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Soccer injuries and recovery in Dutch male amateur soccer players: results of a prospective cohort study

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Abstract

Objective: To describe characteristics of outdoor soccer injury and recovery among Dutch soccer players.
Design: Prospective cohort study.
Setting: The 2009-2010 competitive season (33 weeks).
Participants: 456 Dutch male soccer players of 23 amateur teams.
Main outcome measures: Coaches recorded individual exposure to all soccer activities. Paramedics or sports trainers collected information on the occurrence (e.g. location, type, circumstances) and consequences (e.g. absenteeism, medical treatment) of injuries.
Results: In total 424 time-loss injuries were sustained by 60% (n=274) of the players, with 23% (n=105) having more than one injury. This corresponds to an overall density of 9.6 (8.7-10.5) injuries per 1,000 player hours; 3.9 (3.3-4.7) in training sessions and 20.4 (18.1-23.1) in soccer matches. Almost 30% (n=123) of the injuries lasted for more than one month, 14% (n=58) were re-injuries (causing longer absence than new injuries), and 54% (n=230) of the injuries were given medical treatment. The most common diagnoses were muscle/tendon (38%) or joint/ligament injuries (23%) of the lower extremities. After regaining the ability to fully take part in soccer training or matches, 27.4% of the players (n=116) still reported complaints.
Conclusions: Two recommendations based on the above-mentioned results are (1) prevention should primarily focus on these most common diagnoses and (2) players resuming soccer activities after an injury should be given special attention, to resolve the remaining complaints and to prevent re-injuries.

Key words: soccer, injuries, recovery, epidemiology, amateur, incidence.

Introduction

Soccer is one of the most popular sports worldwide and the incidence rate of outdoor soccer injuries is among the highest of all sports, particularly for adult male soccer players.[1-3] Overall injury incidences reported for adult male amateur soccer players range from 4.3 to 29.6 injuries/1,000 soccer hours,[4-6] while specific injury risks for training and matches range from 2.0 to 11.2 and from 11.4 to 44.6, respectively.[4,7,8]

In 2011, there were more than 1.2 million licensed members of the Royal Netherlands Football Association (KNVB), 45% of whom were adult male soccer players (www.knvb.nl). Outdoor soccer, played by approximately 2,660 clubs in the Netherlands, causes the largest number of injuries each year (18% of all sports injuries), totalling approximately 620,000.[9]

One useful model in developing effective prevention strategies is the "sequence of prevention" model by Van Mechelen et al.[10]. Its first phase involves identifying the magnitude of the sports injury problem and describing in terms of incidence and severity. Secondly, the factors and mechanisms contributing to the occurrence of the sports injuries have to be identified.[10] In 2006, Fuller and colleagues published a consensus statement on injury definitions and data collection procedures in studies of soccer injuries.[11] To our knowledge, only a few previous studies on adult male amateur soccer players followed this standard.[4-6,12,13] Most studies on soccer injury epidemiology were conducted with professional or youth players. The vast majority of the available epidemiological studies limit their information to the injury characteristics and circumstances at the moment the injury occurs and detailed information about injury recovery is lacking. In view of the negative consequences of injuries, like suffering of the injured players and their team, medical costs, sports and/or work absenteeism, and financial loss due to these injuries, it is important to collect and present data about injuries and the corresponding recovery period. The present prospective study aimed to provide insight into injury characteristics as well as the recovery period of the injuries, by examining outdoor soccer injuries sustained by Dutch adult male amateur soccer players during one competitive season.

Methods

The data for this prospective cohort study were obtained from a cluster-randomized controlled trial (RCT) comparing the injury incidences between an intervention group that used a special training program (called "The11" [4,14]) during warm-up and a control group training as usual. The study protocol was approved by the Medical Ethics Committee of the University Medical Center Utrecht (reference number 08/263). The trial design, the intervention program, and the results of the trial have been described in detail elsewhere.[9,15] Teams from two geographically separated districts in the second highest Dutch amateur soccer league were invited to participate. Data on injuries and exposure were collected during the entire 2009-2010 competitive season, from the first competition match in September until the last regular competition match of the season in May (33 weeks).

Male soccer players, aged between 18 and 40 years, were eligible for inclusion. They generally had two or three practice sessions and one match each week. Players who were injured at the start of the season were included in the study, but that injury was not incorporated into the results. Also players who left the team during the season were included, based on the time they spent on the team. All players provided written informed consent at the start of the study.

During the pre-season period (August 2009), all players were asked to complete a questionnaire to record baseline characteristics. Data recorded were age, self-reported height

and weight, player position, years of experience as a soccer player, and soccer injuries sustained during the previous year (number and location). All coaches reported individual player exposure to practice sessions and matches (in minutes) on a weekly basis, using a computer-based recording form. When a player was not present at a regular practice session or game, the reason for his absence was reported on the exposure form as "injured" or "other".[16] Training exposure was defined as team-based and individual physical activities under the guidance of the team's staff. Match exposure was defined as play between teams from different clubs.[11] The team paramedic or sports trainer (an individual who is trained in the prevention and immediate treatment of athletic injuries and who was present at every training session and match of his/her team) was responsible for recording all the injuries occurring during organized soccer activities, using the Web-Based Injury System (BIS) developed by the Netherlands Organization for Applied Scientific Research (TNO). For more information about this system, we kindly refer to the study protocol.[15] BIS includes all categories needed to enter data according to the basic guidelines of the consensus statement on injury definitions and data collection procedures in soccer.[11] When a player sustained an injury he was asked to complete a questionnaire about the injury incurred. Generally, the paramedic asked the player the questions according to the items of the so-called injury form, to collect the information about the injury sustained. Subsequently, the paramedic entered this data into the online system. The injury form comprised questions to collect epidemiological information on injuries (e.g. location, duration, severity, and type) and mechanisms (circumstances of the injury: contributing factors like contact, jumping, and weather conditions). Following the recovery period, a so-called recovery form had to be completed when the player was once again able to fully take part in soccer training or matches. This form was used to record information concerning the final diagnosis (in some cases after additional diagnostics); consequences of injuries, like work/school/sports absenteeism; and the amount and type of medical treatment (e.g. physical therapy, surgery). To avoid discrepancies or missing information the paramedics were instructed to enter the information about injuries and recovery as soon as possible. If, after one week, the information was not available in the online system the paramedic was contacted by the researchers to remind him to enter the data into the system. Subsequently, the injury form was collected immediately after an injury was sustained, while the recovery form was collected at the end of the recovery period, after possible additional diagnostics and/or consultations with a therapist and/or specialist. Injuries were recorded using the following time-loss definition, in accordance with the consensus statement: "any physical complaint sustained by a player resulting from a soccer match or soccer practice session, and leading to the player being unable to fully take part in a soccer activity on the day after the injury".[11] A recurrent injury was defined as: "an injury of the same type and at the same site as an index injury and which occurs after a player's return to full participation from the index injury" and a medical attention injury as: "an injury that results in a player receiving medical attention, i.e. an assessment of a player's medical condition by a qualified medical practitioner". Injuries were classified according to their severity, based on the number of days of absence from soccer: minimal (1-3 days); mild (4-7 days); moderate (8-28 days); severe (>28 days); or career ending.[11]

The statistical procedures were performed with SPSS 20 (SPSS Inc, Chicago, Illinois). Baseline characteristics measured as continuous variables were expressed as mean and standard deviation (SD). Ordinal or categorical variables, such as injury severity and injury history, were expressed as absolute numbers and percentages. The baseline data from dropouts and players with complete follow-up were compared using a univariate T-test for the continuous parameters, and χ^2 analysis for categorical parameters. Injury density per 1,000 hours of soccer participation (I) was calculated as I=(n/e)*1,000, where n is the number

of soccer injuries and e the total exposure time expressed as total hours of soccer participation. The Poisson model was used to obtain 95% confidence intervals (95% CI). The following injury variables were analyzed: density, characteristics, circumstances, and consequences. Because of the skewed distribution, injury absenteeism is presented as median and interquartile range (IQR). The categorical parameters representing injury characteristics and injury circumstances are expressed as percentages. Since no effects of the intervention program were found compared to the control group [9], the analyses did not factor in group assignment, meaning that the intervention was not a covariate for injuries.

Results

The final sample consisted of 456 players from 23 teams. Baseline mean characteristics were: age 24.8 ± 4.2 years; height 1.83 ± 0.06 m; weight 78.2 ± 7.5 kg; BMI 23.3 ± 1.8 kg/m^2; soccer experience 17.5 ± 4.5 years. Almost 70 percent of the players (n=300, 69.0%) reported a soccer injury in the year prior to the start of this study, and 52 players (11.4%) were injured at the start of the season. During the season, 29 players (6.4%) dropped out, mostly because they ended their soccer career or changed their team or club. Baseline characteristics did not differ significantly between dropouts and players with complete follow-up.

The total practice time during the season was 31,518 hours, and the total time spent in matches was 12,734 hours, resulting in a total exposure time of 44,252 hours. During the 33 weeks of the competition season, the mean numbers of hours of practice and match playing per player were 69.1 ± 21.0 and 27.9 ± 10.7, respectively.

A total of 424 time-loss injuries were recorded, affecting 274 of the 456 players (60.1%). This resulted in an overall injury density of 9.6 (8.7-10.5) injuries per 1,000 player hours; 3.9 (3.3-4.7) during training sessions and 20.4 (18.1-23.1) during matches. A team sustained an average of 0.7 injuries per match. More details regarding injury densities are presented in Table 1.

Of the injured players, 169 (61.7%) sustained one injury, and 105 (38.3%) sustained more than one injury: 74 players (16.2%) were injured twice, 23 players (5.0%) 3 times, 3 players 4 times, 4 players 5 times, and 1 player 6 times during the season. Fourteen percent (n=58) of the injuries were classified as recurrent injury, mostly affecting the posterior upper leg (n=14) and ankle (n=11). Fifty-three percent (n=31) of these injuries occurred within two months of a player's return to full participation ("early recurrence").

Most of the injuries were acute (n=318; 75.0%) and happened during a match (n=260; 61.3%). Possible contributing factors leading to an injury are listed in Table 2. The most commonly mentioned factors were: contact with other player (n=159; 40.2%), distortion (n=60; 15.2%), and turning/twisting (n=53; 13.4%). Injuries were most frequently located in the lower extremities (n=362; 85.4%). The most commonly injured body parts (n=406) were the ankle (n=77; 18.2%), posterior upper leg (n=65; 15.3%), knee (n=64; 15.1%), groin (n=43; 10.1%), and anterior upper leg (n=42; 9.9%). Affected body parts with corresponding injury types are listed in Table 3; locations and types are cross-tabulated in Table 4. The most common diagnoses were lower limb muscle/tendon injuries (n=154; 37.9%) and lower limb joint/ligament injuries (n=95; 23.4%), especially ankle sprains and posterior thigh strains.

Injury time loss ranged from 2 to 407 days, with a median of 16 days and a interquartile range of 30. Recurrent injuries caused longer average absence (median = 24 days, IQR = 35) than first-time injuries (median = 16, IQR = 30). Knee injuries had the most serious consequences in terms of days of absence from soccer play: the rehabilitation of a knee injury took an average of 53 days (median = 25, IQR = 51.5). Almost 30% of the injuries (n=123; 29.0%) lasted for more than one month. Injury severity is specified in Table

3. Four players (0.9%) end their soccer career because of an injury; three of them had sustained an anterior cruciate ligament (ACL) injury. One out of 20 injuries (n=19, 4.5%) caused the player to be absent from school or work (median = 5 days, IQR = 12). After regaining the ability to fully take part in soccer training or matches, 27.4% of the players (n=116) still reported complaints (mostly pain, but also swelling, strength reduction, or instability).

The most common treatments after sustaining an injury included ice/cooling, physical therapy, and adjusted training/ exercises (Table 5). Fifty-four percent of the injuries (n=230) were given medical treatment. Additional diagnostics (like ultrasound, radiographs, MRI-scans, CT-scans) were performed in 10.1% of all injuries (n=43). Several care providers treated the players during their recovery phase. Different treatments and care providers are specified in Table 5. Three percent of the injuries (n=14) were followed by hospitalization.

Discussion

The main findings of this study were that almost 60% of Dutch amateur soccer players sustained at least one injury during one competitive soccer season, and approximately one third of these injuries resulted in absence from soccer play for at least one month.

The injury densities in training sessions and matches in our study are consistent with data reported from other adult male amateur soccer cohorts.[4,5,7] Other outcomes are also comparable to those of previous prospective studies in male amateur and professional soccer, which found an approximately 5 times higher injury density in matches than in training sessions [8] and a longer absence from soccer play for re-injuries than for new injuries.[17,18] Because 3 (out of 4) players in our study who end their career had sustained an ACL injury, it is evident that prevention of ACL injuries is important, as has also been reported for other cohorts.[19] Such injuries, as well as other serious knee injuries, result in long rehabilitation periods. The absence of an injured player may have an adverse influence on the player himself, on the team, and also on society, in view of the associated health care costs.[20,21]

Compared to previous studies,[8,18] we found a lower re-injury rate (14%, n=58). Junge & Dvorak [8] reported a re-injury rate of 20-25% for male players in their review, and several Scandinavian studies in professional soccer found early re-injury rates between 12% and 30%. Ekstrand et al.[18] stated that the low rate of 12% (observed in European professional teams) could be due to better medical support in these clubs, providing more personalized rehabilitation to injured players. Although, this was not the case for the present study population, it is conceivable that the paramedics in our study were more aware of rehabilitation and/or prevention of (recurrent) injuries, owing to their participation in the trial.

In terms of phase two of the prevention sequence model,[10] the most important contributing factors for male amateur soccer players (Table 2) were contact with another player, distortion, and turning/twisting. Reducing the number of contact injuries might be achieved by changing the rules of the soccer game and/or to work for stricter rule enforcement by the referee.[7,22-24] Unfortunately, we did not collect information about foul play, or yellow and red cards during/after the eliciting event. This information could be valuable to specify the contact situations leading to injuries and indicate the possibility of reducing them by changing rules. The frequency of the other contributing factors (distorting/turning/twisting) might be reduced by means of appropriate exercises to improve the stability of ankles and knees, and/or core stability.

In view of the expected large number of injuries in this study, it was impossible to have the injury diagnosis verified by an independent medical doctor. However, the recording and diagnosing of injuries were assumed to be highly reliable. Using the definitions in the

consensus statement by Fuller et al.[11], injuries were recorded primarily by well-trained paramedics. Any injury that may have been missed was likely to be recorded in the weekly exposure form by the coaches. In case of any inconsistencies between the two recordings on the absence of a player due to injury, a member of the research staff contacted the coach and/or paramedic to verify the absence. Given these procedures, reporting bias and underreporting should have been minimal. Nevertheless, if underreporting was the case, it could apply for minor injuries and/or overuse injuries. Since the participants in our study only have soccer activities 2-3 times a week. As a result, minor injuries may have been missed, as players may have recovered from their injuries in the meantime. In addition, due to the use of the time-loss injury definition, it is likely that some overuse injuries do not lead to time being lost from sport.[26,27]

In line with the above, a strength of this study is that we followed the injured players until return to play. This enabled us to collect data about the recovery period. An additional advantage of this extensive follow-up period was that the final diagnosis in the recovery form was more precise than the first diagnosis in the injury form. In view of the amateur status of our study sample medical support for the teams was generally limited, which may have caused delays in diagnosis. It should be noted that the injury form was collected immediately after an injury was sustained, while the recovery form was collected at the end of the recovery period, after possible additional diagnostics and/or consultations with a therapist/specialist. Nevertheless, several injured players (10%) were lost to follow-up before their return to play, so the supplementary information from the recovery form was missing. We used the first diagnosis from the injury form to report the injury characteristics. Another strength of our study is that we gathered information prospectively, according to the international consensus statement by Fuller et al.[11], in a homogeneous subpopulation (high-level amateurs) of more than 450 players within the largest group of active participants in soccer worldwide, viz. male adult soccer players.

Conclusions

The main findings of this study were that almost 60% of the Dutch adult amateur players in our study became injured during one season, with muscle/tendon (38%) or joint/ligament injuries (23%) of the lower extremities as the most prominent injuries. Consequently, prevention should primarily focus on these most common diagnoses. In addition, 14% of the injuries were re-injuries and these caused longer absence than new injuries. Also, as more than 1 in 4 players (27%) still reported complaints after regaining the ability to fully take part in soccer activities, players resuming soccer activities after an injury should be given special attention to resolve the remaining complaints and to prevent re-injuries. Furthermore, numerous soccer injuries had substantial consequences, as almost 30% lasted for more than one month, and 54% were given medical treatment. Finally, it would be interesting to compare research findings on contributing factors for different ages, genders and skill levels. Such comparisons could be useful to determine what prevention strategies are effective for specific study populations.

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