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The Preventive Warm up to Reduce No-Contact Injury Risk in Amateur Male Soccer Players

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Abstract

The study aims to describe the effects of preventive exercise introduced in a soccer traditional warm up on lower limb injury risk in amateur male soccer players. A total number of 76 no-contact injuries were recorded, 80.27% of them to the lower limbs, specifically in the: thigh (46.8%), calves (4.6%), adductor (15.1%), knee (12.9%) and ankle (20.6%). The number of injuries to the lower limbs was greater in the CG, comprising 72.1% compared to the 27.9% from the EG. Furthermore, when comparing the injuries in both groups depending on the muscle group or the joint, the same thing occurs: thigh (CG = 18 and EG = 13), calves (CG = 3 and EG = 1), adductor (CG = 8 and EG = 2), knee (CG = 10 and EG = 1) and ankle (CG = 10 and EG = 2). Thigh muscle injuries were identified as follows: in the CG, the 87.7% in the posterior region, the 12.3% in the anterior region; in the EG, the 88.6% in the posterior region and the 11.4% in the anterior region. Statistically significant differences ($p < 0.01$) were observed for the values of adductor, knee and ankle injury. The exercises that integrated the traditional warm-up were functional to reduce the risk of injury only for the adductor muscles; no statistically significant difference was observed for calves and thigh. For the hamstrings and the rectus femoris, there is a need to introduce exercises with external loads.

Keywords

Warm up, Injury Prevention, Soccer Player

1. Introduction

In recent years, an increasing number of people have been taking up soccer as a hobby, playing in amateur leagues and tournaments in their spare time.

There are 4.6 million men in Italy who play soccer, which constitutes the most

played sport among the population under 35: one in three Italians play soccer in their free time (Eurispes, 2021).

Soccer is a beloved sport, played by people of all ages and abilities. It is also a high-impact, high-intensity sport that can cause serious injuries (Oliva-Lozano et al., 2020; Sánchez-Sánchez et al., 2016).

The injuries are a limiting factor in performance, and appear frequently in the amateur soccer world (Minnig et al., 2022; Van de Hoef et al., 2017; Ekstrand et al., 2009; van der Horst et al., 2015): moreover, the amateur footballer often cannot have the presence of complete medical and technical staff in every training session.

The majority of the injuries acquired are located in the lower limbs (89.6%), specifically in the: thigh (31.4%), ankle (12.5%), groin (10.9%) and in lesser measure in the knee and calves (Noya et al., 2014).

It is for these reasons that many papers have addressed the issue of the methodology for the soccer injuries prevention (Verrall et al., 2005).

However, the prevalence of these injuries continues to be alarming (Aiello et al., 2023; Pfirrmann et al., 2016; Ekstrand et al., 2011). Specifically, muscle-type injuries constitute one of the main problems to affect amateur and professional soccer players and to most concern the teams, with between 20% - 37% of injuries forcing professional players off the pitch for a certain amount of time, and 18% - 23% of amateur-level players (Ekstrand et al., 2011).

In fact, the latest epidemiological studies reveal that muscle injuries constitute over 30% of all injuries, representing an average of 12 muscle injuries per season in a professional football team, which represent over 300 days of player absence from the pitch (Junge et al., 2006; Gimigliano et al., 2021).

A study performed in professional Spanish football affirms that around 6 - 9 injuries occur for every 1000 hours of football play. Furthermore, these injuries that occur in football entail quite high economic costs. In the Netherlands, for example, losses of up to 4.5 million euros occur each year (Noya & Sillero, 2012), but even more alarming are these figures in England, where losses have reached up to 118 million euros each year (van Beijsterveldt et al., 2011).

In the amateur soccer player, there are no important financial costs but remain some considerations relating to the practioners health: in fact, in Italy the amateur soccer player does not receive a salary like the professional soccer player, nor does the sports association provide for medical expenses in case of injury.

This is the reason why the attention of the literature has focused on soccer injury prevention strategies (Zein et al., 2022; Chebbi et al., 2022; Biz et al. 2021; Al Attar et al., 2017).

Specifically, the International Federation of Association Football (FIFA) designed an injury prevention programme, entitled FIFA 11+, to try and solve this issue. Despite this programme being proven to be effective in the prevention of injuries in female soccers' knees, it is not applicable to muscle injuries in the thigh, groin, etc. (Slauterbeck et al., 2019; Bizzini & Dvorak, 2015; Thorborg et

al., 2017).

Another of the aspects proposed to contribute to the advancement of the search for solutions to this issue is to assess the epidemiology of the injuries, establishing the risk of suffering from them and the circumstances in which they occur (Argibay-González et al., 2022; Stephenson et al., 2021; Ekstrand et al., 2009). This data could be very useful because it could provide a good definition of which are the main injuries that occur in football and therefore, the path that should be taken to orientate planned preventive strategies. Despite the frequency with which they occur, the understanding of the factors that predispose players to suffering from a muscle injury is limited16, and there is little scientific evidence regarding the prevention and treatment of these injuries.

2. Methods

2.1. Objective

The aim of this study was to verify the efficiency of a preventive soccer warm up to no-contact injury reduction in amateur male soccer players.

2.2. Participants and Setting

A total number of 94 amateur footballers constituted the sample of this study. The experimental group (EG) was composed of 49 players (age: 27.1 ± 4.4 years, height: 175.8 ± 3.8, weight: 74.1 ± 4.2 kg) and 45 players in the control group (CG) (age: 28.4 ± 3.5 years, height: 174.1 ± 2.9, weight: 76.3 ± 2.4 kg).

2.3. Procedure

The number and type of injuries suffered by the players was recorded, during the season 2020/21, as well as the minutes of training and play in each session and match, and the role of the player and the player substitute in each day.

No-contact injuries have been recorded because preventive interventions can only be effective with this type of event (van Beijsterveldt et al., 2011; van Mechelen et al., 1992).

An injury is considered to be the alteration or damage caused to a part of the body due to a blow, illness, etc., which impedes the player from participating in competitions or some training sessions (Chomiak et al., 2000; van Mechelen et al., 1992). The detection of injuries was entrusted to the same medical staff. All subjects have been informed in advance about the proposed training and potential injury risk. The study was conducted acknowledging the principles presented in the Helsinki Declaration.

The intervention was performed on the EG, consisting of the inclusion of a preventive exercise plan during traditional warm up (aerobic phase, joint mobility and run skills), twice a week, which included strength and balance exercises of the main leg muscle groups and leg joints (**Table 1**). The exercises were differentiated in the various phases of the season. To carry out individual follow-up on each player, an Excel Sheet was designed. The inclusion criteria predicted a

Table 1. Preventive exercise inserted in traditional soccer warm up.

Season phase	Exercise	Motor load
Pre-season	1. One-leg Jump and hold	2 × 4 × leg
	2. One-leg lateral hop and hold	2 × 4 × leg
	3. Romanian dead lift without external load	2 × 6
	4. Jump and turn (90˚ and 180˚)	1 × 4
	5. Nordic hamstring	2 × 3
	6. Reverse nordic	2 × 4
In-season (first phase of tournament)	1. One-leg balance task with partner	2 × 4 × 5 × 10 sec
	2. One-leg vertical hop and hold	2 × 4 × leg
	3. One-leg stance and draw a "box" with arms	2 × 3 × 10 sec× leg
	4. Copenaghen adductor	2 × 6 × leg
	5. Nordic hamstring	3 × 4
	6. Reverse nordic	3 × 4
In-season (second phase of tournament)	1. Triple hop and hold	3 × leg
	2. Side hop and hold	3 × 3 × leg
	3. Bouncing and one-leg hold	2 × 3 × leg
	4. Single leg romanian dead lift without external load	3 × 4 × leg
	5. Copenaghen adductor	2 × 6 × leg
	6. Reverse nordic	4 × 4

compliance of more than 85% of the training sessions.

All statistical analyses were conducted using the Statistical Package for Social Sciences (SPSS 15.0 for Windows) software. Descriptive and inferential tests were used to compare the control group and intervention group, including frequency counts, t-test between groups. The significance level was set for $p < 0.05$. The injury rates were calculated based on athletic exposures and are expressed as a rate per 1000 athletic exposures.

3. Results

A total number of 76 no-contact injuries were recorded, 80.27% of them to the lower limbs, specifically in the: thigh (46.8%), calves (4.6%), adductor (15.1%), knee (12.9%) and ankle (20.6%). The number of injuries to the lower limbs was greater in the CG, comprising 72.1% compared to the 27.9% from the EG. Furthermore, when comparing the injuries in both groups depending on the muscle group or the joint, the same thing occurs: thigh (CG = 18 and EG = 13), calves (CG = 3 and EG = 1), adductor (CG = 8 and EG = 2), knee (CG = 10 and EG = 1) and ankle (CG = 10 and EG = 2). Thigh muscle injuries were identified as follows: in the CG, the 87.7% in the posterior region, the 12.3% in the anterior region; in the EG, the 88.6% in the posterior region and the 11.4% in the anterior region.

Statistically significant differences ($p < 0.01$) were observed for the values of adductor, knee and ankle injury.

In Table 2, the values for each group are described. Moreover, upon calculating the number of injuries for every 1000 hours of training and play in both

Table 2. Number of injury for every observed anatomical region.

	thigh	calves	adductor	knee	ankle
EG	12	1	2	1	2
CG	18	3	8**	10**	10**

Legend: **p < 0.01.

groups, the EG also had much fewer injuries than the CG, with 10.1 against 39.6 injuries for every 1000 hours of training and play, respectively ($p < 0.01$).

The warm up in the training session recorded a compliance of 89.6%.

4. Discussion

The aim of the study was to verify if a preventive exercise warm up applied to the traditional soccer warm up could help reduce the number and risk of suffering injuries among amateur soccer players.

The results obtained highlights that the traditional soccer warm up integrated with preventive exercises can contribute to reducing the injury risk in amateur soccer players.

The need to identify a more current warm-up for amateur soccer players arose from the particular conditions in which these practitioners train: after a work day, in conditions of fatigue, often late in the evening, often with incomplete staff, in sports facilities that are not always adequate.

The success of a prevention intervention depends on the compliance that the practitioners show in the observation period: in this study the recorded values seem to be satisfactory compared to other similar research experiences in the literature (Soligard et al., 2010; Slauterbeck et al., 2019; Pérez-Gómez et al., 2022).

These results align with those found in other studies, which reveal that performing a preventive programme after warming up reduces the injury risk (Pérez-Gómez et al., 2022; Slauterbeck et al., 2019; Ekstrand et al., 2011).

However, in contrary to the programme suggested by the International Federation of Association Football, FIFA 11+, the results obtained in this study reveal that the programme proposed helps reduce the risk of suffering injuries, and the number of them in all the joints and muscle groups in the legs, and not just in the knees as observed in previous research studies with the approach proposed by FIFA (Silvers-Granelli et al., 2017; Barengo et al., 2014; Steffen et al., 2008).

Furthermore, considering the existing concern regarding muscle type injuries, the results obtained in this study reveal the possibility that including the designed programme after warming up could contribute to reducing the number of muscle injuries that occur, given that the number of injuries in each muscle group is considerably lower in the group that performed preventive warm up compared to the group that did not include any motor task of this kind.

In observing the effectiveness with respect to muscle injuries, a relevant consideration emerges: the exercises that integrated the traditional warm-up were functional to reduce the risk of injury only for the adductor muscles; no statisti-

cally significant difference was observed for calves and thigh.

If the number of injuries to the calves is very low, instead those of the thigh are numerous: above all those in the posterior region, which in the EG, do not differ much from the CG.

This data suggests that, appropriately, the literature indicates more complex exercises for hamstrings and that probably these exercises must be performed with external loads to be more effective (Afonso et al., 2021; Kipp et al., 2022).

Therefore, the introduction of a few exercises in the warm up does not seem sufficient but a specific part of the training session must be organized in which are introduced exercises with external loads and exercises for the gluteal-hamstring synergy (Biz et al., 2021; Shield & Bourne, 2018; Afonso et al., 2021; Bisciotti et al., 2020; Petersen et al., 2011).

The injuries calculated per 1000 hours of training and match are lower than what has been observed in other research conducted with amateur soccer players (Carlos-Vivas et al., 2016).

On the other hand, the results obtained in terms of the number of injuries that occur in every 1,000 hours of play coincide with other research studies performed in professional football, specifically in the Spanish First Division, in which it is revealed that around 8.5 injuries occur with every 1000 hours of play (Carlos-Vivas et al., 2016), coinciding with the results for the EG of 10.1 injuries for every 1,000 hours of play in this study. The values obtained in this section for the CG in this research study no differ considerably to those presented in the aforementioned study, that presenting a value of 41 injuries for every 1000 hours of training and match for the CG (Carlos-Vivas et al., 2016).

The differences can be attributable to multiple factors (training schedule, coaches' skills, availability of equipment, organization of training sessions, etc.) but it would seem that the choice to integrate the soccer player's traditional warm-up can reduce the number of injuries.

5. Conclusion

Reducing the risk of injury is also a possible goal in amateur soccer. The adult population chooses to play soccer to maintain an active lifestyle and to protect their health.

On the contrary, injury forces the young adult to a period of suspension of training and, often, interruption of sports practice.

The data seem to indicate that through a few but specific interventions, the risk of injury in the amateur soccer player can be reduced.

Further research will be able to integrate these data by observing nutrition regimes, the severity of injuries and the consequent absence from competitions.

Furthermore, it will be possible to verify whether the introduction of exercises with external loads and for gluteal/hamstring energy during the training session will reduce thigh muscle injuries.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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