated the injury risk, attributable either to underreporting injuries or overestimating training or match exposure. We used the same injury registration system as in previous studies,[17,23,24] based on monthly reporting forms and coach interviews to record exposure and to detect injuries. Injured players were then interviewed in person about the characteristics of the injury. Because many of the youngest teams we followed only trained once a week, most minor injuries would have been missed entirely. We only detected 17 injuries without time loss among 1260 boys and only 1 injury among 619 girls during the entire season, which clearly indicates that our estimate of injuries not causing significant time loss from sports is much too low. On the other hand, we have previously shown that monthly reporting using the same procedures as in the current study identifies moderate and major injuries in lower level adolescent team handball.[16]

The other main findings were as expected from previous studies,[†] namely that the majority of injuries were acute, mild, or moderate; affected the lower extremity; and were mainly caused by player-to-player contact.

It is difficult to compare our results directly with previous studies on youth and children.[‡] Some of these have been conducted during tournament play, which does not take into account training injuries. Moreover, registration methods, study designs, and injury definitions vary between

[†]References 6, 7, 9-14, 18-20, 23, 24, 28.
[‡]References 9, 10, 13, 14, 20-22, 25, 28.

TABLE 5
Risk of Traumatic Time-Loss Injuries Expressed as Number of Time-Loss Injuries, Injury Incidence, Player Exposure, and Number of Time-Loss Injuries Per Team Per Season for Female Players in Different Age Groups[a]

			Match		Training		Player Exposure			Injuries Per Season Per Team (16 players)		
Age Group	Study	Sample, N	Exposure, h	Injuries, n	Exposure, h	Injuries, n	Match, h/player	Training, h/player	Total Incidence, n/1000 h	Match, n	Training, n	Total, N
Elite (17-34 y)	Tegnander et al[26]	181	3663	89	26 956	100	20	149	6.2	7.9	8.8	16.7
Youth (16-17 y)	Steffen et al[24]	2020	41 311	343	101 410	113	20	50	3.2	2.7	0.9	3.6
Youth (13-16 y)	Present study	293	4595	19	12 290	8	16	42	1.6	1.0	0.4	1.5
Children (6-12 y)	Present study	298	1752	9	8479	1	6	28	1.0	0.48	0.05	0.54

[a]The calculations are based on results from the present study as well as 2 previous reports from Norwegian female soccer using similar injury recording methodology and injury definitions.

studies. However, we used the same methodology in 2 recent studies on female soccer, 1 in the elite national league[26] and 1 among 16- to 17-year-old players.[24] This permits an interesting comparison between female soccer players in different age groups, as shown in Table 5.

Injury risk should be compared not only as the relative injury risk (ie, where the injury risk is expressed as a rate corrected for exposure, usually the number of injuries per 1000 playing hours) but also as the absolute injury risk (ie, expressed as the total number of injuries to a player or team during a season). When the relative risk (ie, the injury incidence) is compared, players at the elite level have an injury risk that is approximately twice as high as that for 16- to 17-year old youth players (6.2 vs 3.2 injuries per 1000 hours), about 4 times that of 13- to 16-year old players (1.6), and about 6 times that of 6- to 12-year old girls. However, when the absolute injury risk is compared, these differences are amplified. The reason for this is that older players play more games and train much more than younger players, as illustrated in Table 5. Therefore, the absolute injury risk among elite female players is about 5 times higher than that of 16- to 17-year old youth players (16.7 vs 3.6 injuries per team of 16 players per season), about 11 times that of 13- to 16-year old players (1.5), and about 30 times that of 6- to 12-year old girls (0.5) (see Table 5). In other words, the total injury risk among young girls playing soccer is very low, much lower than at the elite level.

Whether the lower injury rate among the youngest children reflects general differences in player characteristics or playing style between age groups or is a result of differences between playing mainly 5- or 7-a-side soccer on a smaller field versus 11-a-side soccer on a regular-size pitch cannot be determined from the current study. Playing 11-a-side obviously alters playing style and may change the interaction between players. However, the explanation may simply be that regardless of tactics or pitch size, older players are faster, stronger, and bigger, which increases the potential for collisions and tougher player-to-player contact. In fact, Emery[4] showed in a recent review that adolescents (>13 years) are at a greater risk of injury than younger children across all sport studies.

The results clearly show that efforts to prevent injuries should be focused on the older groups playing 11-a-side soccer. Injury prevention takes time and requires resources. Therefore, spending time on specific injury prevention programs among the youngest, who often only train once a week, will probably not be realistic. On the other hand, it could be argued that it is important to develop good habits, for example, by using appropriate warm-up programs and correct playing technique and focusing on fair play attitudes from an early age.

The present study shows that among children playing 5- or 7-a-side soccer, injuries are few and rarely serious. Soccer is a safe sport for children.

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