Injuries in Soccer (Football) Referees of Santa Catarina State

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ABSTRACT

Da Silva AI, Paes MR, Oliveira MC. Injuries in Soccer (Football) Referees of Santa Catarina State. JEPonline 2014;17(5):21-30. Sports injuries among athletes are highlighted in studies about soccer. By comparison, it has long been thought that football referees are equally susceptible to the same injuries as the football players. Thus, the purpose of this study was to analyze the situations where professional soccer referees suffer injuries. The sample consisted of 101 male referees from the Santa Catarina Soccer Federation. Three situations were evaluated as to an increase in the referees’ susceptibility to an injury, and whether the injury would be considered a sports injury. The situations included during a physical evaluation, a training session, and a match. Thirty-six referees (35.6%) reported that they had suffered 54 injuries during their career. Fifty-four injuries were identified. The referees reported 10 sprains, 19 strains, and 2 fractures. The assistant referees reported 5 sprains, 15 strains, 1 fracture, 1 dislocation, and 1 contusion. Thirty-nine percent (21) of the injuries occurred during the referees’ training session. The findings indicate that while football referees suffer few injuries during the game, they do in fact suffer injuries during the training session or during physical tests. Therefore, the associations should be more responsible for the development of preventive training programs in the referee’s routine preparation for refereeing

Key word: Referees, Soccer, Injuries, Training
INTRODUCTION

According to the International Federation of Association Football (FIFA), there are approximately 270 million people directly involved with soccer of which 840,000 are referees and assistant referees. Ninety-four percent are men and 6% are women. Interestingly, since 2000, the number of referees has increased by 17% (5). In Brazil, there are more than 25 agencies representing the soccer referees and, depending on the state, there are at least two entities.

The soccer referee can be considered the 23rd player (6). Fortunately, for safety and ethical play in soccer, the scientific community has increased its study of referees. However, the number of scientific studies on football referees is still very small, especially when compared to the volume of studies with soccer players (11). The anthropometric profiles, movement patterns, physiological demands during startup, and physical tests of referees and assistant referees have been evaluated in numerous studies (11). However, there are few studies on the prevention of injuries in soccer, due to lack of solid evidence about the risk factors and injury mechanisms at different levels of refereeing (1).

Several studies have reported the incidence of injuries in soccer referees. The authors’ of these studies evaluated Suisse referees (3,4), FIFA international referees (5), and Brazilian soccer referees (25). Bizzini et al. in 2009 and 2011 (3,4) and Bizzini and colleagues (5) determined the injury incidence while refereeing during the game or during the physical training sessions. The Brazilian study by Paes et al. (25) expanded the investigative field. They sought to identify the injuries that occurred beyond the playing field and during the training sessions as well as the injuries that affected the referees during the physical tests imposed by the sports entities to which referees were affiliated.

The battery of physical tests developed by FIFA to evaluate the soccer referees is controversial. It is also a very contentious issue that was the focus of studies by Castagna et al. (8), Cerqueira et al. (9), and Weston et al. (30). However, we are aware of only one study that identified the incidence and the type of injuries referees are exposed to during the physical tests applied by the federations and confederations. In addition, many of the studies with referees in Brazil were carried out in the Paraná state. There is little to nothing is known about the incidence of injury and/or type of injuries that referees from other states are exposed to. Therefore, the purpose of this study was to analyze the frequency, circumstances, and characteristics of injuries sustained by soccer referees of the state of Santa Catarina Soccer Federation (FCF) during the game, training, and/or physical test.

METHODS

Subjects

The procedures used in this retrospective study are consistent with Resolution 196/96 of the National Health Committee. Also, the procedures were approved by the Research Ethics UEPG (Resolution 49/2007). The study population consisted of referees and assistant referees accredited by the Santa Catarina Soccer Federation (FCF).

The sample consisted of 101 male soccer referees. Forty were field referees and 61 acted as assistant referees. The data were collected from the referees and assistant referees who voluntarily answered the interview during preseason, which was organized by the Union of Football Referees of Santa Catarina (SINAFESC) in early 2011 in the city of Florianópolis (Santa Catarina - Brazil). A semi-structured questionnaire was administered to the subjects during an interview by an experienced researcher.
The questionnaire was proposed by Paes et al. (25). The questions were standardized in order to precisely characterize the activities related to refereeing to account for only the sports injuries that occurred in the three situations previously defined as: (a) during a soccer match; (b) during physical training; and (c) during the physical tests applied by the FCF or Brazilian Soccer Confederation (CBF). Injuries that occurred outside these three conditions were discarded. Moreover, the referees were asked how many times they trained during the week, whether a professional monitored the training, the average duration of the training sessions, when they began to officiate, and whether they practiced soccer as a professional, amateur, or as a hobby before becoming a referee.

The definition of injury used in the present study was previously proposed by the Union of European Football Associations (UEFA) (15), which was defined as pain or a complaint that resulted in the removal from training, a physical test, or official refereeing. Five types of injuries were considered: strain, dislocation, sprain, fracture, and contusion. The questionnaire also allowed for identifying the injured referee who sought medical aid and physiotherapy. Finally, it was possible to collect the necessary data to determine Body Mass Index (BMI).

The physical test applied by FIFA to measure aerobic capacity consisted of 20 rounds of 150 m in 30 sec with intervals of a 50-m walk in 40 sec. Anaerobic capacity was measured by applying six sprints of 40 m. The exposure time in training was calculated based on the information provided by referees during the interview. The exposure time in the physical tests was calculated in the same way. However, in consideration of the fact that the FCF referees are tested twice a year by the refereeing department, the FCF information was used to calculate the time spent in this situation. On the other hand, if the data had not been stored, the exposure time in the matches was not calculated. The risk of injury per 1000 hrs was calculated as 1000 x number of injuries divided by the total number of hours spent in each of the aforementioned (21).

Statistical analysis was performed using SPSS (version 11, SPSS Institute, Chicago, Illinois). For statistical processing of the data, descriptive statistics was initially used to group results in values of mean, standard deviation, and percentage. Due to the small number of subjects analyzed, we adopted the logarithmic conversion to non-standard variables, according to the Gaussian curve in order to use parametric statistical parameters. The t test for independent samples was used to evaluate the data. An alpha level of P ≤ 0.05 was used to establish statistical significance.

RESULTS

The subjects’ main of age, weight, and height were 29 ± 7.55 yrs old, 77 ± 10.18 kg, and 1.79 ± 0.06 m, respectively. The subjects’ BMI was 24.30 ± 2.59 kg·m⁻². Table 1 presents the anthropometric evaluation of referees separated by function. Statistical analysis of the anthropometric data between the referees and the assistant referees demonstrated a statistically significant difference between the variables body weight (P = 0.0072) and height (P = 0.0007).

Table 1. Anthropometric Evaluation of Referees from Santa Catarina State by Function.

<table>
<thead>
<tr>
<th></th>
<th>Age (yrs)</th>
<th>Weight (kg)</th>
<th>Height (m)</th>
<th>BMI (kg·m⁻²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Referees (N = 40)</td>
<td>M ± SD</td>
<td>30 ± 6.0</td>
<td>80 ± 8.9*</td>
<td>1.80 ± 0.1*</td>
</tr>
<tr>
<td>Assistants (N = 61)</td>
<td>M ± SD</td>
<td>29 ± 8.5</td>
<td>75 ± 10.4</td>
<td>1.77 ± 0.1</td>
</tr>
</tbody>
</table>

*Statistical difference between referees and assistant referees
From the entire sample (N = 101), 36 subjects (35.6%) reported they had suffered 54 injuries during their career. Of those injured, 26 subjects (72%) reported they obtained medical help for diagnosis. Twenty-four (67%) of the 36 subjects received physical therapy treatment.

The most prevalent injury type investigated was the strains with 34 injuries, followed by sprains with 15 injuries. Three fractures, one dislocation, and one contusion were also reported. The places most affected by injuries were posterior thigh muscles (14 injuries), followed by calf (13 injuries) and ankle sprains (10 injuries). Other places were less affected by injuries, such as strain of the anterior thigh muscles (7 injuries), knee sprain (6 injuries), tibia fracture (2 injuries), foot injury, and a dislocated ankle.

The data indicate that the referees’ injuries occurred primarily during physical training. In fact, 21 injuries occurred during training while 19 occurred during the game and 14 during the physical tests. The incidence of injury by 1000 hrs during physical tests was $314.38 \pm 383$ hrs and the incidence of injury by 1000 hrs during physical training was $1.16 \pm 1.40$ hrs.

When compared with the assistant referees, it is clear in Figure 1 that the referees suffered more injuries during the physical training (13 x 8) and during the matches (11 x 8). During the physical tests, both the referees and the assistant referees had the same number of injuries.

![Figure 1. Situations Where the Referees and Assistant Referees Suffered Injuries.](image-url)

The referees reported the incidence of $515.35 \pm 555.36$ injuries per 1000 hrs during the physical tests and $1.46 \pm 1.72$ injuries per 1000 hrs during training. The assistant referees had fewer injuries during the physical tests (mean, $170.83 \pm 82.60$ injuries per 1000 hrs) and $0.73 \pm 0.65$ injuries per 1000 hrs during training.

The referees reported 10 sprains, 19 strains, and 2 fractures. The assistant referees reported 5 sprains, 15 strains, 1 fracture, 1 dislocation, and 1 contusion. The different locations affected by the 5 types of injuries are shown in Table 2.
Table 2. Types and Locations of Injuries in Soccer Referees in the Santa Catarina Soccer Federation.

<table>
<thead>
<tr>
<th>Injuries</th>
<th>Local</th>
<th>Referees</th>
<th>Assistant Referees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sprain</td>
<td>Ankle</td>
<td>9</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Knee</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Strain</td>
<td>Anterior thigh</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Posterior thigh</td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>Calf</td>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td>Fracture</td>
<td>Tibia</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Dislocation</td>
<td>Ankle</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Contusion</td>
<td>Feet</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

The training frequency of the referees involved in this study (N = 101) was 3.0 ± 1.1 times·wk^{-1}. The time spent in training was 60 ± 26.17 min·session^{-1}. There was no statistically significant difference in the weekly frequency and duration of each training session between referees and assistant referees (P>0.05). Seventy-seven (77) referees reported that they trained without the supervision of a Physical Education Professional.

The referees who reported some type of injury were separated into three groups by age. The first group was composed of referees aged between 20 and 29 yrs; the second group, with referees between 30 and 39 yrs; the last group was composed of referees over the age of 40. The referees over 40 yrs of age had the highest number of injuries (Figure 2). Of the 36 injured referees, 8 were 20 to 29 yrs of age with 11 reported injuries, 14 were 30 to 39 yrs of age with 21 injuries, and 14 were over 40 yrs of age with 22 injuries.

Figure 2. Number of Injuries in Each Age Group of Soccer Referees by FCF.
When the referees were asked about their experience with soccer before becoming a referee, 24% reported having practiced soccer professionally, 47% reported having practiced soccer in an amateur way, 25% said they had contact with the soccer during their leisure time, and 4% reported not have any contact with soccer (Figure 3).

![Figure 3. Experience Level of Referees as Soccer Player.](image)

**DISCUSSION**

The referees in this study were similar in age, weight, and height to the referees in the Danish (22), Italian (7), Chilean (16), Brazilian (12) and international (23) studies. The type and local of injuries presented by the referees from Federation of Santa Catarina were similar to those presented by Swiss (3,4), international (5) and Brazilian referees from Paraná state (25).

As described previously, ~36% of the 101 subjects reported that they had received an injury during their career. Given the severity of the injury to the 36 referees, twenty-six (72%) obtained medical help. Twenty-four (67%) of the 36 referees received physical therapy treatment. The highest number of injuries in the referees and assistant referees occurred during the training sessions more so than during the soccer match (Figure 1). Regarding the referees, this finding is in agreement with Paes et al. (25) and Bizzini et al. (3,5) who also reported that the referees suffered more injuries during physical training. But, in addition, Bizzini et al. (3,5) also reported that the assistant referees suffered more injuries during physical training than during the match itself. Interestingly, though, in the 2011 study by Bizzini et al. (4), the Swiss referees reported that they were injured more during the match games than during the physical training.

In regards to the types of injury, the present study offers some support of the findings in the Sul American (25) and European (3-5) referees. Paes et al. (25), Bizzini et al. (3), Bizzini et al. (4), and Bizzini et al. (5) reported that the referees and assistant referees suffered more muscle strains. All injuries were affected by the referees in the lower limb. In fact, in 2002, Junge et al. (19) investigated the injuries soccer players experienced during 64 games in the 2002 World Cup and reported that the injuries affected predominantly the knee and ankle joints and the thigh and calf muscles. Two years later Junge et al. (20) published another report that concluded 17% of the injuries occurred mainly in the ankle, 16% in the thigh, 15% in the leg, and 12% in the knee (20). In a 2011 study published in Brazil, Valente and colleagues (29) reported that injuries in soccer players
occurred primarily in the lower limb by way of sprains. These data showed that referees and players are prone to develop predominantly lower limb injuries (i.e., from the hip to the foot). Therefore, it is more than reasonable that prophylactic measures should be adopted by the referees to decrease the risk of injury.

The referees reported that the physical preparation for refereeing consisted of 60 min·session⁻¹ at an average of 3 times·wk⁻¹. The majority of the referees engaged in aerobic running to increase aerobic power and intermittent races to increase anaerobic power. The training frequency, duration, and type of physical activity used are consistent with the general recommendation for maintaining health and well-being. The referees’ training was not designed to increase physical fitness at an athlete’s level, which is consistent with the training of high class referees from Denmark who often engaged in moderate intensity aerobic racing with a distance between 3 and 7 km (22).

The soccer match was the second condition in which the referees suffered more injuries while the assistant referees showed the same number of injuries during the game and the physical training. As the studies have developed, especially in Brazil (25) and Europe (3,5), researchers have reported that field referees experienced fewer injuries during the game when compared to the number of injuries during physical training. The only exception is the work of Bizzini et al. (4).

Referees presenting a high number of injuries during the physical training versus the game represent an unusual situation, especially since the distance covered by the referees is similar to the soccer players. In fact, as reported by Hägglund et al. (15), soccer referees typically cover distances between 9 and 12 km during a match (15) while soccer players (particularly the midfielders) also cover the same distance during a match. This similarity between the total distance covered by the referees and players reinforces the idea that referees should be more physically prepared for their work (11,30). After all, soccer requires the athlete have a high level of anaerobic capacity (speed and muscle strength) to perform numerous motor actions such as during sprints with short recovery periods (26).

According to Ekstrand and Nigg (14), soccer players can suffer injuries during the game due to the use of inappropriate footwear, the unevenness of the field, and by physical contact. These factors were also mentioned by several referees during the 2006 World Cup selection as possible causes of their injuries (5). However, more often than not, when compared to the players’ injuries, the referees who receive physical contact experience less risk of acute injury (3). This is because ~50% of the acute injuries (especially with regards to the knee and ankle sprains) in soccer are caused by physical contact with another player (19). The most common injuries without contact with another player are sprains (especially the back of the leg), which are also common in referees.

The smallest number of injuries presented by both referees and assistant referees occurred during the FIFA fitness tests (Table 1). These tests are performed on a track with a smoother surface than the soccer field, which may justify the low number fractures and sprains. However, it is possible that the referees may contribute to the muscle injuries (strains), given their desire to be approved. This means at times the referees may push themselves beyond their safe physical capacity during the physical tests.

Da Silva et al. (13) evaluated 209 professional soccer referees and reported that most were rejected during the anaerobic test when it was applied before the aerobic test. After changing the order of physical tests, Da Silva (10) found that a large number of professional referees continued to fail the anaerobic test, which demonstrates that the referees were not prepared to perform an intense
anaerobic activity over a short period of time. Although there are no studies with injury data during the physical tests in European referees (3-5), such information is extremely important.

Jones et al. (17) reported that soccer referees at the national and international levels should be experienced at refereeing. The referees in the present study were on average 30 yrs old of age with 5 yrs of experience. The fact that the referees are generally 10 to 15 yrs older than the players suggests that specialized physical training is important to help minimize the likelihood of getting injured (30) while also improving their ability to conduct an official soccer match. Age is also an important consideration, especially since an increase in age is highly related to more muscular injuries (Figure 2). This point is supported by the Bizzini et al. (4) study of Swiss referees that found the older referees had a higher number of injuries than the younger referees. Similar results were reported by Paes et al. (25). Also, Arnason et al. (2) reported that increasing age increases the risk factor for injury in soccer players. The age difference between players and referees is considered a key factor among the international governing bodies of refereeing (FIFA and UEFA) (6).

When considering the findings in the present study, there is the limitation of the referees’ memory bias (18,28). That is, it is always possible the referees remembered only the injuries that were moderately severe or worse. Thus, the true incidence of injuries may have been underestimated.

CONCLUSIONS

The injury prevalence during training and physical testing is significantly higher than during the game. Therefore, the associations should be more responsible for the development of preventive training programs in the referee’s routine preparation for refereeing. In fact, the training programs should be similar to the players’ physical training to help minimize the injuries that the referees experience. After all, referees at all levels can continue until 45 yrs old, which is the age limit of refereeing at the national and international level.

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