

THE PREVENTION OF NON-CONTACT INJURIES IN SOCCER: A SYSTEMATIC LITERATURE REVIEW[‡]

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SUMMARY

Successful injury surveillance and prevention requires valid pre- and post-intervention data on the extent of the problem. The etiology, risk factors and exact mechanisms of injuries need to be identified before initiating a measure or program for preventing sports injuries. In the present review, literature about these mechanisms and incidence are given, with special concern on non-contact injuries. Despite the economical burden sports injuries incur, the extent of injury preventative actions remains limited. Once implemented, these actions yield significantly beneficial results, especially in groups with an increased risk of injury.

Key words: Soccer injuries, etiology, risk factors, injury prevention

ÖZET

FUTBOLDA NON-KONTAKT YARALANMALARIN ÖNLENMESİ: SİSTEMATİK BİR KAYNAKÇA DERLEMESİ

Spora ilişkin yaralanmaların başarılı izlem ve önlenmesi, konunun kapsamına yönelik geçerli verilerin bulunmasına bağlıdır. Söz konusu yaralanmaları önlemeye yönelik yaklaşım ve programları başlatmadan önce bunların etiyojisi, risk faktörleri ve tam mekanizmalarının tanımlanması gerekmektedir. Bu derlemede yaralanmaların mekanizma ve insidansına ilişkin kaynakça verilmekte, non-kontakt yaralanmalara özellikle değinilmektedir. Neden oldukları ağır ekonomik yüke karşın, sportif yaralanmaların önlenmesine ilişkin yaklaşımlar sınırlıdır. Bu önlemlerin hayata geçirilmesi, özellikle yüksek yaralanma riski bulunan gruplarda anlamlı düzeyde yararlı sonuçlar vermektedir.

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Anahtar sözcükler: *Futbol yaralanmaları, etiyoloji, risk faktörleri, yaralanmadan korunma*

INTRODUCTION

Sports injuries occur very frequently in modern western societies. Treating sports injuries is often difficult, expensive and time consuming, and thus preventative strategies and activities are justified on medical as well as economic grounds. Successful injury surveillance and prevention requires valid pre- and post-intervention data on the extent of the problem. The etiology, risk factors and exact mechanisms of injuries need to be identified before initiating a measure or program for preventing sports injuries. Measurement of the injury outcome must include a standardized definition of the injury and its severity, as well as a systematic method of collecting the information. Valid and reliable measurement of the exposure includes exact information about the population at risk and the exposure time. The true efficacy of a preventive measure or program can be best evaluated through a well-planned randomized trial (13).

Risk factors for non-contact soccer injuries and possibilities for their prevention have been previously investigated, but there are very few studies that have investigated the effectiveness of preventative interventions. In order to deal with the subject of sports injury prevention, Van Michelen and coworkers (14) proposed a four-stage analysis, the first of which being called the "problem analysis". It includes the injury incidence and severity of the investigated subject. This is then followed by the etiology and mechanisms involved in the particular sport. The third stage consists of the analysis of preventative actions, and finally the new analysis to evaluate the preventative effect of the actions taken and their resulting consequences regarding their effectiveness in reducing the number of injuries. A thorough literature search was conducted using the Cochrane Musculoskeletal Injuries Group's specialized register, the Medline, PubMed, Embase and Cinahl search registers.

PROBLEM ANALYSIS

The injury rate in soccer is high, and effective injury prevention methods are needed. From the data evaluated, it can be estimated that, on the average, every elite male soccer player incurs approximately one

performance-limiting injury each year. More than a quarter of injuries reported in soccer were incurred without contact with another player (6).

Anderson et al (1) investigated the mechanisms of soccer injuries. Their results revealed that 23% of the injuries were of non-contact nature. About 15% occurred during running and 8% during landing after heading the ball. The UCL study 2005/6, in which injury analysis was done in 17 European 1st division teams, reported that approximately 90% of injuries involved the lower limbs. There was however no breakdown between contact and non-contact injuries. Hamstring injuries accounted for approximately 12% of the total injuries in the English professional soccer league over two competitive seasons. The vast majority of these were non-contact in nature. The re-injury rate was 12%, and certain player-portions such as outfielders and older age player groups demonstrated a higher incidence (16).

Previous hamstring injury has been shown in numerous studies to be the single most significant factor in predisposing soccer players to injury (11). Preseason hamstring tightness seems to be a further predisposing factor (15). Interestingly enough, Zeren and Öztekin (17) reported that 6% of the soccer players in their study had injured themselves while celebrating after scoring goals. Of these, 60% were non-contact sliding-type injuries. Tyler and coworkers (13) found that players who were overweight and who had a previous sprain were 19 times more likely to sustain a non-contact ankle sprain than a normal weight player with no previous injury.

Griffin and colleagues (4) stated that of the 80,000 to 100,000 ACL injuries occurring annually in the USA, 40-70% are non-contact in nature, with medical costs of \$1.5 billion annually. Jensen et al (5) investigated the loss of work days and personal income in these types of injuries. The 2002 US Consumer Product safety commission 1999 (NEISS data and estimates), reported that more than 477,500 soccer-related injuries are treated in US hospitals annually. Despite the above data and statistics, it is noted that of the 3572 Medline citations under the ACL topic heading, only 133 are sub-headed "prevention" and less than 10 of these deal with prevention of injury rather than prevention of surgical complications (4).

ETIOLOGY AND MECHANISMS

Andersen et al (1) conducted an extensive video analysis of the mechanisms for ankle injuries in football. It was noted that there were

numerous dominant positions that predisposed the lower limb to injury: decelerating and pivoting, awkward landings, and "out of control" play, plant-and-cut with knee in valgus, and external rotation of the foot relative to the knee, straight-leg landing with a flat foot and knee in extension and finally the one-step-stop with hip and knee extended and center of gravity behind the knee.

Lloyd (9) concluded from his studies that the external knee loading patterns during sidestep cutting put the ACL at greatest risk for injury. In the position, the knee is in the valgus and in rotation. He proposes that stability and balance training suppress muscle stretch reflexes, and enhance co-contraction in return. Plyometric training may reduce voluntary activation times and the times to peak torque, so as to decrease muscle response times, so that players are able to perform more rapid and unexpected sports maneuvers. He therefore advocates plyometric training programs as the most optimal prevention method.

PREVENTATIVE ACTIONS

It has been shown clearly from numerous good quality randomized-controlled trials that ankle sprains can be prevented in soccer by ankle supports such as semi-rigid orthoses or air-cast braces (12). The introduction of a prevention program, including education and supervision of coaches and players, produced 21% fewer injuries in the intervention group of youth amateur soccer players (7). An eccentric pre-season strength training program significantly reduced the number of hamstring injuries in the training group. There were also advantages in speed and strength (2).

Mandelbaum and coworkers (10) concluded from their preventative trials aiming to reduce ACL injuries in female soccer players, that a neuromuscular training program may have a direct benefit in decreasing these injuries. They reported an 88% reduction in ACL injury compared to the control group. Cerulli et al (3) reported about a successful knee injury prevention protocol emphasizing stimulating the proprioceptive control mechanisms at the joint. Knobloch and colleagues (8) used a proprioceptive coordinative training program to prevent muscle injuries in elite female soccer players. Their study revealed a 400% reduction in such injuries. This included improved jumping and landing techniques.

CONCLUSIONS

The rate of non-contact injuries among soccer players increases with age. Numerous well-designed clinical trials have been conducted

over the last few years to ascertain whether non-contact soccer injuries can be reduced. Though the results are partly inconclusive, neuromuscular training programs that emphasize jumping and landing techniques seem to have a direct benefit in decreasing the number of ACL injuries in female soccer players, however. Prevention programs seem likely to be more effective in groups with an increased risk of injury. More restrictive rules, which penalize lack of self-control, may assist in the prevention of certain non-contact injuries, as well as behavior modification may reduce score-celebration injuries. More methodologically well-designed studies are required to evaluate the effects of specific preventative interventions.

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