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Analysis of football referees injuries - literature review

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Abstract

Introduction and purpose: According to the literature, injuries are defined as the result of the action of significant energy, causing dysfunction and anatomical-physiological changes. In the case of football referees, sports injuries occur during physical exertion in the form of matches and training sessions. As a result, various injuries occur, both on the pitch and during arduous training. They often take place as the aftermath of summed micro-injuries. Properly early detection and analysis of these signals helps to heal the damage and to avoid a longer break from activity, which would inevitably result in a serious injury. The aim of this study is to analyze the most common injuries and their risk factors in football referees on the basis of the current literature.

Description of the state of knowledge: 9 research papers from the last twelve years (2009-2021) containing the above-mentioned keywords have been qualified for this review. Based on the above works, it is possible to determine when and how often injuries occur among referees, and what areas of the body are injured. Due to the multifactorial etiology of injuries and heterogeneous diagnostic systems, which would constitute a standardized research tool, it is difficult to say unequivocally what is the greatest cause of an injury.

Conclusions: 1) Injuries among referees at different levels of the game occur more often due to the match load than the training load. 2) Muscle injuries were the most common, but there was no indication of a tendency towards the exact location of the injury, which requires further research.

Keywords: football (soccer); referee; injury prevalence; musculoskeletal complaints.

Introduction

According to the literature, injuries are defined as the result of the action of significant energy, causing dysfunction and anatomical-physiological changes [7,8]. In the case of football referees, sports injuries occur during physical exertion in the form of matches and training sessions. These injuries cause complete or temporary cessation of physical activity [13]. In consideration of the ever-increasing popularity of football and the pressure imposed on the participants of the match, referees must demonstrate not only impeccable knowledge and interpretation of the rules of the game, but also the highest level of physical parameters. Especially in the elite levels of the game where the pace of the match is much faster. With the increasing prestige of the game level, the referees are subjected to more and more demanding fitness tests in order to always be in the right place on the pitch and thus have the time and perspective to properly assess the match situation [1,11,12]. As a result, various injuries occur, both on the pitch and during arduous training. They often take place as the aftermath of summed micro-injuries. Properly early detection and analysis of these signals helps to heal the damage and to avoid a longer break from activity, which would inevitably result in a serious injury. This action also provides further training opportunities, and thus has a positive effect on the level of endurance and sports performance. In-depth analysis of injuries and their prevention should include both male and female referees groups, as female are increasingly appearing in the cast of prestigious competitions of both sexes. However, one should take into account the differences in the structure and strength of individual systems, as well as tendencies towards postural disorders or the psychological aspect itself. It is a very broad issue that poses a challenge to modern sports medicine [3,4,11,14]. Therefore, attempts are made to learn about the resulting ailments, which should always be done holistically and analyze many factors. These activities are aimed at determining the type of injury and assessing risk factors for this sport discipline [2]. Most of the research focuses on the analysis of players and less on referees and assistant referees. The aim of this study is to analyze the

most common injuries and their risk factors in football referees on the basis of the current literature.

Material and methods

The material for the literature review consisted of articles from the ResearchGate, PubMed and Google Scholar publications database. In order to identify the relevant publications, the search was carried out using a combination of keywords: football (soccer), referee, injury prevalence, musculoskeletal complaints. On the basis of these guidelines, 9 research papers from the last twelve years (2009-2021) containing the above-mentioned keywords have been qualified for this review (tab. 1, 2).

Results

In the works of Bizzini et al. and Mohtasham et al., despite the differences in the groups subjected to the study, more frequent injuries occurring during training load were indicated [2,10]. However, the work of Kordi et al., Wilson et al. and Szymiski et al. present matches as the most common circumstances of injury, although also based on different groups participating in the studies [9,11,14]. Additionally, Gabrilo et al. examining Croatian referees noticed the presence of injuries during fitness tests that referees must pass, usually twice a season, to be able to compete in a given division. Stress and the pressure of passing running exams are indicated as a factor contributing especially to muscle injuries, emphasizing that during matches the referees are able to partially adapt their style of movement to a specific match. However, the match load of Gabrilo et al. It is associated with frequent injuries of the knee joint, which is related to the referee's footwear, because during examination runs, footwear adapted to the athletics track is required, and during the competition, most often these are football boots for hard grass or astro football boots, which may cause the limb to become stuck in the ground, during a sprint [6]. The influence of footwear on the traumatic nature of referees has not yet been adequately investigated, as has the comparison of natural and artificial turf. Although it is commonly assumed that the artificial pavement negatively affects the efficiency of the musculoskeletal system after prolonged exposure, there are still no unambiguous publications on this subject.

Authors and year	Title, purpose, material and methods
Bizzini et al., 2009	<p>Title: Female soccer referees selected for the FIFA Women's World Cup 2007: survey of injuries and musculoskeletal problems</p> <p>Purpose: Assessment of the frequency, characteristics of injuries and musculoskeletal ailments in the group of female referee delegated by FIFA to the 2007 Women's World Cup</p> <p>Material and methods: 81 female referees aged 26-44 were examined using a survey questionnaire.</p>
Bizzini et al., 2009	<p>Title: Injuries and Musculoskeletal Complaints in Referees- A Complete Survey in the Top Divisions of the Swiss Football League</p> <p>Purpose: Determining the type and extent of injuries and ailments of the musculoskeletal system among elite football referees. Investigate the differences between referees and assistant referees running competitions in the top 2 leagues in Switzerland</p> <p>Material and methods: 71 referees (66 males i 5 females) were subjected to the injury questionnaire.</p>
Bizzini et al., 2011	<p>Title: Injuries of football referees: a representative survey of Swiss referees officiating at all levels of play</p> <p>Purpose: To analyze the frequency and types of injuries and musculoskeletal dysfunctions among football referees of all levels in Switzerland</p> <p>Material and methods: 489 Swiss referees. The health condition and past injuries were verified using an interview questionnaire.</p>
Gabrilo et al., 2013	<p>Title: A retrospective survey on injuries in Croatian football/soccer referee</p> <p>Purpose: To investigate the frequency, specificity and effects of damage related to matches and fitness examinations in a group of Croatian football referees at different levels of the competition.</p> <p>Material and methods: 342 Croatian football referees aged 32.9 ± 5.02 years. The study consisted of completing a questionnaire on the characteristics of the referee, past injuries and their consequences.</p>
Kordi et al., 2013	<p>Title: Incidence, Nature, and Pattern of Injuries to Referees in a Premier Football (Soccer) League</p> <p>Purpose: Analysis of the frequency and characteristics of injuries of top-class Iranian referees and comparison with the ailments of international referees.</p> <p>Material and methods: 30 main referees i 45 assistant referees were examined by a sports medicine doctor. Reported injuries were recorded on the form.</p>
Mohtasham et al., 2018	<p>Title: Epidemiology and history of knee injury and its impact on activity limitation among football premier league professional referees</p> <p>Purpose: Investigate the symptoms of injuries and their impact on activity, activity of daily living and participation in sports.</p> <p>Material and methods: 59 football referees from 1-2 Iranian leagues and international referees completed the KOS questionnaire.</p>
Wilson et al., 2011	<p>Title: A prospective study of injuries in elite soccer referees and assistant referees</p> <p>Purpose: Analysis of the type and frequency of injuries of referees</p>

	during matches. Material and methods: 31 referees (4 female and 27 male) aged 33.2 years old from the elite base of referees in Ireland were assessed weekly for match and training injuries . Supervision over the participants lasted for a year.
Al Atar et al., 2021	Title: The effect of the Fédération Internationale de Football Association (FIFA) 11+ referees injury prevention program in reducing injury rates among soccer referees and assistant referees: a randomized controlled trial Purpose: To determine the effectiveness of the FIFA 11+ injury prevention program in the group of referees and assistant referees. Material and methods: 200 football referees were tested for 6 months during the season, including a control group. They performed, among others, twice a week, a warm-up in accordance with the FIFA 11+ program as part of the training, while the control group used the previous form of warm-up.
Szymski et al., 2021	Title: High injury rates and weak injury prevention strategies in football referees at all levels of play Purpose: Assessment of injuries and prevention of injuries in a group of German football referees at various levels of the game, taking into account training and preventive strategies. Material and methods: A group of 923 German football referees (male and female) reported injuries during the season in a questionnaire.

Tab. 1. Collection of publications qualified for the review (title, purpose, material and methods)

Authors	Results
Bizzini et al., 2009	50% of the female referees and 47% of the female assistant referees were injured during matches and training in their career. The most common were strains of the hamstrings and calves, ankle sprains and injuries of the quadriceps muscle - both in the past and during the 2007 World Cup. Additionally, the female assistant referees suffered adductor injuries. Female reported headaches in both groups.
Bizzini et al., 2009	Injuries of referees occurred more often during training than during matches. Almost 90% of people reporting injuries indicated a musculoskeletal injury in the last year. The most common sites for male injuries were the hamstrings, the knee joint and the Achilles tendon.
Bizzini et al., 2011	22.5% of Swiss judges at all competitive levels have sustained at least one injury and 25.8% reported musculoskeletal problems related to refereeing. The most common were strains of the thigh muscles and sprains of the ankle joints.
Gabrilo et al., 2013	Injuries during fitness tests most often involved the quadriceps and hamstrings, while during the matches there were injuries to the calves and ankle joints. Along with the increase in the level of refereeing, the injury risk also increased (apart from the UEFA

	referees group).
Kordi et al., 2013	The most common injuries were muscle and tendon injuries involving the calves, hip and groin areas. The injury rate of referees during matches was 19.6 per 1000 hours, and during training - 4.6 per 1000 hours.
Mohtasham et al., 2018	In the Iranian Premier League referees experienced injuries more often during training - 52%. Additionally, injuries of the non-dominant leg accounted for 48.8%.
Wilson et al., 2011	The most injuries of the referees concerned the muscles - 55%, among which the injuries of the calves muscles predominated (76% of the muscular injuries). On the other hand, the overloads concerned the Achilles tendon and the groin.
Al Atar et al., 2021	In the control group, 24 injuries were reported among 100 referees, the frequency of which was 1.45 injuries per 1000 training hours. In the group training with the FIFA 11+ program, there were 9 injuries among 100 referees, during the game the injury rate was lower - 0.50 injury per 1000h. It was recorded that the injury risk index IRR was 0.35, which indicates a reduction of injuries by 65% in the experimental group compared to the control group.
Szymiski et al., 2021	Among German referees, significant differences were found in the frequency of injuries during matches at different levels - amateur referees 3.14 / 1000h of match exposure, semi-professional 1.92 / 1000h, and professional 1.01 / 1000h. Such significant differences in the frequency of training injuries were not observed. Among professional judges thigh injuries dominated (25%), while in the lower-level groups knee injuries - semi-professionals - 23.1%; amateurs 18.3%.

Tab. 2. Collection of publications qualified for the review (results)

Discussion

Based on the above works, it is possible to determine when and how often injuries occur among referees, and what areas of the body are injured. Due to the multifactorial etiology of injuries and heterogeneous diagnostic systems, which would constitute a standardized research tool, it is difficult to say unequivocally what is the greatest cause of an injury. In addition, so far various groups of referees, presenting a different level of physical preparation, have been studied, which is also important in the context of the precise determination of the most frequently damaged structures. It has been proven that the muscles of the thigh and calves are damaged both during training and matches [3,4,9]. This is confirmed by the research of Wilson et al., Where among the elite of Irish referees as much as 76% of muscle injuries occurred in the area of the calf [14]. On the other hand, Gabrilo et al. indicate that injuries to the quadriceps and hamstrings occur during fitness tests, which are associated with

high pressure and stress. This is confirmed by the fact that with the increase in the level of referees and the prestige of the league level, injuries during examinations were more frequent, with the exception of the group of UEFA referees [6]. This may be related to a higher level of fitness and a qualitative approach to training, which is an important element of prevention. There is also no common position regarding the circumstances of the injuries. Bizzini et al. points out that during the 2007 Women's World Cup there were many match injuries - 34.7/1000 hours of matches [3]. Similar conclusions can be drawn from the study by Kordi et al., Where in the Iranian Premier League the frequency of injuries to referees was at the level of 19.6/1000 hours of matches, while training provoked a trauma at the level of 4.6/1000 hours of matches [9]. This is also indicated by Wilson et al., examining the elite of referees in Ireland, confirming almost twice as often match injuries as compared to training - 16.4/1000 match hours and 8.8/1000 training hours. [14]. The results of Szymiski et al. can be received ambiguously, where among the German referees the greatest differences were observed between different groups of referees at the match load - amateurs 3.14/ 1000h, semi-professionals 1.92/1000h and professionals 1.01/1000h. However, such significant ones were not noticed with training exposure [11]. The works of Bizzini et al. And Mohtasham et al. stand in opposition to these studies, which suggest greater training than match trauma among the Swiss and Iranian elites [4,10]. The results of Mohtasham et al. also show the prevalence of non-dominant limb injury - as much as 48.8%, which may [10]. Taking into account the differences between the injuries of referees with a different level of sports advancement, it can be assumed that there is a relationship between the presence or duration of the pre-match warm-up, the level of tissue flexibility and the possibility of regeneration (the issue of professionalisation among the referee's elite is important, where training and match routines are programmed as well as wellness) [10,11]. The results of the work of Al Atar et al. examining the effectiveness of the FIFA11 + warm-up protocol indicate that the referees using the protocol showed approximately three times lower trauma compared to the control group. Injury risk index IRR was 0.35, which resulted a reduction of injuries by 65% [1]. A literature review of joint injuries found the most common location in the ankle, knee and hip joints. In the case of the knee joints, rotational injuries of the meniscus were predominant, which may be related to low level of proprioception [10]. In addition, it also indicates overloading of the Achilles tendons and groin [3,4,5,9,10,14]. However, there is still a lack of thorough research based on standardized protocols.

Conclusions

1. Injuries among referees at different levels of the game occur more often due to the match load than the training load.
2. Muscle injuries were the most common, but there was no indication of a tendency towards the exact location of the injury, which requires further research.

Conflict of interest

The author does not report any financial or personal connections with other persons or organizations that could adversely affect the content of the publication and claim the right to this publication.

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