

Slobodan Klačar<sup>1,2</sup> and Leandro Phillips<sup>3</sup>

# EVALUATION OF HAMSTRING MATCH INJURY FREQUENCY, INCIDENCE AND SEVERITY PATTERNS AMONG THE EUROPEAN TOP FIVE FOOTBALL LEAGUES DURING THE SEASON 2022/2023

<sup>1</sup> University of Sarajevo, Faculty of Sport and Physical Education

<sup>2</sup> Université des Antilles

<sup>3</sup> Noisefeed, Chiavari (Italy)

Original research

## Correspondence to

Slobodan Klačar  
University of Sarajevo, Faculty of Sport and Physical Education  
Bosnia and Herzegovina  
slobodan.klacar@fasto.unsa.ba

**Submitted:** 16<sup>th</sup> of November 2023

**Accepted:** 28<sup>th</sup> of November 2023

© 2023 by the author(s).  
Faculty of Sport and Physical Education, University of Sarajevo.  
This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY).

**To cite:** Klačar, S., et al. (2023) Evaluation of hamstring match injury frequency, incidence and severity patterns among the European top five football leagues during the season 2022/2023. *Homosporticus*, 25 (2), 24-28. doi 10.61886/1840-4324.2023.25.2.30

## ABSTRACT

This study aims to explore the specific muscle injury types, nature of match injury frequency and match incidence of the European top five football leagues (UEFA, 2023), to compare match hamstring injury severity characteristics and to study differences in match injury, frequency and incidence between the five leagues during the season 2022/2023. The sample size was N= 2678 (SD ± 41.8) male players from the "Big Five" European professional football leagues with a mean age of 26.7 (SD ± 4.6) years and an average of 1303 minutes played per player with an average of a 27-player squad. A total number of 630 hamstring match injuries was recorded among the 98 clubs. Most of the injuries (N=298) required a two to four-week absence from football. The total playing exposure hours per league was 11,640.48, (SD ± 124.5). The severe injury patterns severe injuries represent 28.6% of the total of all severity patterns, indicating an extremely high hamstring injury burden.

**Keywords:** football, injury, incidence, muscle.

## INTRODUCTION

Injuries in professional football represent a substantial problem for players, coaches, clubs and national teams, even though injury prevention strategies, monitoring methodology and epidemiological research have been enormously developed in the last two decades (Fuller et al, 2006; Thorborg et al., 2017; Junge and Dvorak, 2013), but some injury types and mechanisms haven't decreased in the European top leagues (Ekstrand et al., 2022b) such as hamstring muscle injuries. Muscle injuries are extremely prevalent and represent a third of all injuries in elite football (Mueller-Wohlfahrt et al., 2013). Numerous studies on the risk factors of muscle injuries in professional

football that have been published indicate that the risk factors are often identical or similar to the mentioned studies (Klačar et al., 2022). Muscle injuries are more likely to be the result of multiple risk factors interacting at the time of the injury rather than being the result of one particular factor (Lievens et al., 2022; Pruna et al., 2019). The most prevalent injury among professional male football players is a hamstring strain or tear (Ayala et al., 2019; Buchheit et al, 2023; Van Beijsterveldt et al., 2013). According to the ECIS (Elite Club Injury Study), hamstring injury incidence is on the rise and accounts for almost one-quarter of all injury types in

**HOMO** SCIENTIFIC JOURNAL OF SPORT AND PHYSICAL EDUCATION  
**SPORTICUS**

OPEN  ACCESS

male elite professional football (Ekstrand et al., 2022b). Hamstring injury mechanisms in professional football and patterns are complex in nature and various internal and external factors could affect players' hamstring injury risks (Dunlop et al., 2020; McCall et al., 2015).

Concerning financial burden and team performance, football injury prevention models and injury analysis in professional football is a highly essential and comprehensive process as modern professional football is a multi-billion euro industry (Krutsch et al., 2020) and higher injury incidence will negatively affect team performance in the long run (Hägglund et al., 2009;

Hägglund et al, 2013; Ekstrand et al, 2018; Verheijen, 2020). It has been suggested that hamstring muscles are more vulnerable to injury when running at high speeds and sprinting (Engebretsen et al., 2010; van Dyk et al., 2018) but Bucheit et al. (2023) found an association with match hamstring injuries when players were not exposed near-to-maximal sprinting speed running sessions during the training.

Monitoring, assessment and evaluation of injuries in professional football from the epidemiological perspective is an important tool in the injury prevention model (Buckthorpe et al., 2018). The present article aimed to assess and compare the injury frequency, incidence and severity patterns of muscle injury types of the hamstring muscles among the European top five football leagues and the 98 participating clubs during the season 2022/2023.

## METHODS

Descriptive statistical methods were applied in this study. Descriptive statistics of means, standard deviation (SDs) and frequencies were used as statistical tools to describe the footballers' injury characteristics and other variables. Percentages and frequencies were used to answer the research questions. The match incidence rate was calculated using the following equation:

$$\text{Match injury incidence} = \frac{\text{Number of injuries} \times 1000}{\text{Player exposure hours}}$$

The Noisefeed injury database (<https://noisefeed.com>) for professional football was used to collect the data forms for hamstring injury match frequency and severity patterns. Noisefeed Injuries is a professional tool for the scouting and studying of football injuries. With over 130.000 entries, it represents the ultimate database when looking for injury information. The dataset was filtered for the five European football leagues (Premier League, Ligue 1, Serie A, La Liga and Bundesliga). The Excel database of injury files is processed and classified according to the number of

days of absence from training and matches and the type of muscle injury. The mean of player age, exposure hours and players that played during the season 2022/2023 are presented in Table 1.

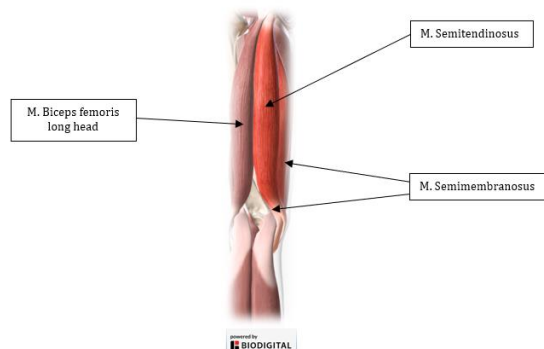
**Table 1** Players' age, exposure hours per league and number of players that played matches in each league

League	Age	Exposure hours	Players
Premier League	26.7	12,588.82	545
La Liga	27.1	10,532.78	481
Serie A	26.8	12,550.27	573
Bundesliga	26.4	10,075.87	499
Ligue 1	25.8	12,454.67	580
Mean	26.8 (SD ± 4.6)	11,640.48 (SD ± 124.5)	535.6

The term "hamstrings" refers to the group of muscles located in the rear region of the thigh.

They include the muscles of the semitendinosus, semimembranosus, and biceps femoris, which create distinct tendons in the posterior portion of the knee, both medially and laterally. The biceps femoris, which have long and short heads, the semimembranosus, and the semitendinosus muscles are located in the posterior compartment of the thigh, which is also known as the hamstrings as described in Figure 1:

Figure 1. Left hamstring muscle group. Interactive 3D Anatomy - Posterior thigh muscles. BioDigital. Retrieved December 2023, from <https://www.biodigital.com>



The severity of an injury was evaluated by the length of absence from football participation (football training and playing). An injury's severity can be classified into four categories: minimum, mild, moderate, and severe, according to prior epidemiological literature on injury studies, (Hägglund et al., 2005) this classification is presented in Table 2.

**Table 2** Injurie clasification

Minimal injury	resulting in 1–3 days absence from training and playing.
Mild injury	resulting 4–7 in days absence from training and playing.
Moderate injury	resulting in 8–28 days absence from training playing.
Severe injury	resulting in > 28 days absence from training and playing.

## CONFIDENTIALITY

All personal data were confidential. The names of all the players and the clubs involved in the study are evaluated anonymously. The anonymous data forms are collected from the injury database for professional football (Noisefeed, <https://noisefeed.com>) with ethical permission.

## RESULTS

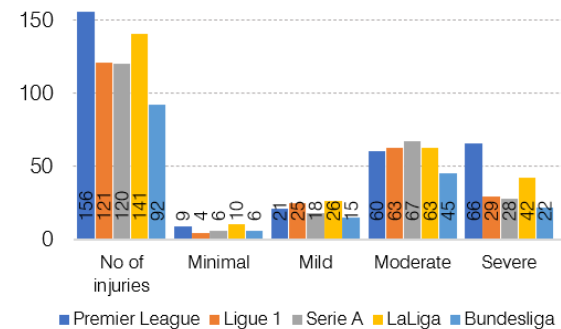
The median lay-off following a hamstring injury was 18,5 days, ranging from 23,5 in the Premier League and 14 in the Bundesliga (Table 2.). In the Elite Club Injury Study, Ekstrand et al. (2022) reported a median lay-off of 13 days. The mean lay-off in this study was the highest in the Premier League 32,15 days and the lowest in the Bundesliga 20 days. The sums of lay-off days were 5016 in the Premier League, 3125 in the La Liga, 2904 in the Serie A, 2569 in the Ligue 1 and 1762 in the Bundesliga as shown in Table 2. Maximum lay-off days for the hamstring injury were 192 in the Premier League, 186 in the Serie A, 125 in the La Liga, 74 in the Ligue 1 and 69 in the Bundesliga, indicating that hamstring injury severity could be an extremely serious problem for a club and a player with a long absence from football training and playing.

**Table 3** Descriptive statistics of hamstring injury frequency and severity patterns

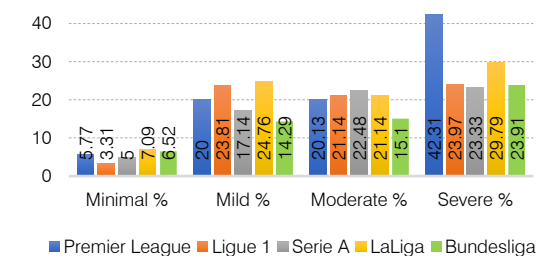
League	Premier League	Ligue 1	Serie A	La Liga	Bundesliga
Mean	32.15	21.06	24.40	22.16	20.02
Median	23.5	16	21	18	14
Mode	4	7	22	3	8
SD	32.44	16.09	24.80	18.52	16.05
Range	189	71	184	122	66
Minimum	3	3	2	3	3
Maximum	192	74	186	125	69
Sum	5016	2569	2904	3125	1762

The frequency of all hamstring injuries is presented in Figure 1. indicating the highest frequency in the Premier League, and the lowest in the Bundesliga 156 and 92, respectively. What is specific is the high frequency of severe injury patterns in the Premier League 66 compared to the average of 30 for the rest of the leagues. Seven injuries were not registered in terms of injury severity of lay-off days (Figure 2., N/A). Severe and moderate injury patterns represent more than three-quarters (76,6 %) of all injuries recorded. Severe injuries (causing an absence of >28 days) accounted for 28,6 % of all injuries which is relatively higher compared to other studies (Petersen et al., 2010; Ekstrand et al., 2016; Ekstrand et al., 2022b) as presented in Figure 3. The highest percentage of moderate injuries was found in the Serie A 22,4 % and the lowest in the Bundesliga 15,1 %. Mild injuries are the lowest in the Bundesliga and highest in the La Liga, 14,29 % and 24,76 % respectively (Figure 3.).

**Figure 2** Injury frequency and frequency of injury severity patterns

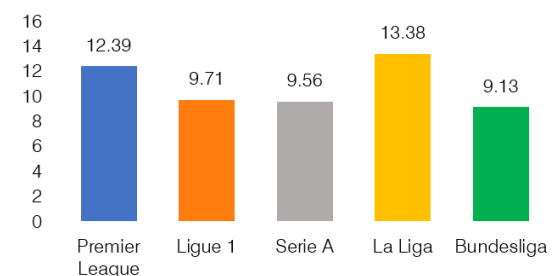


**Figure 3** Percentage (%) of injury severity patterns



Hamstring match injury incidence is presented in Figure 4. The incidence in the La Liga is 13,38 injuries per 1000 hours of exposure, even though the highest frequency was in the Premier League, the number of players that played games in the La Liga was 481 and 10,532 exposure hours compared to the Premier League 545 players playing 12,588 hours. These match injury incidences are higher compared to recent studies from the UEFA ECIS cohorts (Ekstrand et al., 2016; Ekstrand et al., 2022b), although, in the study by López-Valenciano et al. (2019) during the systematic review and meta-analysis of match incidence was reported 36,0 injuries per 1000 hours of match exposure, similarly, Stubbe et al. (2015), found high match injury incidence of 32,8 in the Dutch league. The other three leagues in this study range from 9,71 to 9,13 injuries per 1000 hours with the lowest incidence in the Bundesliga.

**Figure 4** Number of match injury incidence



## DISCUSSION

Hamstring injuries are one of the most frequent types and the biggest problem in the European top five football leagues, evidently, these types of injuries have increased in the past and the volume of exposure hours (playing and training) is increasing in these leagues and clubs. Professional football players are subject to a significant risk of injury, particularly during official games in the participating clubs during the season 2022/2023. During this study hamstring injury severity patterns are higher than in the previous research (Ekstrand et al., 2022; Ekstrand et al., 2019). Generally, the incidence of injuries during matches is over tenfold greater than that of injuries during training (Ekstrand et al., 2011; López-Valenciano et al., 2019.). The injury evaluation of this cohort didn't include training injury incidence in the hamstring muscle group, however, the research data shows a significant match-play incidence of 6.5 match hamstring injuries per participating club within the five European leagues during an average of 11,640 hours of playing exposure or per one season. An interesting finding is that injury severe patterns are high in the Premier League and the La Liga, 42,3% and 23,9, respectively, the average severe patterns of the five leagues is 28,6%. In the UEFA Elite Club Injury Study from 2001/02 to 2021/22, Ekstrand et al. (2022) reported hamstring injury severe patterns of 15% and moderate patterns of 57% on a sample size of 2636 hamstring injuries (within 54 elite football teams). However, moderate severity patterns in this are lower compared to the UEFA Elite Club Injury Study 2001/2022 20% vs 57%. Mild patterns are relatively similar in these two studies, 20% vs 19%, respectively.

Professional football is an intensive sport characterised by explosive football actions during attacking, defending and transitioning that increase hamstring injury risk with injury mechanisms of running, sprinting, stretching, kicking, overuse and other mechanisms. But also the injury history and age of players will affect the risk of a hamstring injury (Hägglund et al., 2006). The intensity during match-play is higher compared to training, therefore the hamstring match injury incidence is higher compared to the hamstring training injury incidence (Hägglund et al., 2003; López-Valenciano et al., 2019; Waldén et al., 2005). Additionally, increasing the number of matches (national team caps, international competitions, national cups) and less time between the matches would also increase hamstring injury risks in the European top five football leagues in the future. Return to play is getting longer than in the past based on these findings of the severity patterns which could be explained by less recovery time between the training and matches, but also the application of injury

prevention strategies. There is a shred of evidence that some injury prevention programs may reduce hamstring injury risks (Engebretsen et al., 2010; Mjøltnes et al., 2004; Petersen et al., 2011).

## CONCLUSION

This research indicated a high occurrence of hamstring match injuries in the European top five football leagues. There is a substantial risk of a hamstring injury for the participating clubs during matches. Hamstring match injury proportions in terms of number of injuries, severity patterns and total absence days are concerningly high during the season 2022/2023. These findings can contribute to the hamstring injury prevention perception, better internal communication among the staff and the development of specific programs or models in the future to decrease injury risks among professional football clubs.

## REFERENCES

- Ayala, F., López-Valenciano, A., Martín, J. A. G., Croix, M. D. S., Vera-García, F. J., del Pilar García-Vaquero, M., ... & Myer, G. D. (2019). A preventive model for hamstring injuries in professional soccer: Learning algorithms. *International journal of sports medicine*, 40(05), 344-353.
- Buchheit, M., Settembre, M., Hader, K., & McHugh, D. (2023). Exposures to near-to-maximal speed running bouts during different turnarounds in elite football: association with match hamstring injuries. *Biology of Sport*, 40(4), 1057-1067.
- Buckthorpe, M., Wright, S., Bruce-Low, S., Nanni, G., Sturdy, T., Gross, A. S., ... & Gimpel, M. (2018). Recommendations for hamstring injury prevention in elite football: translating research into practice. *British journal of sports medicine*.
- Dunlop, G., Ardern, C. L., Andersen, T. E., Lewin, C., Dupont, G., Ashworth, B., ... & McCall, A. (2020). Return-to-play practices following hamstring injury: a worldwide survey of 131 premier league football teams. *Sports Medicine*, 50, 829-840.
- Ekstrand, J., Bengtsson, H., Waldén, M., Davison, M., Khan, K. M., & Hägglund, M. (2022b). Hamstring injury rates have increased during recent seasons and now constitute 24% of all injuries in men's professional football: the UEFA Elite Club Injury Study from 2001/02 to 2021/22. *British Journal of Sports Medicine*, 57(5), bjsports-2021-105407. <https://doi.org/10.1136/bjsports-2021-105407>.
- Ekstrand, J., Hägglund, M., & Waldén, M. (2011). Epidemiology of muscle injuries in professional football (soccer). *The American journal of sports medicine*, 39(6), 1226-1232.
- Ekstrand, J., Lundqvist, D., Lagerbäck, L., Vouillamoz, M., Papadimitiou, N., & Karlsson, J. (2018). Is there a correlation between coaches' leadership styles and injuries in elite football teams? A study of 36 elite teams in 17 countries. *British journal of sports medicine*, 52(8), 527-531.
- Ekstrand, J., Waldén, M., & Hägglund, M. (2016). Hamstring injuries have increased by 4% annually in men's professional football, since 2001: a 13-year longitudinal

- analysis of the UEFA Elite Club injury study. *British journal of sports medicine*.
- Engebretsen, A. H., Myklebust, G., Holme, I., Engebretsen, L., & Bahr, R. (2010). Intrinsic risk factors for hamstring injuries among male soccer players: a prospective cohort study. *The American journal of sports medicine*, 38(6), 1147-1153.
- Engebretsen, A. H., Myklebust, G., Holme, I., Engebretsen, L., & Bahr, R. (2010). Intrinsic risk factors for hamstring injuries among male soccer players: a prospective cohort study. *The American journal of sports medicine*, 38(6), 1147-1153.
- Fuller, C. W., Ekstrand, J., Junge, A., Andersen, T. E., Bahr, R., Dvorak, J., ... & Meeuwisse, W. H. (2006). Consensus statement on injury definitions and data collection procedures in studies of football (soccer) injuries. *Scandinavian journal of medicine & science in sports*, 16(2), 83-92.
- Häggglund, M., Waldén, M., & Ekstrand, J. (2003). Exposure and injury risk in Swedish elite football: a comparison between seasons 1982 and 2001. *Scandinavian journal of medicine & science in sports*, 13(6), 364-370.
- Häggglund, M., Waldén, M., & Ekstrand, J. (2006). Previous injury as a risk factor for injury in elite football—a prospective study over two consecutive seasons. *British journal of sports medicine*.
- Häggglund, M., Waldén, M., & Ekstrand, J. (2009). UEFA injury study—an injury audit of European Championships 2006 to 2008. *British journal of sports medicine*, 43(7), 483-489.
- Häggglund, M., Waldén, M., Bahr, R., & Ekstrand, J. (2005). Methods for epidemiological study of injuries to professional football players: developing the UEFA model. *British journal of sports medicine*, 39(6), 340-346.
- Häggglund, M., Waldén, M., Magnusson, H., Kristenson, K., Bengtsson, H., & Ekstrand, J. (2013). Injuries affect team performance negatively in professional football: an 11-year follow-up of the UEFA Champions League injury study. *British journal of sports medicine*, 47(12), 738-742.
- Junge, A., & Dvorak, J. (2013). Injury surveillance in the world football tournaments 1998–2012. *British journal of sports medicine*, 47(12), 782-788.
- Klačar, S., Alić, H., Jelešković, E., Talović, M., Čović, N., & Ibrahimović, M. (2022). POVREDE U PROFESIONALNOM FUDBALU. Univerzitet u Sarajevu - Fakultet sporta i tjelesnog odgoja. [https://www.researchgate.net/publication/365400111\\_POVREDE\\_U\\_PROFESIONALNOM\\_FUDBALU\\_INJURIES\\_IN\\_PROFESIONAL\\_FOOTBALL](https://www.researchgate.net/publication/365400111_POVREDE_U_PROFESIONALNOM_FUDBALU_INJURIES_IN_PROFESIONAL_FOOTBALL)
- Krutsch, V., Grechenig, S., Loose, O., Achenbach, L., Zellner, J., Striegel, H., ... & Krutsch, W. (2020). Injury analysis in professional soccer by means of media reports—only severe injury types show high validity. *Open access journal of sports medicine*, 123-131.
- Lievens, E., Van Vossel, K., Van de Casteele, F., Wezenbeek, E., Deprez, D., Mathys, S., ... & Derave, W. (2022). Muscle fibre typology as a novel risk factor for hamstring strain injuries in professional football (soccer): a prospective cohort study. *Sports Medicine*, 1-9.
- López-Valenciano, A., Ruiz-Pérez, I., García-Gómez, A., Vera-García, F. J., Croix, M. D. S., Myer, G. D., & Ayala, F. (2019). Epidemiology of injuries in professional football: a systematic review and meta-analysis. *British journal of sports medicine*.
- McCall, A., Carling, C., Davison, M., Nedelec, M., Le Gall, F., Berthoin, S., & Dupont, G. (2015). Injury risk factors, screening tests and preventative strategies: a systematic review of the evidence that underpins the perceptions and practices of 44 football (soccer) teams from various premier leagues. *British journal of sports medicine*.
- Mjølsnes, R., Arnason, A., Østhagen, T., Raastad, T., & Bahr, R. (2004). A 10-week randomized trial comparing eccentric vs. concentric hamstring strength training in well-trained soccer players. *Scandinavian journal of medicine & science in sports*, 14(5), 311-317.
- Mueller-Wohlfahrt, H. W., Haensel, L., Mithoefer, K., Ekstrand, J., English, B., McNally, S., ... & Uebliacker, P. (2013). Terminology and classification of muscle injuries in sport: the Munich consensus statement. *British journal of sports medicine*, 47(6), 342-350.
- Petersen, J., Thorborg, K., Nielsen, M. B., & Hölmich, P. (2010). Acute hamstring injuries in Danish elite football: a 12-month prospective registration study among 374 players. *Scandinavian journal of medicine & science in sports*, 20(4), 588-592.
- Petersen, J., Thorborg, K., Nielsen, M. B., Budtz-Jørgensen, E., & Hölmich, P. (2011). Preventive effect of eccentric training on acute hamstring injuries in men's soccer: a cluster-randomized controlled trial. *The American journal of sports medicine*, 39(11), 2296-2303.
- Pruna, R., Andersen, T. E., Clarsen, B., McCall, A., & HUB, B. I. (Eds.). (2019). *Muscle injury guide: prevention of and return to play from muscle injuries*.
- Stubbe, J. H., Van Beijsterveldt, A. M. M., Van Der Knaap, S., Stege, J., Verhagen, E. A., Van Mechelen, W., & Backx, F. J. (2015). Injuries in professional male soccer players in the Netherlands: a prospective cohort study. *Journal of Athletic Training*, 50(2), 211-216.
- Thorborg, K., Krommes, K. K., Esteve, E., Clausen, M. B., Bartels, E. M., & Rathleff, M. S. (2017). Effect of specific exercise-based football injury prevention programmes on the overall injury rate in football: a systematic review and meta-analysis of the FIFA 11 and 11+ programmes. *British journal of sports medicine*, 51(7), 562-571.
- UEFA. (2023). Country coefficients | UEFA Coefficients. UEFA.com. <https://www.uefa.com/nationalassociations/uefarankings/country/#/yr/2023>
- Van Beijsterveldt, A. M. C., van de Port, I. G., Vereijken, A. J., & Backx, F. J. G. (2013). Risk factors for hamstring injuries in male soccer players: a systematic review of prospective studies. *Scandinavian journal of medicine & science in sports*, 23(3), 253-262.
- van Dyk, N., Farooq, A., Bahr, R., & Witvrouw, E. (2018). Hamstring and ankle flexibility deficits are weak risk factors for hamstring injury in professional soccer players: A prospective cohort study of 438 players including 78 injuries. *The American journal of sports medicine*, 46(9), 2203-2210.
- Verheijen, R. (2020). *The original guide to football coaching theory: part 1*. Amsterdam: Football Coach Evolution BV.
- Waldén, M., Häggglund, M., & Ekstrand, J. (2005). UEFA Champions League study: a prospective study of injuries in professional football during the 2001–2002 season. *British journal of sports medicine*, 39(8), 542-546.