

Injuries in Portuguese Amateur Youth Football Players: A Six Month Prospective Descriptive Study

Lesões em Jovens Jogadores Portugueses de Futebol Amador: Estudo Prospetivo Descritivo Durante Seis Meses



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ABSTRACT

Introduction: This study analyzed the incidence and characteristics of injuries sustained by amateur youth football players in Portugal during season 2015 - 2016.

Material and Methods: This is an observational descriptive study. We analyzed Portuguese youth football players' injuries over six months of a season. A total of 529 players were divided according to their age in two groups (Under-17 and Under-19). Data on injuries were collected.

Results: Throughout all 62 062.0 hours of exposure recorded, 248 injuries were reported in 173 different players. The average incidence of injury was 3.87 (95% CI = 2.81; 4.94) per 1000 hours of football exposure. There was a significantly higher average incidence of injury during matches – 14.22 (95% CI = 10.35; 18.09) per 1000 hours of exposure – when compared to the average incidence of injury during training – 2.06 (95% CI = 1.22; 2.90) per 1000 hours of exposure. This significance was also observed when the comparison was made within each age group. A traumatic mechanism was involved in 76.6% of all the injuries, while overuse was reported in 12.9%. The most common type was the injury that affected muscles and tendons (52.8%). The body location most commonly affected by injuries was the thigh (24.6%).

Discussion: Even though is essential a better characterization of Portuguese athletes of younger age groups such as those discussed in this study, the results of the studied population are in agreement with the existing literature. However, this study provides more information that may be important to better target the Portuguese athletes' training for injury prevention.

Conclusion: This study provides descriptive data on injuries developed in a subpopulation of Portuguese amateur youth football players that could represent a focus for future prevention.

Keywords: Athletic Injuries; Incidence; Portugal; Soccer/injuries

RESUMO

Introdução: Este estudo foi projetado com o intuito de analisar a incidência e as características das lesões desenvolvidas pelos jovens jogadores portugueses de futebol amador durante a época de 2015 - 2016.

Material e Métodos: Trata-se de um estudo observacional descritivo. Foram analisadas as lesões de jovens atletas durante seis meses de uma época. Um total de 529 jogadores foi dividido em dois grupos, atendendo à sua idade (Sub-17 e Sub-19). Os dados foram colectados semanalmente pelo responsável por cada equipa.

Resultados: Ao longo de 62 062,0 horas de exposição registadas, foram reportadas 248 lesões em 173 jogadores. A incidência de lesão média foi de 3,87 (95% CI = 2,81; 4,94) por 1000 horas de exposição a futebol. A incidência de lesão média durante os jogos – 14,22 (95% CI = 10,35; 18,09) por 1000 horas de exposição – foi significativamente superior à incidência de lesão média durante os treinos – 2,06 (95% CI = 1,22; 2,90) por 1000 horas de exposição. Esta significância foi também observada quando feita a comparação dentro de cada grupo etário (Sub-17 e Sub-19). O mecanismo traumático esteve envolvido em 76,6% das lesões, enquanto que o mecanismo de sobre-utilização foi causa de 12,9% das lesões. As lesões mais frequentemente observadas foram as que envolveram músculos e tendões (52,8%). A coxa foi a localização mais comum das lesões (24,6%).

Discussão: Apesar de ser essencial uma melhor caracterização dos atletas Portugueses de grupos etários mais novos como os abordados neste estudo, os resultados da população estudada vão de encontro ao que existe na literatura mundial. No entanto, este estudo é mais uma fonte de informação que poderá ser importante para melhor direccionar o treino dos atletas portugueses para a prevenção de lesões.

Conclusão: Este estudo fornece informação descritiva das lesões ocorridas numa sub-população de jovens jogadores portugueses de futebol amador, podendo representar um foco para futura prevenção.

Palavras-chave: Futebol/lesões; Incidência; Lesões em Atletas; Portugal

INTRODUCTION

Physical exercise is seen as an essential part of a healthy lifestyle by providing individuals with benefits ranging across emotional, mental, social and physical spheres.¹ As such, there is an increased understanding of the importance of sports activities, beginning in childhood.²

Football has the largest fan base internationally and is gaining momentum as the fastest growing sport worldwide with approximately 265 million registered football players, most of them under the age of 18.³⁻⁵ Portugal follows this trend: football holds the highest number of registered

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players and most of them are young boys competing in amateur leagues.⁶ As a consequence of this elevated number of players, research to date also recognizes football as one of the leading causes of sports injuries.^{7,8} The serious consequences that may result from injuries among the youth population (including, but not limited to, early bone disease, high medical costs, and a decrease in physical activity) are responsible for the heightened awareness to this topic.^{6,9} Research has demonstrated regional differences in the incidence of injury in European football¹⁰ thus highlighting the relevance of introducing country-specific preventive strategies in the early stages of the players' careers. To achieve this goal, epidemiological data on injury characteristics and population-specific risk factors must be collected.¹¹ In Portugal there is a lack of information on this topic. This study aims to investigate the incidence and characteristics of football-related injuries among young amateur football players in Portugal. These findings may inform future prevention programs in order to reduce injuries among players and cut down on associated medical costs.

MATERIAL AND METHODS

Study design/setting

This is a descriptive epidemiological study. A total of 51 football teams belonging to a northern district of Portugal – Aveiro - were invited to take part in the study. From these, 21 accepted the invitation. A follow-up of six months (26 weeks) of one season was planned. This study was approved by the Ethics Committee of the Faculty of Medicine of Porto University and is reported in line with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement.¹²

Participants and study period

Participants consisted of an all-male sample of youth amateur football players, ranging between 15 and 19 years of age. Age groups were divided according to Portugal's competition division: Under 17 years (U-17) and Under 19 years (U-19). Written informed consent according to the World Medical Association Declaration of Helsinki was requested to the athletes or the parents of minors to sign and were collected by the responsible of each team.

Definition of injury/concepts

Data acquisition was carried out according to the international consensus statement on injury definitions and procedures.¹³

An injury was defined as any physical complaint sustained by a player resulting from a football match or football training.¹³ In accordance to the consensus,¹³ only time loss injuries (injuries that results in a player being unable to take a full part in future football training or a match) were reported.

Injury severity was defined according to the number of days that have elapsed from the date of injury to the date of the player's return to full participation in team training and availability for match selection (divided into four groups: minimal (1 – 3 days), mild (4 – 7 days), moderate (8 – 28 days) and severe (≥ 29 days)).¹³

The location, type, mechanism and date of injury were collected. The resulting absence from sport, exposure in training and matches were documented. Injury mechanisms were classified into three groups: (1) traumatic (an injury resulting from a specific, identifiable event - divided in contact/noncontact), (2) overuse (an injury caused by repeated micro-trauma without a single, identifiable event

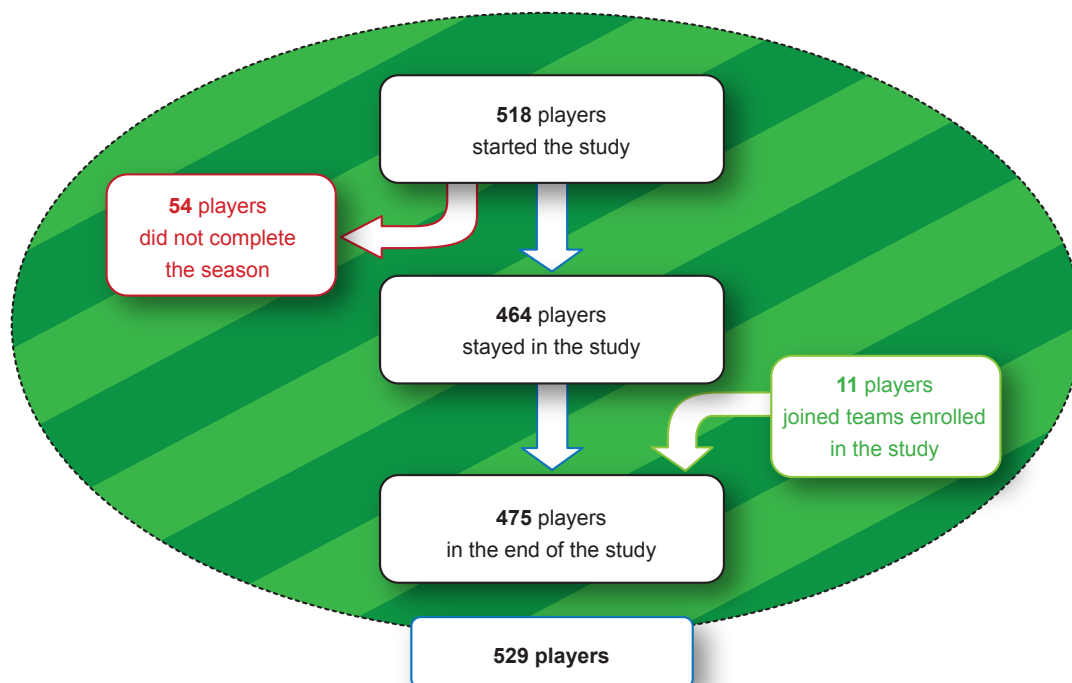


Figure 1 – Evolution of number of players throughout the season

responsible for the injury)¹³ and (3) unknown, when there was no certainty about the associated mechanism.

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.¹³ However, we only considered a recurrence when the previous injury had occurred during the evaluated season.

Possible related factors were also gathered (position and dominant side – preferred leg for kicking - of the injured player, need for more comprehensive medical evaluation).

Data collection

Before the study started, all the teams elected a responsible person (the team coach/physical therapist) for transmitting the medical information to the investigator. A form was planned to gather information and thus standardize the collecting procedure. In a first meeting, the investigators made a brief presentation about the purpose of the study, the reporting system, the form and relevant definitions. Any doubt or additional information was clarified by phone call or via scheduled meeting. During the 26 weeks, the teams were regularly (weekly) contacted via email correspondence or phone call or visited in a scheduled meeting.

Data on exposure was collected on a team basis.¹³ Exposure time for training/match was reported by the responsible person of each team, as well as absence time of players due to an injury. The average length of a U-17 match is 80 minutes and 90 min for U-19. The average length of the training session was 90 minutes for both groups.

Bias

The field positions of players, despite being collected at the beginning of the study, were not consistent throughout the season. It is common for youth players and in amateur leagues to frequently change their field positions depending on the needs of the team. Data on exposure to different charges/intensity patterns was not also collected.

All reporting systems are subject to information bias, and ours is not an exception. However, this last one was improved by selection of one fixed responsible person per football team to report the injuries.

Statistical methods

Incidence of injury per 1000 hours of football participation (I) was calculated on a team basis as $I = (n/e) \times 1000$, where n is the number of injuries sustained and e the exposure time expressed as total hours of football participation. Rate ratio (RR) was used to compare the incidences.¹⁴ Normal distribution was checked using Shapiro-Wilk test or skewness and kurtosis. Gaussian-distributed variables were compared using *t*-tests. For non-normally distributed variables, Mann-Whitney test was performed. Variances were checked with Levene test. Significance was set at 0.05. All analyses were performed using IBM® SPSS® Statistics (version 22.0; SPSS Inc.; Chicago) for Windows®.

RESULTS

Follow-up occurred in season 2015/2016 (a period from 1st of November 2015 until 30th of April 2016 – total of 26 weeks, excluding holiday breaks). The 21 teams that were enrolled in the study provided an initial sample of 518 players (286 U-17 and 232 U-19) that started on day one. During the six-month period there was a loss to follow-up of 54 players (representing 10.2% from the total number of participants – 529 players). This resulted mainly from the end of the career of the player or because of a move to other teams not covered by the study. Additionally, during the follow-up period, two players moved to a team included in the study and 11 new players joined teams participating in the study. However, based on the intention-to-treat standard and although our study is not a randomized one,¹⁵ all available data for the total number of participants (529) were included in the final analysis.

Detailed information about the number of injuries, time of exposure and incidence by each team enrolled in the study is available in Appendix 1

Table 1 - Number of players, time of exposure, number of injuries and their incidence per 1000 hours of exposure by age group. Incidence values were first calculated for each team and the presented values correspond to an extracted average incidence and not to direct calculation.

	Number of players	Time of exposure, h	Injuries, n (%)	Incidence / 1000h (95% CI)
Under 17		33 673.0	138 (55.6)	3.74 (1.96 – 5.51) †
Training	290	28 598.5	73 (29.4)	2.14 (0.64 - 3.64)*
Matches		5074.5	65 (26.2)	12.60 (7.40 - 17.80)*
Under 19		28 389.0	110 (44.4)	4.02 (2.53 - 5.52) †
Training	239	24 561.0	46 (18.5)	1.97 (0.94 - 3.01)*
Matches		3828.0	64 (25.8)	16.01 (9.32 - 22.69)*
Total		62 062.0	248 (100)	3.87 (2.81 - 4.94)
Training	529	53 159.5	119 (48.0)	2.06 (1.22 - 2.90)*
Matches		8902.5	129 (52.0)	14.22 (10.35 - 18.09)*

Values in parentheses represent % of total (248) injuries.

H: hours; n: number of injuries; † Levene test: $p = 0.680$, T-test: $p = 0.787$ (statistically non significant when comparing average incidence of injury of Under 17/Under 19 groups);

* Mann-Whitney test: $p < 0.01$ (statistically significant when comparing average incidence of injury during training/matches in each group: Under 17, Under 19 and Total)

Table 2 - Number (percentage of total) of injuries among Portuguese amateur youth football players by location, type and severity

	Minimal (1 - 3 days) n (%)		Mild (4 - 7 days) n (%)		Moderate (8 - 28 days) n (%)		Severe (≥ 29 days) n (%)		Total n (%)	
Injury location										
Thigh	8	(3.2)	22	(8.8)	27	(10.8)	4	(1.6)	61	(24.6)
*Posterior	4	(1.6)	10	(4.0)	15	(6.0)	2	(0.8)	31	(12.5)
*Anterior	4	(1.6)	12	(4.8)	12	(4.8)	2	(0.8)	30	(12.1)
Ankle	2	(0.8)	10	(4.0)	32	(12.9)	9	(3.6)	53	(21.4)
Knee	2	(0.8)	9	(3.6)	12	(4.8)	11	(4.4)	34	(13.7)
Groin	2	(0.8)	3	(1.2)	12	(4.8)	9	(3.6)	26	(10.5)
Shank/Achilles tendon	5	(2.0)	4	(1.6)	4	(1.6)	5	(2.0)	18	(7.3)
Lower back	4	(1.6)	2	(0.8)	6	(2.4)	5	(2.0)	17	(6.9)
Foot/Toe	5	(2.0)	-	(0.0)	4	(1.6)	2	(0.8)	11	(4.4)
Pelvis/Hip	3	(1.2)	2	(0.8)	-	(0.0)	4	(1.6)	9	(3.6)
Shoulder/Clavicles	-	(0.0)	1	(0.4)	4	(1.6)	-	(0.0)	5	(2.0)
Hand/Finger/Thumb	-	(0.0)	1	(0.4)	3	(1.2)	1	(0.4)	5	(2.0)
Thorax/Upper back	1	(0.4)	2	(0.8)	1	(0.4)	-	(0.0)	4	(1.6)
Wrist	-	(0.0)	-	(0.0)	2	(0.8)	-	(0.0)	2	(0.8)
Head/Face	1	(0.4)	-	(0.0)	-	(0.0)	-	(0.0)	1	(0.4)
Abdomen	-	(0.0)	-	(0.0)	-	(0.0)	1	(0.4)	1	(0.4)
Forearm	-	(0.0)	1	(0.4)	-	(0.0)	-	(0.0)	1	(0.4)
Total	33	(13.3)	57	(22.9)	107	(43.1)	51	(20.6)	248	(100.0)
Type of injury										
Fractures and bone stress	1	(0.4)	0	(0.0)	0	(0.0)	4	(1.6)	5	(2.0)
Muscle and tendon	20	(8.1)	34	(13.7)	52	(21.0)	25	(10.1)	131	(52.8)
Joint (non-bone) and ligament	1	(0.4)	12	(4.8)	47	(19.0)	20	(8.1)	80	(32.3)
Contusions	11	(4.4)	11	(4.4)	8	(3.2)	2	(0.8)	32	(12.9)
Total	33	(13.3)	57	(23.0)	107	(43.1)	51	(20.6)	248	(100.0)

Values in parentheses represent % of total (248) injuries.

N: number of injuries

(<https://www.actamedicaportuguesa.com/revista/index.php/amp/article/view/8835/5272>), which can be consulted to better understand the extracted average incidence values that will be referred throughout the article.

The average exposure time was 2955.3 hours [95% confidence interval (CI) = 2452.6, 3458.1]. A total of 248 injuries were recorded in 173 players (32.7% of total participants). The average incidence of injury was 3.87 per 1000 hours (95% CI = 2.81; 4.94). There were no significant differences when comparing U-17 and U-19 average incidence of injury (RR = 1.07; $p = 0.787$). The average incidence of injury during matches was higher when compared to the average incidence of injury during training sessions (RR = 6.90; $p < 0.01$). For detailed information see Table 1.

Only 11.2% of all injuries were confirmed by complementary physical examination: 6.0% by radiography, 4.0% by ultrasound and 1.2% by magnetic resonance imaging (MRI). All other diagnoses were the responsibility of the medical department of each club.

Injury location

A higher prevalence of injuries in the lower limbs was observed ($n = 212$; 85.5%). The majority of injuries were located on the thigh ($n = 61$; 24.6%), followed by the ankle ($n = 53$; 21.4%). For detailed information see Table 2.

Type

Most common type was the injury that affected the muscle and tendon ($n = 131$; 52.8%) followed by the joints and ligaments ($n = 80$; 32.3%) (Table 2).

Severity

A total of 4639 days were lost and each injury accounted for an average of 18.6 (95% CI = 16.07; 21.10) days lost.

The majority of injuries had a recovery period between 8 to 28 days (moderate severity) ($n = 107$; 43.1%). The most severe injuries occurred in the knee ($n = 11$; 4.4%) followed by the groin and the ankle (both with $n = 9$; 3.6%). Minimal injuries were registered mostly on the thigh ($n = 8$; 3.2%). Severe injuries occurred predominantly in the muscle and tendon ($n = 25$; 10.1%). For detailed information see Table 2.

Table 3 - Incidence of injury by mechanism and their recurrence (by training session and match). Incidence values were first calculated for each team and the presented values correspond to an extracted average incidence and not to direct calculation.

	U-17			
	<u>Training</u>		<u>Match</u>	
	Injury n (%)	Incidence/ 1000 h (95% CI)	Injury n (%)	Incidence/ 1000 h (95% CI)
Mechanism				
Traumatic	51 (21.6)	1.39 (0.13 - 2.66)^a	53 (21.4)	10.62 (6.12 - 15.13)[*]
Contact	16 (6.5)	0.46 (0.04 - 0.88)	31 (12.5)	5.89 (3.20 - 8.58)
Non-contact	35 (14.1)	0.93 (0.01 - 1.85)	22 (8.9)	4.73 (1.15 - 8.32)
Overuse	14 (5.6)	0.51 (0.11 - 0.91)^a	7 (2.8)	1.26 (-0.16 - 2.69)[*]
Unknown	8 (3.2)	-	5 (2.0)	-
Total	73 (29.4)	2.14 (0.64 - 3.64)	65 (26.2)	12.60 (7.40 - 17.80)
Recurrence				
Recurrent injury	17 (6.9)	0.52 (0.11 - 0.94) ⁺	2 (0.8)	0.29 (-0.14 - 0.72) ⁺
Injury for the first time	56 (22.6)	1.62 (0.46 - 2.78) ⁺	63 (25.4)	12.31 (7.20 - 17.42) ⁺
Total	73 (29.4)	2.14 (0.64 - 3.64)	65 (26.2)	12.60 (7.40 - 17.80)

Values in parentheses represent % of total (248) injuries.

N: number of injuries; * Mann-Whitney test: $p < 0.05$ (differences between traumatic/overuse mechanism were considered statistically significant). ^a Mann-Whitney test: $p = 0.111$ (differences between traumatic/overuse mechanism were not considered statistically significant); ⁺ Mann-Whitney test: $p < 0.05$ (differences between recurrent/first-time injury were considered statistically significant)

Mechanism of injury

As we can see in Table 3, most of the injuries were caused by traumatic mechanism (RR = 5.35; $p < 0.05$). In U-17, traumatic injuries were significantly than overuse injuries only in matches (RR = 8.43; $p < 0.05$) while in U-19 the traumatic mechanism was responsible for most injuries in both matches (RR = 7.61; $p < 0.05$) and training (RR = 5.79; $p < 0.05$).

Injuries recurrence

The incidence of first-time injuries exceeded recurrence (RR = 6.11; $p < 0.05$), as we can see in Table 3.

Dominant side

When comparing lower limb non-contact injuries by dominance we found that most of the injuries occurred in the dominant leg (Table 4).

DISCUSSION

Our study analyzed the incidence of injuries and their characteristics in Portuguese amateur football players. We evaluated 248 injuries and thus calculated an average incidence of injury of 3.87 per 1000 hours of exposure (95% CI = 2.81; 4.94). We found no significant differences when comparing the average incidence of injury between U-17 and U-19 groups. A significantly higher incidence of injury occurred during matches when compared with training sessions, and traumatic injuries also registered a higher incidence when compared with overuse mechanism. Although we observed a significantly higher incidence of first-time injuries comparing with recurrent injuries in our study, the comparison with other studies cannot be made because of our previously mentioned different definition of recurrence.

Currently, there is a gap in the literature about the incidence of injuries and characteristics in young amateur football players. Therefore, the following study represents an important contribution by providing descriptive data from the Portuguese context.

Outcomes contextualization

Incidence of injury

We found an average incidence of injury of 3.87 per 1000 hours of exposure (95% CI = 2.81; 4.94). Faude et al¹⁶ provided an extensive review of the existing literature on time loss injuries in young football players until 2013, finding values of incidence between 2 and 7 per 1000 hours of exposure, which is in agreement with our results.

It is important to note that the incidence figures found in groups of youth amateur football players,^{6,17} such as the one of the sample that we examined, is lower when comparing with the values of studies involving elite players.^{18,19}

Injuries in matches versus training sessions

Our data demonstrates a significantly higher incidence of injury in matches than in training sessions (14.22 per 1000 hours of match exposure (95% CI = 10.35; 18.09) versus 2.06 per 1000 hours of training exposure (95% CI = 1.22; 2.90), RR = 6.90, $p < 0.001$. This pattern is also observed in each age group. These results corroborate existing literature,²⁰⁻²³ whereby the overall incidence of injury during training varies from 1 - 5 injuries per 1000 hours and with 15 - 20 injuries per 1000 hours of match time (RR match to training sessions varies between 1.2 and 11.5).¹⁶

Injuries and aging

Some studies report an increase in the incidence of injury with age progression, linking it to enhanced competitiveness

		U-19					
		Training		Match		Total	
Injury n (%)	Incidence/ 1000 h (95% CI)	Injury n (%)	Incidence/ 1000 h (95% CI)	Total n (%)	Incidence/ 1000 h (95% CI)	Total n (%)	Incidence/ 1000 h (95% CI)
33 (13.3)	1.39 (0.70 - 2.07)*	53 (21.4)	13.02 (6.60 - 19.44)*	190 (76.6)	2.94 (2.08 - 3.79)*		
12 (4.8)	0.48 (0.09 - 0.86)	22 (8.9)	5.01 (2.17 - 7.85)	81 (32.6)	1.22 (0.85 - 1.59)		
21 (8.5)	0.91 (0.27 - 1.55)	31 (12.5)	8.00 (3.28 - 12.73)	109 (44.0)	1.72 (1.10 - 2.34)		
5 (2.0)	0.25 (-0.07 - 0.57)*	6 (2.4)	1.71 (0.06 - 3.36)*	32 (12.9)	0.55 (0.28 - 0.82)*		
8 (3.2)	-	5 (2.0)	-	26 (10.5)	-		
46 (18.5)	1.97 (0.94 - 3.01)	64 (25.8)	16.01 (9.32 - 22.69)	248 (100.0)	3.87 (2.81 - 4.94)		
8 (3.2)	0.35 (-0.06 - 0.75)†	9 (3.6)	2.15 (0.58 - 3.71)†	36 (14.5)	0.54 (0.27 - 0.81)†		
38 (15.3)	1.63 (0.84 - 2.41)†	55 (22.2)	13.86 (8.40 - 19.32)†	212 (85.5)	3.33 (2.47 - 4.20)†		
46 (18.5)	1.97 (0.94 - 3.01)	64 (25.8)	16.01 (9.32 - 22.69)	248 (100.0)	3.87 (2.81 - 4.94)		

among players^{16,21} and increased player-to-player contact.²⁴ Although no significant differences were observed among the analyzed groups, the lack of observable difference may result from the close proximity of the age of the players enrolled in the study (15 to 19 years).

Most common location of injury

The authors found that players sustained more injuries in the lower limbs (n = 212; 85.5%) than in the upper limbs. Ergün *et al*²¹ and Owøye *et al*²³ report similar results; the literature that we consulted^{10,16} estimates that lower limb injuries account for approximately 60% - 90% of all football injuries.

When examining specific location of the body, most injuries occurred in the thigh (n = 61; 24.6%), a finding that is also in accordance to existing research.^{10,20,25,26} Recent studies dealing with professional football players

demonstrate that thigh muscles injuries represent more than 30% of all injuries and cause higher number of days away from competition.²⁷ Corazza *et al*²⁷ explained these numbers: thigh muscles achieve a high level of exposure by crossing two joints (hamstrings, gracilis and rectus femoris), all of which are essential to various football movements such as sprinting, jumping and kicking.

Most common mechanism of injury

We found more injuries caused by a traumatic mechanism when compared to overuse, either in match and training sessions (RR = 5.35; *p* < 0.05). This observation strengthens existing data.^{10,21,23} Football is a highly competitive sport and at younger ages the traumatic injuries are more common than the injuries caused by chronic accumulation of stress.

Table 4 - Non-contact lower limb injuries by dominance and location

Injury Location	Dominant leg n (%)		Non-dominant leg n (%)		Total n (%)	
Thigh	28	(22.9)	13	(10.7)	41	(33.6)
Posterior	17	(13.9)	13	(10.7)	30	(24.6)
Anterior	11	(9.0)	0	(0.0)	11	(9.0)
Ankle	18	(14.8)	6	(4.9)	24	(19.7)
Groin	15	(12.3)	8	(6.6)	23	(18.9)
Knee	11	(9.0)	5	(4.1)	16	(13.1)
Shank/Achilles tendon	5	(5.0)	7	(5.7)	12	(9.8)
Pelvis/Hip	3	(2.5)	3	(2.5)	6	(4.9)
Total	80	(65.6)	42	(34.4)	122	(100.0)

Values in parentheses represent % of total (122) non-contact lower limb injuries
N: number of injuries

Injury severity and return to play

Analyzing the level of severity, the authors found that the majority of the injuries (43.1%) were responsible for an absence of 8 to 28 days and the minority (13.3%) led to an absence of 1 to 3 days. These results are again consistent with previous findings in the literature, although the number of severe injuries was slightly higher in our study comparing to the existing data.^{16,23}

Dominant side injuries

For the purpose of this study, the dominant leg was defined as the leg that the football player primarily prefers to use when kicking the ball. The data collected shows that injuries occurred at a higher percentage in the dominant leg when compared to the non-dominant leg (65.6% vs 34.4%) when considering only non-contact injuries. This is in accordance with existing research.²⁸⁻³¹ Daneshjoo *et al*²⁸ suggests that this difference supports the hypothesis that physical performance and the movement patterns involved in football may negatively alter the balance of strength in both legs, known as bilateral strength balance. Negative changes to bilateral strength can be reduced through the use of simple and inexpensive strength balance compensation training³² devised by coaches and physical therapists.

Comparison with existent Portuguese data

As mentioned previously, there is a void in current Portuguese sports injury research. Only two similar studies were identified in the literature and with smaller sample sizes in the age groups compared in our study. The first study found an injury incidence of 1.2 per 1000 hours of exposure, a slightly lower value than the present study.⁶ However, this last one enrolled athletes between age 12 and 19 and, as previously mentioned, the incidence of injury tends to be lower in younger ages. For that reason, the total incidence value that they found may be underestimated when comparing to our older population and the direct comparison between studies cannot be made. Brito *et al*⁶ found similar patterns of location and mechanism predominance. Sousa P *et al*³³ similarly examined amateur Portuguese football players however focusing on adult ones (18 - 38 years of age).

Limitations

Our study has some limitations that we must underline. The classification of injuries and the period of occurrence were solely ascertained by the medical staff of each team. Additionally, injuries were only classified as recurrent if they had occurred during the evaluative season which may have led to an underestimation in the recurrence rate. It was not possible to eliminate this last limitation due to a lack of access to the past medical histories of players.

The 2006 consensus¹³ introduced some level of uniformity in injury criteria thereby contributing to less biased comparisons. However not all existing studies adopt consensus in the classification and nomenclature of football injuries and this limited the comparison between our results

and those from other studies.

The exposure time was recorded and based on a plan proposed by the technical team department of each club in the beginning of the study and the changes (in the plan or in the athletes involved) were communicated throughout the follow-up period. However, there may be some cases where the exposure time was over or underestimated because of unreported changes. We did not have access to information about training plans or charge and intensity of players' exposure, and this data may have improved our analysis. The dropouts also constitute a limitation that we could not control.

CONCLUSION

Our incidence rates agree with the existing literature. We found no significant differences when comparing the average incidence of injury between both age groups (U-17 vs U-19). We found a significantly higher incidence of injury during matches when comparing to training sessions; traumatic injuries also registered a higher incidence when comparing with overuse ones, as well as recurrent injuries comparing with first-time injuries. Overall, the most frequently affected location was the thigh and the most common recovery period of injuries was between 8 to 28 days. Considering injuries that were not caused by contact with the opponent, we verified a higher occurrence in the dominant side of the athletes.

This study emphasizes the importance of having more prospective data for better characterization of the Portuguese athletes and their injury patterns so that more consistent conclusions can be drawn.

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PROTECTION OF HUMANS AND ANIMALS

The authors declare that the procedures were followed according to the regulations established by the Clinical Research and Ethics Committee and to the Helsinki Declaration of the World Medical Association.

DATA CONFIDENTIALITY

The authors declare having followed the protocols in use at their working center regarding patients' data publication. Informed consent was duly obtained from the patient.

CONFLICTS OF INTEREST

All authors report no conflict of interest.

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