

Mestrado Integrado em Medicina

Dissertação - Artigo de Investigação Médica

**SURVEY ON THE INJURY PATTERN
OF THE SENIOR AND U-19 SOCCER PLAYERS IN
PORTUGAL**

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ABSTRACT

Objectives

The aim of the study was to compare the injury pattern of U-19 at the highest skill level and professional senior players in Portugal.

Methods

This prospective cohort study comprised an initial baseline data collection. The exposure and injury data was registered by medical and technical staff during the 6-month study period. Fifty-one U-19 players and 62 senior players could be followed over this time.

Results

Comparison of the incidence of youth and senior injuries indicate that there is no significant difference between both groups (2,34 vs. 3,33 injuries/player 1000hours), however there are statistically significant difference concerning the locations of injuries. The U-19 players had a higher incidence of traumatic injuries, whereas the senior players had an higher incidence of overuse injuries. Significantly more injuries were incurred during matches than training ($p<0,001$).

Conclusion

The incidence of injuries in the U19-players of this skill level is similar to the one of the senior players, so that it is important that they are accompanied by a medical team to recognize and treat the injuries correctly. The development and implementation of preventive interventions to reduce injuries and re-injuries should be emphasized at this level, too.

Keywords:

Injuries, Injury incidence, Soccer, U-19, Epidemiology

INTRODUCTION

Soccer is a modality of long tradition in Portugal and it is the most practiced sport in the whole world. The *Federation of International Football Associations* (FIFA) has 208 affiliated associations and over 200 million athletes licensed. On May, the 21st of 2009 federation of Portugal had 145409 players registered.

Since some years, many epidemiological studies show an increasing importance of injuries in soccer. Some of these investigate also risk factors and how to reduce the injury incidence. One of the objectives of such studies is to develop explanation models that serve as ground for prevention programmes. Most of the publications focus on professional soccer players. However interests are being directed towards youth. [1-8]

Soccer is associated to a certain risk of injuries, being responsible for 40-60% of all sports lesions. It is estimated that 3,5% to 10% of physical trauma treated in European hospital are due to soccer.[9-10]

In general, a professional soccer player has two minor injuries per year and one severe lesion in three years. The injury incidence of youth players is higher during matches than training. These values vary between 2,4 and 19,1 injuries/player 1000 hours conforming to the study and used methodology. It seems that the older the player, the higher the injury risk, being the risk between 16 and 18 years of age similar to that of senior players. Previous history of injury increases the probability of injuries.[1,10-11]

Most of the injuries occur at the lower extremities. The knee and ankle are the most injured joints. The most frequent types of injuries involve the muscles and joints. The hamstring injury is the most frequent single injury. Injuries are mainly cause by trauma rather than by overuse. Nine percent up to 34% of all injuries during a season are due to overuse. An important factor of the injury pattern is the contact, where 12% to 28% are considerate law violation. In 20% to 25% injuries reoccur at the same location and of the same type.[1,11-12]

Adolescents are divided into different categories according to their ages. The category U-19 encloses players between 16 and 18 years. This category plays at different skill levels and the highest level in Portugal is the "*Campeonato Nacional de Juniores A – I Divisão*". Several studies contemplate the injury risk of diverse age categories including U-19. In this connection only few studies are found, that take into account the injury pattern of youth players which train under virtually professional conditions. Published investigations concerning this level and describing the situation in Portugal are even scarcer.[12-14]

The aim of this article is to compare the injury pattern of nearly professional U-19 players to professional senior players in Portugal and provide a basis for further studies in Portugal in concrete.

MATERIAL AND METHODS

The study design was a prospective cohort study, carried out over the last 6 months of season 2009/2010. All teams of the “*Campeonato Nacional de Juiores A - I Divisão*”, “*Liga Sagres*” and “*Liga Vitalis*” were invited to take part in this study per written contact. Three U-19 and three senior teams accepted to participate. One team of each category dropped out during the study period. Thus the sample consists of 51 male U-19 players and 62 male senior players.

The study design followed the consensus of definitions and data collection procedures in studies of soccer injuries outlined by FIFA and UEFA.[15-16]

Baseline data (age, height, weight) from each player was collected at the beginning of the study (Appendix 1). Exposure was registered on a standard form (Appendix 2) by a club representative differentiating between match and training exposure. All time loss injuries that occurred during the study period were also registered and characterized on a standard form (Appendix 3) by the club medical staff.

Written informed consent was obtained from all participating players and the medical staff. The informed consent of minor U-19 players was signed by their legal representative.

An injury was defined as any physical complaint that results during a soccer match or training session and results in the impossibility of the player to participate in a complete training or match (time loss injury).

Statistical analysis

The incidence of injuries was calculated per player per 1000 hours of exposure (including matches and training sessions). Only players with complete registers were included.

The following statistical methods were used:

- Descriptive: absolute and relative frequencies, means, standard variation deviation, confidence intervals and ranges;
- Z-test for comparison of incidences between groups;
- T-test for comparisons of means;
- χ^2 -test for comparison of proportions .

The significance level was set at $p < 0,05$.

RESULTS

Sample

There were on average 25 players per team (Range: 21-27).

Table 1: Player characteristics

	U-19	Senior	Total
No. of players	51	62	113
Age (years)‡	18 (0,41)	25 (3,62)	20 (4,57)
Height (cm)*	177,5 (6,09)	180 (5,79)	179 (6,13)
Weight (kg)*	70,5 (9,31)	77 (6,20)	74 (7,94)

Mean (standard deviation) – Significance difference: ‡ - $p < 0,001$; † - $p < 0,01$; * - $p < 0,05$

The teams differ significantly in their age level and anthropometric values (Table 1). This difference is inherent to the study population because of the different age/skill levels.

Exposure

Altogether 17161 hours of exposure were registered (U-19: 7249,75hours - 769,5 of match and 6480,5 of training; S: 9911hours - 764,5 of match and 9146,5 of training). Each youth player played on average 10 matches (IC95%: [4;16]; Range:1-20) and had 103 training sessions (IC95%: [86;120]; Range:63-105). Each player of the other group participated on average 8 matches (IC95%: [1-15]; Range:0-20) and 150 training sessions (IC95%: [131;169]; Range:63-159). The U-19 players are statistically significantly more exposed in terms of hours than the older level. In terms of number of training sessions the professional players have significantly more sessions. Additional information is shown in Table 2.

Table 2: Exposure characteristics

	U-19 Mean (SD)	Senior Mean (SD)
No. of matches/player	10 (6)	8 (7)
No. of training sessions/player‡	103 (17)	150 (19)
Exposure hours/player‡	149 (12)	110 (23)
Match hours/player*	12 (9)	8 (10)
Training hours/player‡	137 (14)	102 (34)

Significance difference: ‡ - $p < 0,001$; † - $p < 0,01$; * - $p < 0,05$

Frequency and nature of injuries

During the study period 50 injuries were recorded, 17 (34%) for the U-19 players and 33 (66%) for the senior players. This values correspond to an injury incidence of 2,34 and 3,33 injuries per 1000 hours, respectively. On average one youth player sustained 0,4 injuries during 5 months and a senior player 0,5 injuries.

Table 3: Comparison of injury characteristics

Location	U-19 injuries (n=17) n (%)	Senior (n=17) n (%)
Head/Face	0	0
Neck/Cervical spine	0	0
Sternum/Ribs/Upper Back	0	1(3)
Abdomen	0	0
Low back/Sacrum/Pelvis	1 (6)	1(0,3)
Shoulder/Clavicle	0	1(0,3)
Upper arm	0	0
Elbow	0	0
Forearm	0	0
Wrist	0	0
Hand/Finger/Thumb	0	0
Hip/Groin	1 (6)	6 (18)
Thigh	8 (47)	10 (30)
Knee	2 (12)	6 (18)
Lower leg/Achilles tendon	1 (6)	3 (9)
Ankle	4 (24)	4 (12)
Foot/Toe	0	1(0,3)
Total	17 (100)	33 (100)
Type		
Concussion with or without loss of consciousness	0	0
Fracture	0	2 (6)
Other bone injury	0	0
Dislocation/subluxation	0	0
Sprain/ligament injury	3 (18)	5 (15)
Lesion of meniscus or cartilage	1 (6)	2 (6)
Muscle rupture/strain/tear/cramps	8 (47)	16 (48)
Tendon injury, rupture, tendinitis, bursitis	1 (6)	5 (15)
Haematoma, contusion, bruise	4 (24)	3 (9)
Abrasion	0	0
Laceration	0	0
Nerve injury	0	0
Dental injury	0	0
Circumstances		
Overuse	6 (35)	21 (64)
Trauma	11 (65)	12 (36)
Training	10 (59)	16 (49)
Match	7 (41)	17 (51)

Injury severity	U-19 injuries (n=17) n (%)	Senior (n=17) n (%)
Minimal (1-3 days)	2 (12)	2 (6)
Mild (4-7 days) *	0	9 (27)
Moderate (8-28 days)	9 (53)	15 (46)
Severe (>28 days)	6 (35)	7 (21)
Career ending	0	0

Significance difference: ‡ - $p < 0,001$; † - $p < 0,01$; * - $p < 0,05$

In youth players, 99% of injuries affected the lower extremities and in senior players 97% (Table 3). The most affect part was the thigh (U:47% and S:30%) in both groups. Muscle injuries, contusion and ligament injuries were the most frequent types of injuries in the first group and muscle, tendon and ligament injuries in the second one, in order of diminishing frequency.

Like the location and type of injuries, the circumstances in which they occur do not differ significantly between both study groups.

Eighty-eight percent and 67%, respectively, are categorized as moderate to severe. No career ending injury was observed during this period. Only the mild injuries are significantly more frequent in senior players (U-19:0% vs. S:27%; $p < 0,05$).

Incidence of injuries

As seen before, U-19 players are more exposed than senior players, nevertheless the incidence of injuries is not higher, in contrast there are some locations (shoulder, knee and foot), where the incidence is significantly higher for the professional group. Though global incidence does not differ significantly (U-19:2,34 vs. S:3,33) (Table 4).

The circumstances in which the injuries occur are statistically significantly different between the two groups. The younger players have significantly more traumatic injuries than overuse ones (1,52 vs.0,83; $p < 0,001$) and the older ones more overuse injuries (2,12 vs. 1,21; $p < 0,001$). The injury risk during matches is six times higher than during training for the younger group and even 12-times higher for the professional group. Both groups have higher injury incidences during match exposure, nevertheless the incidence is significantly higher for the senior players during both training as well as match. Ninety percent of the traumatic injuries were caused by contact in both groups.

Mild injuries are significantly higher incidence for the senior players and severe injuries for the younger players. However the mean duration of an injury does not differ significantly (11 vs.20 days).

Table 4: Incidences of injuries

Location of injury	U-19 players (n=51) (injuries /1000h exposure)	Senior players (n=62) (injuries/1000h exposure)
Head/Face	0	0
Neck/Cervical spine	0	0
Sternum/Ribs/Upper Back†	0	0,10
Abdomen	0	0
Low back/Sacrum/Pelvis	0,14	0,10
Shoulder/Clavicle†	0	0,10
Upper arm	0	0
Elbow	0	0
Forearm	0	0
Wrist	0	0
Hand/Finger/Thumb	0	0
Hip/Groin ‡	0,14	0,61
Thigh ‡	1,10	1,01
Knee*	0,28	0,61
Lower leg/Achilles tendon	0,14	0,30
Ankle	0,00	0,40
Foot/Toe ‡	0,00	0,10
Total	2,34	3,33
Type		
Concussion with or without loss of consciousness	0	0
Fracture	0	0,20
Other bone injury	0	0
Dislocation/subluxation	0	0
Sprain/ligament injury	0,41	0,50
Lesion of meniscus or cartilage	0,14	0,20
Muscle rupture/strain/tear/cramps	1,10	1,61
Tendon injury, rupture, tendinitis, bursitis ‡	0,14	0,50
Haematoma, contusion, bruise ‡	0,55	0,30
Abrasion	0	0
Laceration	0	0
Nerve injury	0	0
Dental injury	0	0
Circumstances		
Overuse ‡	0,83	2,12
Trauma‡	1,52	1,21
Training‡	1,54	1,75
Match ‡	9,10	22,24
Injury severity		
Minimal (1-3 days)	0,28	0,20
Mild (4-7 days) ‡	0	0,91
Moderate (8-28 days)	1,24	1,51
Severe (>28 days) ‡	0,83	0,71
Career ending	0	0

Significance difference: ‡ - p<0,001; † - p<0,01; * - p<0,05

DISCUSSION

The present study was designed to compare the injury pattern of two different groups of soccer players with similar performance requirements. A larger sample is needed to obtain reliable results, since this sample has not the power to be representative for the whole Portuguese player population of these skill and age levels. Even so it may be helpful to form new hypotheses.

Differences in anthropometric characteristics reflect the distinct age levels of the two groups. However studies investigating the effects of these characteristics of the incidence of injury within a sport have exposed that they are not very important.[1]

The comparison of the obtained data with literature is limited because of the different study approaches and the lack of studies concerning U-19 players in specific. Especially the papers published before 2006, date of the publication of the "Consensus Statement on Injury Definition and Data Collection Procedures in Studies of Football (Soccer)" (Fuller et al 2006), must be read with carefulness. The calculated parameters may not use the same definitions. Additionally, many studies are based on data that are not collected by medical professionals, e.g. technical staff, leading to other bias.[12]

The injury pattern with dominance of the lower extremities and a great part of muscle injuries, especially of the thigh, illustrated in this study is congruent with the information found in other literature.[6-7,12]

It is in conformation with other publications, that trauma injury is more frequent than overuse injury in the U-19 level. The results for the senior level, however, are discordant with literature, where trauma is more frequent than overuse, in contrast to the inverted relation found in this study. In a study with Scandinavian professional teams overuse injuries encountered for 39% of all injuries (2005). Le Gall (2006) observed within French elite youth players 17% of overuse injuries.[12,17-18]

The high percentage of traumatic injuries that occurred by contact uncover the importance of strategies to apply for fair play, both at youth level as well as senior level. These prophylactic actions are more common at professional level but should also get more regular at other levels. [12]

Globally seen, there are not many differences between the studied groups. Several studies confirm that the injury pattern of youth players is brought closer to the one of the senior players by achieving the age group between 16 and 18. Inklaar et al.(1996) compared different age groups and observed the highest injury incidence in the U-19 level. Also, Hawkins and Fuller (1999) found a similar epidemiology in three professional senior teams and their U-19 teams.[1,12,19-20]

The calculated injury incidences are a little lower than the results found in other studies at youth level. At professional level the results are concordant. In a review about soccer injuries

in children and adolescents the injury risk is between 2,3 (training) and 14,8 (match) per player and 1000 hours exposure. Generally the risk is superior during matches than during training like it is shown in this study. Hägglund et al.(2005) analysed the pattern of professional senior players in Denmark and Sweden. There the injury incidence was higher than the obtained in the present study (7,1 and 14,4 vs. 3,33 injuries/player 1000hours).[1,15,21]

The mean duration of the injuries until full rehabilitation is comparable with the obtained by other data. The distribution of the severity pattern is in accordance, too.[12]

In summary, globally seen location and type of the injury pattern corresponds to that found in other investigations. In most of the parameters were no statistically significant differences between U-19 and senior players. The U-19 players on this level (highest Portuguese skill level) have similar injury patterns to the professional Portuguese senior players. To maintain future injuries low it is important that youth players of this performance level have comparable medical and physiotherapeutic care to the professional levels. The risk of a new injury increases significantly during the first year after an injury. Therefore special attention should be paid to the training methods to prevent injuries, especially in youth levels.[1,7,12]

These results should be interpreted with caution due to the relatively small sample size and short study period. A study with a more powerful sample and contemplating at least one full soccer season should be made to confirm or withdraw these results.

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REFERENCES

- 1 Dvorak J, Junge A, Chomiak J, et al. Risk factor analysis for injuries in football players—possibilities to design a preventive program. *Am J Sports Med* 2000;28(Suppl 5):S69–74
- 2 Engström B, Renstrom PA. How can injuries be prevented in the World Cup soccer athlete? *Clin J Sport Med* 1998;7(4):755-768
- 3 Parkkari J, Kujala U, Kannus P. Is it possible to prevent sports injuries? Review of controlled clinical trials and recommendations for future work. *Sports Med* 2001;31(14):985-995
- 4 Parkkari J, Pasanen K, Mattila VM et al. The risk for a cruciate ligament injury of the knee in adolescents and young adults: a population-based cohort study of 46 500 people with a 9 year follow-up. *Br J Sports Med* 2008;42:422-426
- 5 Hägglund M, Walden M, Ekstrand J. Exposure and injury risk in Swedish elite football: a comparison between seasons 1982 and 2001. *Scand J Med Sci Sports* 2003; 13(6):364-370
- 6 Hawkins RD, Fuller CW. A prospective epidemiological study of injuries in four English professional football clubs. *Br J Sports Med* 1999;33(3):196-203
- 7 Emery CA, Meeuwisse WH, Hartmann SE. Evaluation of risk factors for the injury in adolescent soccer implementation and validation of an injury surveillance system. *Am J Sports Med* 2005;33(12):1882-1891
- 8 Louw QA, Manilall J, Grimmer KA. Epidemiology of knee injuries among adolescents: a systematic review. *Br J Sports Med* 2008;42
- 9 Zafra AO, Álvarez MD, Montero FJ e tal. Epidemiología lesional en futbolistas jóvenes. *Cultura, Ciencia y Deporte* 2005; 9(3):177-183
- 10 Henke T, Schulz D. Sportunfälle im Berufsfußball – Epidemiologie und Prävention. Bochum: Ruhr-Universität Bochum; 2005.
- 11 Dvorak J, Junge A. Football Injuries and Physical Symptoms: A Review of the Literature. *Am J Sports Med* 2000;28:S-3-S-9
- 12 Müller-Rath R, Schmidt C, Mumme T. Das Verletzungsmuster nach Einführung der A-Junioren-Fußball-Bundesliga in Deutschland im Vergleich zum Senioren-Profi-Fußball. *Sportverl Sportschad* 2006;20:192-195
- 13 Peterson L, Junge A, Chomiak J et al. Incidence of football injuries and complaints in different age groups and skill-level groups. *Am J Sports Med* 2000;28:S51-S57
- 14 Schmidt-Olsen S, Joergensen U, Kaalund S et al. Injuries among young soccer player. *Am J Sports Med* 1991;19:273-275
- 15 Hägglund M, Waldén M, Bahr R et al. Methods for epidemiological study of injuries to professional football players: developing the UEFA model. *Br J Sports Med* 2005;39:340–346
- 16 Fuller C, Ekstrand J, Junge A et al. Consensus statement on injury definitions and data collection procedures in studies of football (soccer) injuries. *Br J Sports Med* 2006;40:193-201

- 17 Le Gall F, Carling C, Reilly T et al. Incidence of injuries in elite French youth players. *Am J Sports Med* 2006;34:1-11
- 18 Häggglund M, Waldén M, Erkstrand J et al. Injury incidence and distribution: a prospective study of danish and swedish top teams. *Br J Sports Med* 2005;39:340–346
- 19 Inklaar H, Bole E, Schmickl S et al. Injuries in male soccer players: team risk analysis. *Int J Sports Med* 1996;17:229-234
- 20 Hawkins RD, Fuller CW. A prospective study of injuries in four English professional football clubs. *Br J Sports Med* 1999;33:196–203
- 21 Timpka T, Risto O, Björmsjö M. Boys soccer league injuries: a community-based study of time-loss from sports participation and long-term sequelae. *Eur J Public Health* 2008;18(1):19-24

Appendix 1

[illegible]

Appendix 2



REGISTO DE EXPOSIÇÃO

Nome da equipa:

[illegible]

Appendix 3



REGISTO DA LESÃO

Código do jogador: _____

U. PORTO

centro hospitalar
do Porto



INSTITUTO DE CIÊNCIAS BIOMÉDICAS ABEL SALAZAR
UNIVERSIDADE DO PORTO

1. Data da lesão _____
2. Data de retorno a participação completa _____
3. Região do corpo lesionada

Cabeça/Face	
Pescoço/Coluna cervical	
Esterno/Costelas/Região dorsal	
Abdómen	
Região lombar/Sacro/Pelve	
Ombro/Clavícula	
Braço	
Cotovelo	
Antebraço	

Punho	
Mão/Dedo/Polegar	
Anca/Virilha	
Coxa	
Joelho	
Perna/Tendão de Aquiles	
Tornozelo	
Pé/Dedo	

4. Localização

Esquerda		Direita		Não aplicável	
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5. Tipo de lesão

Concussão com ou sem perda de consciência	
Fractura	
Outra lesão óssea	
Luxação/Subluxação	
Entorse/Lesão ligamentar	
Lesão meniscal ou cartilaginosa	
Ruptura/estiramento/distensão/cãibra muscular	
Lesão tendinosa/Ruptura/Tendinite/Bursite	
Hematoma/Contusão/Equimose	
Abrasão	
Laceração	
Lesão nervosa	
Lesão dentária	
Outro tipo de lesão (especifique p.f.)	

6. Diagnóstico (Texto ou Código Orchard):

7. O jogador teve lesões prévias do mesmo tipo do mesmo lado (i.e. a lesão é uma recorrência)?

Sim ☐ Não ☐

Se sim, especifique a data de retorno a participação completa após a lesão prévia: _____

8. A lesão foi causada por sobreuso ou traumatismo?

Sobreuso ☐ Traumatismo ☐

9. Quando ocorreu a lesão?

Treino ☐ Jogo ☐

10. A lesão ocorreu por contacto ou colisão?

Não ☐ Sim, com outro jogador ☐

Sim, com a bola ☐

Sim, com outro objecto (especifique) ☐

11. O árbitro considerou a acção que levou a lesão uma violação da lei?

Não ☐ Sim, livre/penalty ☐ Sim, cartão amarelo ☐ Sim, cartão vermelho ☐

Se sim, a sanção foi contra o: Jogador lesionado ☐ Adversário ☐