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Original Research

Injury Trends in Men's English Professional Football: An 11-year Case Series

Ben Palmer[1], Michael McBride[2], Gareth Jones[1], Lawrence Mayhew[1]

[1] School of Health, Leeds Beckett University, [2] Lincolnshire, United Kingdom, Scunthorpe United Football Club

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Background

There is a paucity of longitudinal epidemiological injury data in football players competing in the English Football League (EFL). The aim of this study was to report the incidence, site and nature of injury in professional male football players over 11 seasons.

Study Design

Retrospective case series.

Methods

Three-hundred and sixty-three professional football players from four squads competing in the EFL. Data collection procedures followed the guidelines set out in the Union of European Football Associations (UEFA) consensus for all 11 seasons. Injury incidence per 1000 hours was estimated from match and training exposure.

Results

Overall injury incidence was 6.5/1000 hours (95% CI 5.6-7.5). Incidence of injury in match play was significantly higher than training (58/1000 hours, 95% CI 38.4-83.8 v 2.8/1000 hours, 95% CI 1.8-5.2, P<0.001). Re-injuries constituted 6.1% (55/907) of all injuries and caused longer absences than initial injury (15 vs 9). A total of 907 injuries were recorded. No significant differences were found between overall (P=0.935), training (P=0.752) and match (P=0.882) incidence and muscle (P=0.728) and ligament (P=0.991) injuries between seasons. There was a significant increase in the number of hamstring injuries occurring during match play across seasons (R2=0.450, b=0.575, 95% CI 0.1 to 1.1, P=0.024). Moderate severity injuries accounted for 32.6% of all injuries (21-45.5%, 296/907), with a mean (SD) time loss of 18 (33) days per injury.

Conclusions

Whilst overall incidence rates remain stable; the incidence of hamstring injuries remains high and re-injuries had a higher severity than initial injuries. Moderate injuries were the most frequent and on average you can expect injury burden of 18 days per injury per season.

INTRODUCTION

The physiological demand of football means that players are associated with a high risk of injury.[1] Recent epidemiological findings reveal that English Football League (EFL) players are estimated to sustain 1.9 injuries per season.[2] Time loss injuries are detrimental to teams as it reduces match player availability.[3] Time loss injuries have a negative effect on full time results when players are injured during a match,[4] which can lead to detrimental effects on team performance,[3,5] a potential reduction in points per game[3] and as a result negatively affect financial revenue.[6]

Recently the injury incidence of English professional players has been estimated to be 9.1 injuries/1000 h.[2] This estimate was provided over the 2015/16 season and gives up-to-date estimate of injury incidence in the EFL, although the study doesn't provide inter-seasonal differences. Inter-seasonal differences are important as they provide natural trends of injury between seasons which could provide a critical foundation for researchers and clinicians to reduce risk of injury through development of specific prevention strategies.[7]

In 2001, Hawkins et al.[8] provided the first inter-seasonal data in English professional players and estimated the incidence to be 8.5/1000 hours. Although, due to when the study was conducted, it doesn't provide an up-to-date estimate of injury epidemiology. It has since been reported that

technical and physical football performance figures have increased in the English Premier League (EPL).[1]

In the last 20 years, inter-seasonal differences have been identified from 23 UEFA Champions League (UCL) teams showing an overall injury incidence of 8/1000 hours, with training and match injury incidences remaining stable over seven seasons.[9] In addition to this Ekstrand (2022)[10] recently compared hamstring injury rates over 21 seasons (2001/02-2021/22), showing hamstring injury rates have increased significantly between 2014/15 and 2021/22 in training and match play.[10] Although the data used for both studies excludes squads from the EFL and, it is important to note, that there are fundamental differences between England and mainland Europe, such as winter breaks, the intensity of the match and the weather conditions.[11]

The aim of this study was to report the incidence, site and nature of injury in professional male football players in the EFL over 11 seasons. Due to the retrospective nature of the study, a case series will be the most appropriate methodological approach, this will allow generation of hypotheses which can be tested in future studies with greater methodological rigor.

METHODS AND MATERIALS

ETHICAL APPROVAL

The project received research ethical approval in line with the Research Ethics Policy and Procedures of Leeds Beckett University and was performed in accordance with the standards of ethics outlined in the Declaration of Helsinki. Permission was gained from all clubs involved to access and publish anonymised data. All players provided written informed consent for data to be included and disseminated in the study.

PARTICIPANTS

Participants were adult male professional footballers, signed to four professional football clubs competing in the 2nd and 3rd tier of English football (top two divisions of the EFL) over 11 seasons (2007/8 to 2013/14 and 2015/16 to 2018/19). Each season represented by one squad and club. The EFL consists of the 2nd, 3rd and 4th tiers of English football and is separate to the first division which is the EPL. The season of 2014-15 was excluded due to insufficient data.

PROCEDURES

The UEFA Consensus Statement guidelines were used to determine injury, exposure, severity of injury and reoccurrence of injury.[12] A clinician with over 23 years' experience in male professional football at varying levels recorded all injuries in accordance with Fuller et al. (2006)[12] consensus statement over all 11 seasons. Following an injury, a player's period of absence constituted the full time period (number of days) between the date the player was forced to withdraw football participation due to an injury until the date when the medical team allowed the player to return to full unrestricted training and be available for match selection.[12] Injuries were categorised as follows: slight (0 days), minimal (1-3 day's absence), mild (4-7 days absence), moderate (8-28 days absence), severe (> 28 days absence) and career ending.[12] Diagnosis of injury or recurrent injury was made by the club medical team. The type of injury was recorded using the Orchard Sports Injury Classification System (OSICS) categories.[13]

A time loss injury was defined as any physical complaint reported or sustained by a player that resulted from an incident in training or a competitive match play and prevented participation in future training and/or match play.[12] Injuries that were sustained completing non-related football activities with the club were not recorded.[12]

Reoccurrence of an injury was defined as an injury to the same muscle, site and categorised as the same type after returning to full unrestricted play following the initial injury.[12] Reoccurrences were categorised as early (< 2 months after initial injury), late (2-12 months after initial injury) and delayed (> 12 months after initial injury).[12]

Exposure hours were not recorded or available to view retrospectively so the Athlete at Risk (AAR) method was used to provide an estimated exposure.[14] This is a common method used when individual exposure is not available.[14] Match exposure is defined as play between two different clubs. Any matches between players from the same club was considered a training match and added to training exposure.[15] Training exposure is defined as team and individual based physical activities under the direction of coaching or fitness staff, aimed at improving player's football ability and physical attributes/fitness.[15]

DATA AND STATISTICAL ANALYSIS

All data was anonymised using a reference code during data analysis. Statistical analysis was conducted using Statistical Package for the Social Sciences (SPSS) for Windows version 24 (SPSS Inc. Chicago, Illinois) with statistical significance set at $p<0.05$. Injury incidence was calculated as the number of injuries per 1000 hours with 95% CI's.

Injury burden are presented as mean + Standard Deviation (SD) and median + Inter Quartile Range (IQR) for days missing. Descriptive statistics (Frequencies, Crosstabs) were used to describe the features of the data. Paired-Samples T Test was used to compare means. Seasonal trends based on a comparison of each season against the other were expressed as the average annual percentages of change and were calculated each season using the percentage change calculation.

Additionally, a two-year Moving Average (MA) approach was used to summarise two consecutive seasons to smooth out large seasonal variations. A linear regression analysis was used to determine any significant (<0.05) differences between seasons.

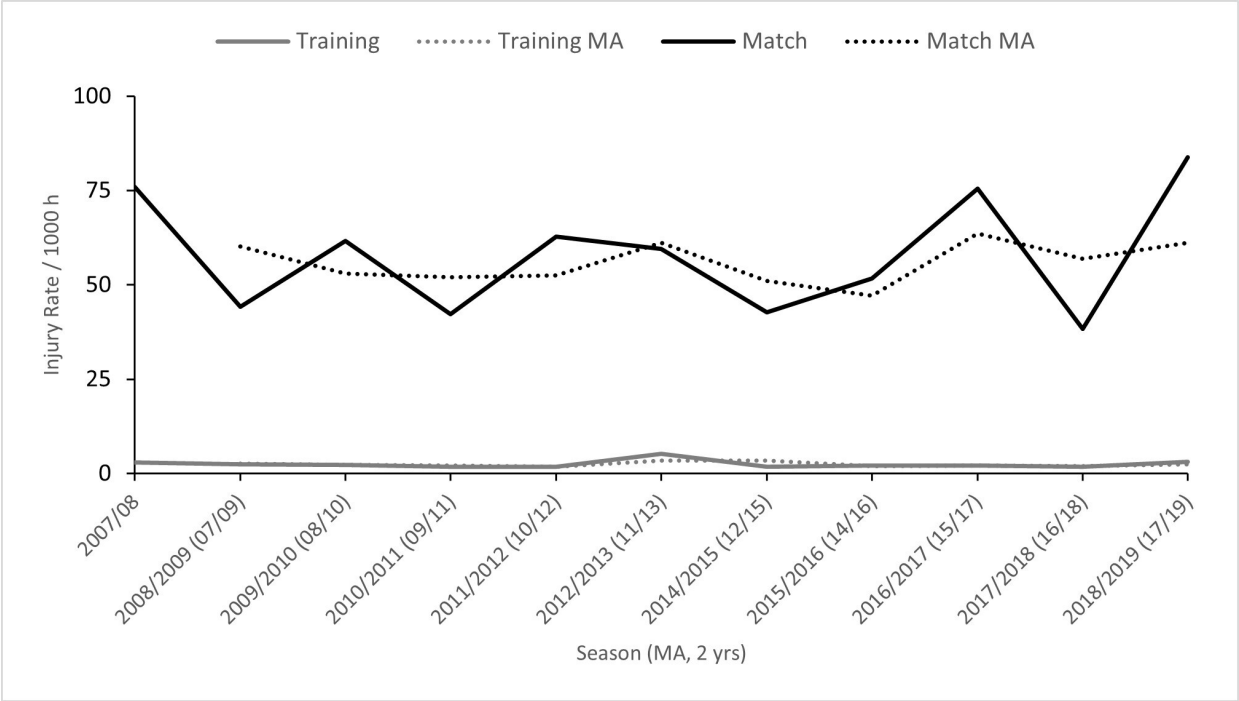

Figure 1. Seasonal variation in match and training injuries in male professional football players and the moving average (MA).

RESULTS

A total of 363 male professional football players, aged 18-40 participated over 11 seasons from four squads, with a mean (SD) of 32 (2.7) players (27-35) per squad.

EXPOSURE

In total, 138,892 hours of exposure (10,461 hours of match play and 128,431 hours of training) were recorded over the 11 seasons. The mean (SD) player participation was 58 (2.46) matches per season and 154 (3.09) training sessions (median values being 57 and 152). The mean (SD) overall exposure per player over a season was 452.5 (9.3) with 86.5 (3.7) match hours and 366 (7) training hours (median values being 451.5, 85.5 and 365).

INCIDENCE

There were 907 injuries recorded over 11 seasons. The overall incidence rate was 6.5/1000 hours (95% CI 5.6-7.5). The incidence rate in match play was significantly higher than training (58 vs 2.8 / 1000 hours, 95% CI 1.8-5.2, P<0.001) (Figure 1).

No significant differences were found between overall (P=0.935, 95% CI −1.591 to 1.477), training (P=0.752, 95% CI −0.137 to 0.182) and match (P=0.882, 95% CI −2.672 to 2.337) incidence rates and muscle (P=0.728, 95% CI −2.819 to 3.802) and ligament (P=0.991, 95% CI −4.113 to 4.069) injuries between all seasons.

On average, a player sustained 2 to 3 injuries per season, resulting in approximately 82 per team per season.

SITE AND TYPE OF INJURY

The most common site of injury was the thigh, (27%, 242/907). Muscle strains accounted for 49% (445/907) of all injuries. The hamstrings were the most frequently injured muscle group, accounting for 17% (150/907) of all injuries and 34% (150/445) of muscle injuries (Table 1). There was a significant increase in the number of hamstring injuries occurring during match play across all seasons (R2=0.450, b=0.575, 95% CI 0.1 to 1.1, P=0.024) (Figure 2).

SEASONAL

The greatest incidence of match play and training injuries was seen in January (13.7% - Match, 11.1% - Training) and the lowest was observed in May (0.002% - Match, 0.01% - Training).

INJURY BURDEN

The mean (SD) days missing per injury was 18.43 (33.5) with match injuries having a higher burden 21.34 (39) than training injuries 13.9 (17.7) The injury burden of the top ten most frequent injuries can be seen in Table 1.

MECHANISM OF INJURY

Acute injuries accounted for 83.2% (755/907) of all injuries with chronic overuse mechanisms accounting for 10.7% (97/907). Re-injuries accounted for 6.1% (55/907) of all injuries and all were categorised as early reoccurrences (< 2 months after initial injury). Re-injuries caused longer absences than initial injury, the mean (SD) number of missed

Table 1. Ten Most Frequent Injuries and Their Burden

Injury Location	Number of injuries (% of all injuries)	Mean No. lay off days +SD	Median No. lay off days (IQR)
Hamstring	150 (16.5)	17.59+22.20	10 (15.25)
Adductor	75 (8.3)	13.08+13.11	7 (13.5)
Ankle Lateral	69 (7.6)	18.61+25.58	10 (18.5)
Calf	66 (7.3)	14.53+16.93	7 (13.25)
Quadriceps	54 (6.0)	21.06+31.11	11.5 (18)
Knee Medial	45 (5.0)	20.05+29.27	7 (22)
Lumbar Spine	33 (3.6)	14.33+27.03	6 (6.5)
Foot	33 (3.6)	13.16+17.52	5 (11)
Thigh Haematoma	31 (3.4)	4.59+3.25	4 (3)
Iliopsoas	29 (3.2)	7.06+8.24	5 (3)

*Percentages may be subject to rounding miscalculations related to individual components.

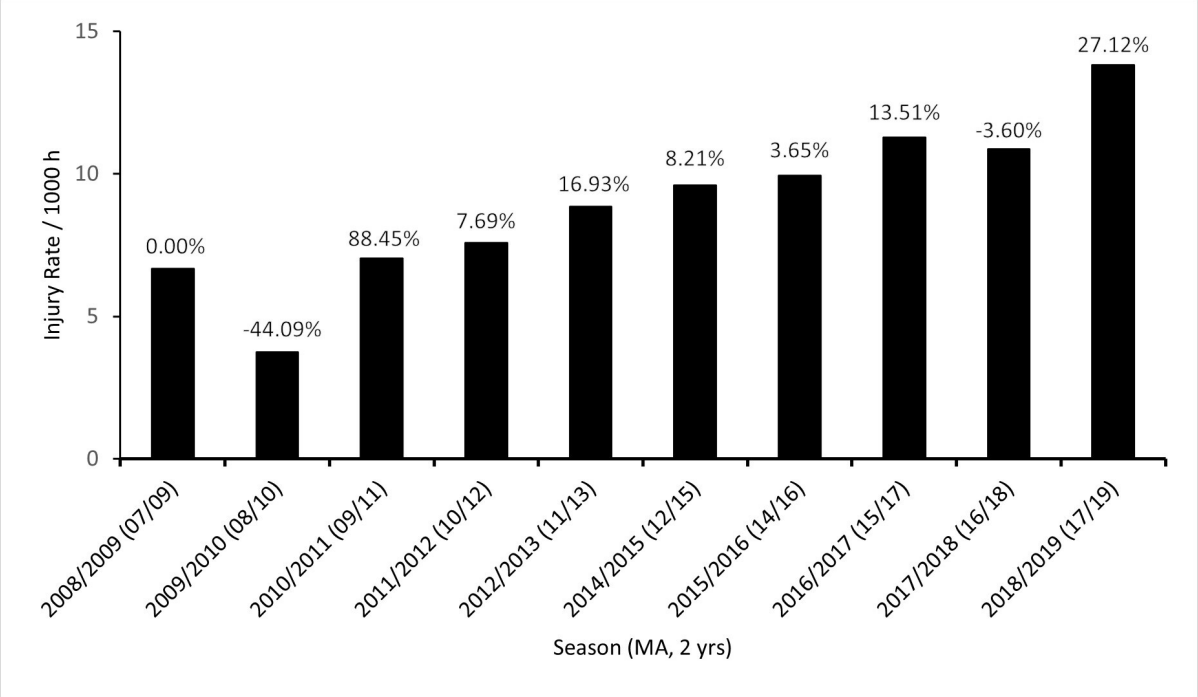

Figure 2. Hamstring match injury incidence MA (2 years) with percentage seasonal change in male professional football players.

days being 15 (25) compared with 9 (12) for the initial injury.

SEVERITY OF INJURY

Moderate severity (8-28 days) injuries were most frequent (32.6%, 20.96-45.45%, 296/907), There were 197 slight severity (1-3 days) injuries (21.8%, 5.5-31.2%), 270 minor severity (4-7 days) injuries (29.2%, 25-38.6%) and 144 major severity (>28 days) injuries (15.9%, 7.89-27.4%).

DISCUSSION

INCIDENCE

Injury incidence was consistent with previous data from Dutch and German professional football.[16,17] In contrast however, other studies representing English based teams presented a higher injury incidence overall 9.1/1000 hours[2] and 8.5/1000 hours[8] than this study. This was evident in the larger scaled UCL study 8/1000 hours.[9] Differences however between the current study and Hawkins et al. (2001)[8] may be attributed towards differing methods including; age of the study, whether an epidemiological consensus statement was adhered to[12] and changes noted in the athletic demands of football.[1] Contrary to this, Jones et al. (2019)[2] and Ekstrand et al. (2011)[9] both followed procedures for

data collection in epidemiological studies adding strength to their conclusions. Although, the differences between the findings of Ekstrand et al. (2011)[9] and the current study may be due to regional differences, as Walden et al.'s (2005a)[18] findings on the same cohort reported a higher incidence of match, severe and overuse injuries in Northern European clubs compared to Southern European countries.

SITE AND TYPE OF INJURY

The thigh region was shown to be the most injured region in the current study (26.7%) and this dominance is seen across literature; with similar figures to this study seen in Germany (26.3%).[16] Studies representing English club populations[8,19] reported slightly lower figures (23%)[8,19] however, and one study reporting slightly higher figures (31.7%).[2] Overall, findings from the current study demonstrate good consistency with previously reported data.

One of the main findings in this study was that over the 11 seasons hamstring injury incidence, overall and during matches, has increased significantly. This reflects data reported by Ekstrand et al. (2022)[10] between 2001 and 2022 in men's professional football, with hamstring injury incidence increasing across that period. Over the last 8 years of that study, the authors found hamstring injuries increased in both training and match play. The study has not evaluated the reasons for these increases, however a possible explanation may be that coaches need to prepare players to meet increasing match demands earlier,[20] therefore providing an adequate overload stimulus throughout training in preparation. It is noted in the literature that football players require development of a higher chronic load to be able to cope with potential demands during competitive match play.[21] Match demands have been shown to increase over recent years[1] and as higher intensity actions increase, the risk of hamstring injuries increases.[22] This finding supports the lack of effect injury prevention interventions have had to reduce hamstring injury incidence in professional football, therefore, highlighting that currently research doesn't have the solution to inform the practice of clinicians to affect the increasing incidence.

MECHANISM OF INJURY

It was noted that re-injuries caused longer absences than initial injuries (15+25 vs 9+12 days). This is in accordance with previous findings of 24 vs 18 days[9] and 10.9+15.1 vs 7.6+7.1 days.[23] This demonstrates the importance of evidenced based injury prevention and rehabilitation programmes, as well as evidenced based return to play parameters following injury.[15,24]

The percentage of re-injuries in the current study was 6.1%, which was lower than most studies; 12%,[9] 16.9%[2] and 20.58%[18] respectively. Results however are similar to those reported by Hawkins et al. (2001)[8] previously of 7%. That said, a clear definition for re-injury was not identifiable in that particular study. The low re-injury rates in the current study may be attributed towards the same physician overseeing all return to play decisions.

SEASONAL

Similar to previous studies there was a predominance of injuries in August noted in the current study, which may be associated with a period of higher volume training.[2] The expected spike during the Christmas period, as reported by Jones et al.'s (2019),[2] due to fixture congestion, was not seen in the current study findings. Instead a reduction in injuries were noted throughout December in comparison, with a spike noted in the January period. This was reported in studies from France[25] and Germany,[16] although, the authors believed this was due to the winter break being too short to recover appropriate fitness levels to deal with the stresses of professional football.[16,25] This would not be relevant for English leagues represented in the current study where there is typically no winter break in competitive fixtures. These results may therefore be due to a cumulative load following a congested period of games.[26]

INJURY BURDEN

The average days missing per injury in this study accumulated to 18, which was significantly higher than other studies; ranging from 8-15 days.[15-17,24,27,28] When comparing to English studies, our study found comparable results to Hawkins and Fuller, (1999)[18] who reported 14.6 days missing and Hawkins et al. (2001)[8] who reported 24.2 days missing. When taken as an average it equates to 19.4 days missing for both Hawkins studies, showing that average days missing has not changed in England for two decades. This suggests that advances in the demand of the game in England since Hawkins et al.'s (2001)[8] study, such as increased injury risk and the potential for higher severity injuries (Barnes et al., 2014)[1] have been counteracted by advances in rehabilitation strategies.[29]

SEVERITY OF INJURY

Over the 11 seasons in English professional football this study reported that moderate injuries (8-28 days) occurred most often (32.6%). This is consistent with previous findings, all of which have used the same definitions of moderate severity injuries and the same timeframes 47%,[9] 45%,[8] 44.1%[2] and 37.9%[30] respectively. Although, the consensus is a higher percentage than found in this study.

LIMITATIONS

The strength of this study is its longitudinal prospective data collection, and that one practitioner was consistently diagnosed and documented injuries, which gives high intra rater reliability, as there are no variations in medical support and practice. The study also followed the international consensus by Fuller et al. (2006)[12] which gives the study uniformity with others for comparison.

Although injury incidence was adjusted for exposure, the type of exposure used may be a limitation, as it is estimated on a team basis rather than individual. A further limitation was not having data for consecutive seasons with 2014/15

being excluded due incomplete data set, which limits the statistical power of the inter-seasonal conclusions.

Lastly, the current study only included one team per season and there was variance between leagues in some seasons. Using multiple teams within the same seasons consecutively could have improved the generalisability and power of the study. Differences in leagues can mean differences in finances; with teams in lower leagues less able to access injury diagnosis tools such as MRI, which could provide a more concise diagnosis of which the authors appreciate in the limitations of the work.

CONCLUSIONS

Match and training incidence remained stable across all seasons as well as muscle and ligament injury incidence. While there were significant increases in hamstring injury incidence and hamstring match injury incidence. This highlights the need for football performance practitioners to review current practices around hamstring prevention and adapt them in line with current literature to reduce prevalence and incidence over subsequent seasons.

Re-injuries were found to cause a higher burden than the initial injury, indicating the important of practitioners return to play and rehabilitation strategies within these environments to promote a reduction in re-injury rates.

This inter-seasonal information helps to address the gap of longitudinal epidemiological research identified within the EFL, often underrepresented in injury audit reviews. Future longitudinal epidemiological research is needed in differing cohorts to better enable practitioners to identify trends and manage injury risk reduction more effectively.

PRACTICAL CONSIDERATIONS

- Hamstring injuries in English professional football players have increased significantly in match play in the EFL over a 11 season period. Consequently, there is a need for practitioners at all levels of football to review current practices around hamstring injury prevention and adapt in line with literature to reduce prevalence and incidence.
- The finding of re injuries having a higher burden than initial injury in English professional football players in the EFL shows the importance that practitioners must, 1) have appropriate and evidence-based return to play and rehabilitation strategies and 2) manage match and training loads.

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COMPETING INTERESTS

None declared.

DATA AVAILABILITY

Data available is contained within the publication.

AUTHORS CONTRIBUTIONS

BP is the lead author and MM the data custodian. All authors contributed to design and proof reading of the manuscript.

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