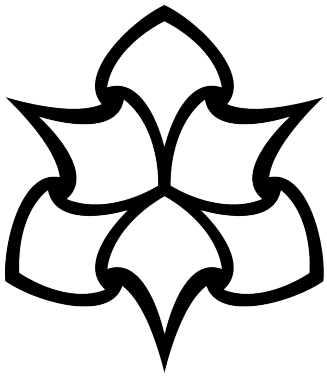

Playing Position is Associated with Injury Incidence Rate in Male Academy Soccer Players

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Abstract

Context: It is unclear whether playing position influences injury in male academy soccer players (ASP).

Objective: To determine if playing position is associated with injury in ASP.

Design: Descriptive Epidemiology Study.

Setting: English, Spanish, Uruguayan and Brazilian soccer academies.

Participants: 369 ASP from Under 14 (U14) to U23 age groups, classified as 'post-peak height velocity' using maturity offset, and grouped as goalkeepers (GK), lateral defenders (LD), central defenders (CD), lateral midfielders (LM), central midfielders (CM) and forwards (FWD). Additional analysis compared central (CENT) with lateral/forward (LAT/FWD) positions.

Main Outcome Measures: Injuries were recorded prospectively over one season. Injury prevalence proportion (IPP), days missed and injury incidence rate (IIR, injuries per 1000 training/match hours, n=116) were analysed according to playing position.

Results: No association with playing position was observed for any injury type/location regarding IPP (P≥0.089) or days missed (P≥0.235). The IIR was higher in CD than LD for general (9.30 *vs.* 4.18 injuries/1000h, P=0.009), soft-tissue (5.14 *vs.* 1.95 injuries/1000h, P=0.026) and ligament/tendon injuries (2.69 *vs.* 0.56 injuries/1000h, P=0.040). Regarding CENT *vs.* LAT/FWD, there were no associations with IPP (P≥0.051) or days missed (P≥0.083), but general IIR was greater in CENT than LAT/FWD (8.67 *vs.* 6.12 injuries/1000h, P=0.047).

Conclusions: ASP playing position was not associated with IPP or days missed but the higher general, soft-tissue and ligament/tendon IIR in CD suggests this position warrants specific attention regarding injury prevention strategies. These novel findings highlight the importance

of including training/match exposure when investigating the influence of playing position on injury in ASP.

Abstract word count: 250

Body of manuscript word count: 3,284

Key words: football; adolescence; development; epidemiology; soft-tissue

Key points:

1. The incidence rates of general injuries (all injuries combined) were greater for centrally-positioned players (particularly defenders) compared to those players occupying lateral and forward positions.
2. Injury prevalence and days missed due to injury do not appear to be influenced by playing position in male academy soccer players.
3. This study highlights the importance of accounting for training and match exposure when investigating the influence of playing position on injury in academy soccer players, and suggests that injury prevention strategies in this population should focus on central playing positions.

A soccer team comprises eleven players occupying different playing positions, which reflect their location on the pitch and different tactical roles during matches. During the development of academy soccer players (ASP), specific skills or physical qualities may lead to players being selected to occupy certain playing positions due to variation within the tactical and physiological requirements of those positions.[1,2] In professional soccer, goalkeepers perform the greatest proportion of low-intensity actions, which differ from outfield players who exhibit more running, ball possession and high-intensity activity.[3] However, the distance covered and frequency of in-game playing actions vary between outfield positions, and may contribute to different physical demands experienced by outfield ASP.[4] Knowledge of whether these differences relate to injury in ASP could inform position-specific training and recovery strategies, in an attempt to mitigate injury risk in this under-researched population.

Playing position is linked to injury incidence rate (IIR) in professional soccer[5], with wide midfielders having the highest match IIR, and central defenders the highest training IIR. Other team sports, such as American football and rugby union also demonstrate a playing position association with injury.[6,7] Whilst the collision-based nature of these sports accounted for much of the variance in contact injuries, rugby union positions performing more sprints and high-speed running demonstrated a greater number of non-contact thigh and hamstring injuries.[7] High-speed running is one of several playing demands in professional soccer that induce fatigue and muscle damage,[8] and may affect the risk of non-contact injury in certain playing positions. Similarly, players in positions who tackle more frequently might be at higher risk of contact injury, whilst those who regularly jump and land may suffer more injuries to the ankle or knee ligaments.[9] Accordingly, different quantities, intensities and durations of playing actions may underpin the positional differences in injury reported in some studies of professional and academy soccer.[5,12]

The few studies of ASP that have reported injuries according to playing position are limited by sample size,[12,13] variable categorisation of playing positions[12-16] and lack of information regarding maturity status,[12,14-17,] which is an important risk factor in ASP.[18] However, it is unclear if different approaches to categorising playing positions affect whether or not associations with injury are detected. For example, grouping defenders as one playing position overlooks evidence from professional soccer that a greater number of sprints are performed by lateral than central defenders.[1] Further, grouping lateral and central midfielders together does not account for differences in low- and high-speed running distances reported in youth players, where lateral players have exhibited higher high-speed running distances.[19] In addition, lateral players perform more accelerations and decelerations than central players in both professional and youth soccer,[20] which has implications for fatigue and acute muscle damage.[8] Consequently, segregating 'lateral' and 'central' players may better reflect their distinct activity profiles, and may be more appropriate for detecting differences in injuries suffered as a consequence of playing position.[2] High-speed running and sprint activities are similar in forward- and laterally-positioned ASP,[10] suggesting there may also be similarities in the non-contact injuries they experience. However, previous investigations of injury and playing position in ASP did not account for these differences,[12,14,16,17] while those that did lacked robust statistical analyses.[11,15] Thorough investigation is required to determine the whether different playing positions can influence injury risk in ASP.

The aim of this study was to investigate whether playing position is associated with injury in a large cohort of physically mature, male ASP from eight academies in four countries. Outfield players were grouped by specific playing positions (according to documented activity profiles), in order to investigate whether different approaches for categorising playing position affected the ability to detect associations with injury. We hypothesised that a greater proportion of lateral and forward positions (typically associated with more high-intensity activities) would

exhibit soft tissue injuries compared to central positions. We also hypothesised that this would be reflected in a greater soft tissue IIR in lateral and forward positions. Due to their unique activity profile characterised by few high-intensity actions, we hypothesised a lower proportion of injured goalkeepers than outfield players (and, similarly, a lower IIR in goalkeepers). We therefore performed all analyses with and without goalkeepers.

Materials and methods

Participants and study period

This study recruited 369 high-level male ASP (age: 17.8 ± 1.9 years, height: 1.78 ± 0.07 m, body mass: 72.8 ± 8.5 kg) registered with the academies of one of eight professional soccer clubs from England, Spain, Uruguay and Brazil. Of the five English academies, two were categorised under the Premier League's Elite Player Performance Plan (EPPP) as Category 1 and two were Category 2. One English academy operated independently of the EPPP and competed regularly with Category 1 academies (Under 23 level). The Uruguayan academy was of the highest national category (Category A). No classification system exists for soccer academies in Spain or Brazil, however, the Spanish and Brazilian academies in this study are recognised as among the most successful in their respective countries for producing professional players. To control for the influence of maturity status on injury,[18] only ASP classified as post-peak height velocity (PHV) were included. Participants' maturity status was calculated via non-invasive methods, using a previously validated regression equation, which included player age, body mass, standing height and sitting height.[21] This allowed calculation of maturity offset, providing a prediction of years from PHV. To account for the error in the equation (~0.5 years),[21] players with a maturity offset greater than +1.0 years were categorised as post-PHV. One season's injury record per player was included for analysis, with 142 players for season 2014-15, 17 for 2016-17, and 210 for 2017-18. All players participated in regular

soccer training and competitive match-play, which was in accordance with the Premier League's EPPP for the English clubs. Written informed consent was obtained from club officials and players, with parental consent and player assent collected for all participants less than 16 years of age. The study received approval from the University Research Ethics Committee and was performed in accordance with the Declaration of Helsinki.

Playing position

Each player self-recorded their playing position via questionnaire. Players were grouped as goalkeepers (GK, *n*=34), central defenders (CD, *n*=66), lateral defenders (LD, *n*=56), central midfielders (CM, *n*=97), lateral midfielders (LM, *n*=59) and forwards (FWD, *n*=57). Based on previous literature describing differences in match activity between central and lateral positions[1,19,20], further analysis was performed comparing central players (CENT; central defenders and central midfielders, *n*=163) with lateral/forward players (LAT/FWD; lateral defenders, lateral midfielders and forwards, *n*=172).

Injury recording and definitions

Injuries were diagnosed and recorded by medical personnel at each club following published guidelines.[22] Injuries were recorded if they had taken place during soccer-related activity and resulted in a player being unable to participate in training or competition for a minimum of 24 hours following the occurrence or onset of injury. Players were considered injured until approved by club medics to return to training and availability for match selection. 'Days missed' were calculated as the difference between the date of injury and the date of return to full training and selection availability. Only injuries sustained during the investigated season were analysed, meaning that if players began the season injured, existing injuries were not recorded. Injury history was unavailable for this study, with no players excluded on the basis

of previous injury. Injuries were categorised based on those most frequently recorded in a previous injury audit for this cohort.[23] Non-contact injuries were those without a clear incident involving contact with another player, the ball or another object, with each injury category including contact and non-contact injuries unless stated. Muscle and ligament/tendon injuries were investigated collectively as 'soft-tissue injuries' and also as separate categories due to different tissue structures and injury aetiology.[24]

Statistical analyses

Prevalence, days missed and incidence were analysed for each injury category. Injury prevalence proportions (IPP)[25] were calculated with 95% confidence intervals and compared between groups using binomial regression to determine whether the proportions (%) of players suffering at least one injury or remaining injury-free during the season differed between groups. Comparison of days missed between groups was conducted by Kruskal-Wallis H test of variance or Mann-Whitney U test (data not normally distributed, presented as median and interquartile range), including only players who had suffered at least one injury for each respective category. Individual exposure minutes from training and matches were available for 116 ASP from England, Spain and Brazil (age: 18.2 ± 1.9 years, height: 1.80 ± 0.07 m, body mass: 73.6 ± 8.5 kg). Injury incidence rates (IIR) for these players are presented as number of injuries/1000 hours with 95% confidence intervals.[26] IIRs were calculated relative to total exposure (the sum of training exposure plus match exposure combined), because not all injury records specified whether an injury had occurred in training or a match. A generalised linear model assuming a Poisson distribution, with exposure hours as an offset representing time at risk, was used to derive rate ratios (RR) with 95% confidence intervals for each injury category. Statistical significance was accepted at $p<0.05$. Statistical analyses were performed using R

(version 3.5.1) for comparisons of IPP and IIR. Comparisons of days missed were performed using IBM SPSS version 25.0 (Armonk, NY, USA).

Results

Total injuries and days missed

A total of 261 injuries were recorded resulting in 7,149 days missed (19.5 ± 42.3 per injury). As expected, more than half (61.0%) were non-contact. The most common types of injury were muscle (36.4%) and ligament/tendon (30.3%), whilst the most common locations were the thigh (29.9%), knee (20.7%) and ankle (15.3%).

Injury prevalence proportion (IPP)

Details of IPP when ASP were grouped according to individual playing position, and by CENT and LAT/FWD positions are presented in Table 1. No difference in IPP was observed according to playing position for any injury category, with or without GK ($P \geq 0.104$ and $P \geq 0.089$, respectively). No differences in IPP were observed when segregating ASP by activity profile for any injury category with GK included ($P \geq 0.210$) or excluded ($P \geq 0.212$), although there was a non-significant tendency for thigh injury IPP to be higher in LAT/FWD players than GK (18.7% *vs.* 2.9%, $P = 0.051$).

TABLE 1 AROUND HERE

Days missed

Details of days missed for each category are presented in Table 2. The cumulative days missed per player due to injury in any category did not differ by playing position, with or without GK ($P \geq 0.235$ and $P \geq 0.239$, respectively). Similarly, cumulative days missed for any injury

category did not differ between CENT, LAT/FWD and GK ($P \geq 0.083$). With GK excluded, there was a tendency for CENT to have missed more days from ankle injuries than LAT/FWD (median (interquartile range) = 41.5 (48.0) *vs*. 18.0 (26.5), $P = 0.053$). No further differences in days missed were observed for any other injury category ($P > 0.05$).

TABLE 2 AROUND HERE

Injury incidence rates (IIR)

Incidence rates for a large sub-sample of ASP with exposure records available (n=116) are presented in Table 3. For specific positional roles, general IIR was lower for LD (RR = 0.45 (0.24 – 0.80), $P = 0.009$) and GK (RR = 0.43 (0.17 – 0.89), $P = 0.038$) compared to CD. Similarly, soft-tissue IIR was lower for LD (RR = 0.38 (0.15 – 0.85) $P = 0.026$) and GK (RR = 0.22 (0.04 – 0.75) $P = 0.041$) compared to CD. The IIR of ligament/tendon injuries was lower for LD than CD (RR = 0.21 (0.03 – 0.77) $P = 0.040$). No other differences were observed between playing positions. When segregating ASP based on activity profile, general IIR was lower for LAT/FWD (RR = 0.71 (0.50 – 1.00) $P = 0.047$) and GK (RR = 0.46 (0.19 – 0.93) $P = 0.048$) compared to CENT, with soft-tissue IIR lower for GK than CENT (RR = 0.24 (0.04 – 0.78) $P = 0.049$). No other differences were observed between activity profiles.

TABLE 3 AROUND HERE

Discussion

This study is the first to comprehensively investigate the potential influence of playing position on injury in male academy soccer players (ASP), accounting for the confounding effect of maturation in a large cohort (n=369) recruited from numerous academies in multiple countries.

The main findings were that, when exposure records were considered in a large sub-sample of ASP (*n*=116), the injury incidence rate (IIR) of all injuries from one season was higher for CENT than LAT/FWD and GK (8.67 *vs.* 6.12 and 3.95 injuries per 1000 hours, respectively). Analysis of specific positional roles suggests the differences between outfield players were primarily driven by higher IIR in CD *versus* LD for general injuries, soft-tissue injuries and ligament/tendon injuries. With a lack of difference in injury *prevalence* between positions, the position-dependent differences in injury *incidence* highlight the importance of recording exposure when investigating injury risk according to playing position in this population, and indicate that injury prevention strategies should be a focus in ASP employing central positions.

Based on activity profile data,[3,19] we hypothesised that relatively more LAT/FWD would be injured than CENT, and that relatively fewer GK would be injured than outfield positions. The LAT/FWD players in this study tended to suffer relatively more thigh muscle injuries than GK, potentially due to more sprints involving high-intensity eccentric contractions of the hamstrings and the quadriceps.[8] These actions lead to indicators of muscle damage,[27] which could increase the susceptibility to muscle strain injuries. Other studies of ASP report fewer injuries for GK than outfield positions using odds ratios,[12] incidence rates,[11,14] and percentages of players injured,[15] but without statistical comparison of those data. In studies with statistical analyses, GK suffered more hand and upper body injuries, and fewer ankle injuries, than outfield positions in a study of 14- to 16- year old players.[13] However, our statistical analysis of IPP across all playing positions, with and without GK, suggests that the proportion of ASP who suffer injuries during a season is unaffected by playing position.

Days missed through injury did not differ according to playing position either, although CENT tended to miss more days across the season from ankle injuries than LAT/FWD (41.5 *vs.* 18.0 median days). This could be a consequence of more tackles occurring in central positions or more jumping and landing by CD,[10] potentially leading to more severe injuries.

When exposure minutes were accounted for, however, the IIR for all injuries was greater in CENT compared to LAT/FWD and GK, suggesting ASP in central positions are at greater risk of injury in general. Comparison of specific outfield roles revealed that the rate of all injuries, soft-tissue injuries and ligament/tendon injuries were statistically higher for CD than LD (Table 3). A greater frequency of tackling and blocking could increase the risk of contact injury in CD, with the requirement to jump and land regularly from heading the ball potentially increasing their risk of ligament and/or tendon injury[9]. Although no specific injury location was associated with playing position, ankle IIR appeared to be higher in CD compared to other positions (Table 3), thus perhaps lending some support to the aforementioned hypothesis. However, this finding was not significant, likely due to the relatively low prevalence of ankle injuries. A lack of difference between outfield positions in non-contact and non-contact soft-tissue injuries suggests that the differences we report could be influenced by actions involving physical contact, and it is possible that the lack of difference for more specific injury categories is due to the relatively low number of injuries recorded. Further investigation in larger cohorts is required to explain these apparent playing position-specific differences in the IIR of injuries in ASP. However, our data highlight that it is important to account for exposure when investigating position-specific injury risk in ASP.

Previously in English academy research, defenders and midfielders were most commonly injured in 9-19 year-olds,[14] with more thigh muscle injuries for midfielders than defenders and GK in another cohort aged 8-16 years[16]. However, none of these studies accounted for maturation, which has been shown to influence injury risk in ASP[18]. One recent study reported a higher IIR for central midfielders than other positions in 18 to 21 year old (most probably post-PHV) ASP[11], thereby supporting our findings. However, in contrast to our sample size, this study included only 41 players from just one academy, and investigated solely overuse injuries. Whilst not controlling for maturity status, another study separated French

ASP by chronological age,[15] reporting that U12-U15 LD and U16-U20 CD and CM suffered more match injuries than other positions in their respective age groups. However, these data did not undergo statistical analyses, and an U12-U15 group is likely to contain players at various stages of maturation[21]. To circumvent the influence of maturity status on injury,[18] we only investigated post-PHV players, which also removes any confounding influence of younger age groups playing with fewer players on smaller pitches that might also affect training and/or match volume and intensity[19] (and potentially injury).

Discrepancy amongst previous studies may also be influenced by different methods used to categorise playing position. Specifically, some have grouped defensive and midfield ASP by central or lateral roles,[11,15] and others as defensive, midfield or forwards.[12-14] The latter represents the 'traditional' method, predating literature describing different match actions in lateral and central players from defensive and midfield positions.[10,19] This is a major limitation due to the difference between central and lateral players in the ability to perform actions that can determine match outcome[1,19]. We addressed this problem directly, performing separate analyses of ASP according to their specified playing position *and* as central or lateral/forward players. For example, when analysed by activity profiles, our IIR data indicated a higher rate of general injuries in centrally-positioned ASP (defenders and midfielders combined), and our additional analysis according to specific positional roles provided further insight, suggesting that this finding was primarily driven by injuries to central defenders. In combination with the steps taken to circumvent the influence of maturity status on injury[18] and using a large sample of ASP from multiple academies and countries (thus, increasing external validity), the present study provides novel and robust evidence regarding the association of playing position with injury in ASP.

As well as the advantages of our study, we acknowledge some limitations. Firstly, we did not quantify the intensity of activities undertaken by ASP, which limits our ability to

explain position-specific differences in IIR. Future studies should seek to include detail on players' match/training load to investigate associations between these variables and injury. Exposure records were also not available for all players in our study. However, our sub-sample detected differences between position groups, demonstrating the importance of including exposure hours in this type of study. It should be noted that we did not analyse training and match injuries separately due to a lack of distinction at the point of recording. This might affect the ability to detect the true rate of match injuries, because players spend a greater proportion of time training than they do playing matches, though injuries typically occur more frequently during competition[18]. To advance our analyses, future studies should seek to record injuries and exposure hours separately for training and matches in large samples of ASP.

Conclusion

This study is the first to investigate the association of playing position with injury in ASP from multiple academies across four nations and two continents, thus demonstrating high external validity of our findings. While there was no association between playing position and injury prevalence proportion, or days missed, injury incidence rate was higher in central players, specifically central defenders, which may be linked to the greater frequency of tackles and jumping and landing in these outfield playing positions. These findings have implications for playing position-specific training and recovery, where centrally-positioned players (particularly central defenders) may benefit from additional focus on injury prevention strategies. Importantly, the lack of difference regarding injury prevalence and days missed in the present study highlights the need to incorporate exposure minutes when investigating position-specific injury differences in ASP.

Conflict of Interest

None declared.

Ethical Approval

The study received approval from the University Research Ethics Committee and was performed in accordance with the Declaration of Helsinki. Written informed consent to participate in this study was provided by club officials and players, with parental consent and player assent collected for all participants less than 16 years of age.

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Table 1. Injury Prevalence Proportion (IPP, %) and 95% Confidence Intervals (CIs) for Each Injury Category According to Playing Position and Activity Profile.

	Playing position						Activity profile		
	GK	**CD**	**LD**	**CM**	**LM**	**FWD**	**GK**	**CENT**	**LAT/FWD**
	n = 34	*n* = 66	*n* = 56	*n* = 97	*n* = 59	*n* = 57	*n* = 34	*n* = 163	*n* = 172
Injury category	**IPP (95% CIs)**						**IPP (95% CIs)**		
General	44.1 (27.4 – 60.8)	45.5 (32.5 – 56.5)	41.1 (28.2 – 54.0)	37.5 (27.9 – 47.1)	42.4 (29.8 – 55.0)	39.4 (26.7 – 52.1)	44.1 (27.4 – 60.8)	40.7 (33.2 – 48.2)	40.9 (33.6 – 48.2)
Non-contact	26.5 (11.7 – 41.3)	30.3 (19.2 – 41.4)	32.1 (19.9 – 44.3)	25.0 (16.4 – 33.6)	27.1 (15.8 – 38.4)	30.4 (18.5 – 42.3)	26.5 (11.7 – 41.3)	26.5 (19.7 – 33.3)	29.2 (22.4 – 36.0)
Soft-tissue	26.5 (11.7 – 41.3)	30.3 (19.2 – 41.4)	32.1 (19.9 – 44.3)	36.5 (26.9 – 46.1)	37.3 (25.0 – 49.6)	37.5 (24.9 – 50.1)	26.5 (11.7 – 41.3)	33.3 (26.1 – 40.5)	35.7 (28.5 – 42.9)
Muscle	14.7 (2.8 – 26.6)	13.6 (5.3 – 21.9)	17.9 (7.9 – 27.9)	19.8 (11.9 – 27.7)	25.4 (14.3 – 36.5)	25.0 (13.8 – 36.2)	14.7 (2.8 – 26.6)	17.3 (11.5 – 23.1)	22.8 (16.5 – 29.1)
Ligament/tendon	8.8 (0.7 – 18.3)	19.7 (10.1 – 29.3)	16.1 (6.5 – 25.7)	14.6 (7.6 – 21.6)	13.6 (4.9 – 22.3)	14.3 (5.2 – 23.4)	8.8 (0.7 – 18.3)	16.7 (11.0 – 22.4)	14.6 (9.3 – 19.9)
Non-contact soft-tissue	26.5 (11.7 – 41.3)	28.8 (17.9 – 39.7)	30.4 (18.4 – 42.4)	24.0 (15.5 – 32.5)	27.1 (15.8 – 38.4)	28.6 (16.9 – 40.3)	26.5 (11.7 – 41.3)	27.2 (20.4 – 34.0)	29.2 (22.4 – 36.0)
Growth-related	2.9 (-2.7 – 8.5)	0.0	0.0	0.0	3.4 (-1.2 – 8.0)	1.8 (-1.7 – 5.3)	2.9 (-2.7 – 8.5)	0.0	1.7 (-0.2 – 3.6)
Low back/sacrum/pelvis	2.9 (-2.7 – 8.5)	6.1 (0.3 – 11.6)	3.6 (-1.3 – 8.5)	3.1 (-0.3 – 6.5)	1.7 (-1.6 – 5.0)	7.1 (0.4 – 13.8)	2.9 (-2.7 – 8.5)	4.3 (1.2 – 7.4)	4.1 (1.1 – 7.1)
Knee	14.7 (2.8 – 26.6)	16.7 (7.7 – 25.7)	14.3 (5.1 – 23.5)	13.5 (6.7 – 20.3)	13.6 (4.9 – 22.3)	10.7 (2.7 – 18.7)	14.7 (2.8 – 26.6)	14.8 (9.3 – 20.3)	12.9 (7.9 – 17.9)
Ankle	2.9 (-2.7 – 8.5)	10.6 (3.2 – 18.0)	8.9 (1.4 – 16.4)	7.3 (2.1 – 12.5)	11.9 (3.6 – 20.2)	8.9 (1.5 – 16.3)	2.9 (-2.7 – 8.5)	8.6 (4.3 – 12.9)	9.9 (5.4 – 14.4)
Thigh	2.9 (-2.7 – 8.5)	13.6 (5.3 – 21.9)	14.3 (5.1 – 23.5)	14.6 (7.6 – 21.6)	20.3 (10.0 – 30.6)	21.4 (10.8 – 32.0)	2.9 (-2.7 – 8.5)	14.2 (8.8 – 19.6)	18.7 (12.9 – 24.5)
Hamstring muscle	0.0	4.5 (-0.5 – 9.5)	5.4 (-0.5 – 11.5)	7.3 (2.1 – 12.5)	13.6 (4.9 – 22.3)	10.7 (2.7 – 18.7)	0.0	6.2 (2.5 – 9.9)	9.9 (5.4 – 14.4)

GK, goalkeeper; *CD*, central defender; *LD*, lateral defender; *CM*, central midfielder; *LM*, lateral midfielder; *FWD*, centre-forward; *CENT*, central playing positions; *LAT/FWD*, lateral and forward playing positions.

Table 2. Number of Days Absent Per Injured Player for Each Injury Category According to Playing Position and Activity Profile. Data Are Median and Interquartile Range (IQR).

	Playing position						Activity profile		
	GK	**CD**	**LD**	**CM**	**LM**	**FWD**	**GK**	**CENT**	**LAT/FWD**
Injury category	*n* = 34	*n* = 66	*n* = 56	*n* = 97	*n* = 59	*n* = 57	*n* = 34	*n* = 163	*n* = 172
General	22.0 (58.0)	32.5 (32.5)	28.0 (55.0)	27.5 (36.8)	24 (57.5)	21.0 (32.3)	22.0 (58.0)	29.5 (33.5)	24.0 (48.0)
Non-contact	16.0 (72.5)	28.5 (50.3)	33.0 (61.0)	18.0 (34.0)	21.0 (57.8)	23.0 (41.0)	16.0 (72.5)	24.0 (37.0)	23.5 (49.0)
Soft-tissue	17.0 (25.5)	25.0 (33.0)	32.5 (39.8)	18.0 (34.0)	18.0 (37.8)	19.0 (28.5)	17.0 (25.5)	23.5 (34.0)	22.0 (34.0)
Muscle	14.0 (15.0)	17.0 (20.0)	18.5 (35.8)	14.0 (16.0)	11.0 (17.0)	18.5 (27.8)	14.0 (15.0)	15.5 (16.5)	15.0 (26.0)
Ligament/tendon	30.5 (53.4)	26.0 (53.0)	28.0 (31.0)	27.0 (38.0)	23.0 (43.0)	29.0 (128.5)	30.5 (53.4)	27.0 (44.5)	28.0 (35.0)
Non-contact soft-tissue	16.0 (72.5)	24.0 (42.3)	30.0 (56.5)	21.0 (17.5)	20.0 (55.3)	20.5 (28.8)	16.0 (72.5)	23.5 (25.8)	23.0 (36.8)
Growth-related	-	-	-	-	10.0 (4.0)	-	-	-	8.0 (-)
Low back/sacrum/pelvis	-	95.0 (193.3)	88.0 (-)	14.0 (-)	-	9.0 (14.3)	-	34.0 (151.0)	21.0 (77.0)
Knee	15.0 (46.0)	29.0 (27.0)	13.0 (37.8)	18.0 (40.5)	21.5 (38.8)	57.0 (217.5)	15.0 (46.0)	26.0 (35.5)	26.0 (48.5)
Ankle	-	40.0 (63.0)	28.0 (35.0)	43.0 (59.0)	17.0 (30.0)	10.0 (22.5)	-	41.5 (48.0)	18.0 (26.5)
Thigh	-	21.0 (22.5)	19.5 (29.3)	17.5 (20.5)	12.0 (34.8)	21.0 (30.5)	-	18.0 (19.0)	17.0 (30.5)
Hamstring muscle	-	21.0 (-)	6.0 (-)	18.0 (37.0)	16.0 (43.8)	22.0 (35.8)	-	19.5 (22.8)	12.0(35.0)

GK, goalkeeper; *CD*, central defender; *LD*, lateral defender; *CM*, central midfielder; *LM*, lateral midfielder; *FWD*, centre-forward; *CENT*, central playing positions; *LAT/FWD*, lateral and forward playing positions.

Table 3. Injury Incidence Rates (IIR, Number of Injuries per 1000 Hours' Exposure) and 95% Confidence Intervals (CIs) for Each Category According to Playing Position and Activity Profile in a Sample of ASP with Exposure Records (*N* = 116)

	Playing position						**Activity profile**		
	GK	**CD**	**LD**	**CM**	**LM**	**FWD**	**GK**	**CENT**	**LAT/FWD**
	n = 12	*n* = 27	*n* = 18	*n* = 24	*n* = 20	*n* = 15	*n* = 12	*n* = 51	*n* = 53
Exposure (hours)	1,770	4,085	3,592	3,528	3,587	3,277	1,770	7,612	10,455
Injury category	**IIR (95% CI)**						**IIR (95% CI)**		
General	**3.95† (1.02 – 6.88)**	9.30 (6.34 – 12.26)	**4.18† (2.06 – 6.29)**	7.94 (5.00 – 10.88)	7.81 (4.91 – 10.70)	6.41 (3.67 – 9.15)	**3.95* (1.02 – 6.88)**	8.67 (6.58 – 10.76)	**6.12* (4.62 – 7.62)**
Non-contact	3.39 (0.68 – 6.10)	5.88 (3.52 – 8.23)	3.62 (1.65 – 5.59)	5.67 (3.18 – 8.15)	5.58 (3.13 – 8.02)	5.80 (3.19 – 8.41)	3.39 (0.68 – 6.10)	5.78 (4.07 – 7.49)	4.97 (3.62 – 6.33)
Soft-tissue	**1.13† (0.44 - 2.70)**	5.14 (2.94 – 7.34)	**1.95† (0.51 – 3.39)**	4.25 (2.10 – 6.40)	4.74 (2.49 – 6.99)	3.66 (1.59 – 5.73)	**1.13* (0.44 - 2.70)**	4.73 (3.18 – 6.27)	3.44 (2.32 – 4.57)
Muscle	0.56 (0.05 – 1.67)	2.45 (0.93 – 3.97)	1.39 (0.17 – 2.61)	3.12 (1.28 – 4.96)	3.35 (1.45 – 5.24)	2.75 (0.95 – 4.54)	0.56 (0.05 – 1.67)	2.76 (1.58 – 3.94)	2.49 (1.53 – 3.44)
Ligament/tendon	0.56 (0.05 – 1.67)	2.69 (1.10 – 4.28)	**0.56† (0.21 – 1.33)**	1.13 (0.02 – 2.25)	1.67 (0.33 – 3.01)	0.92 (0.12 – 1.95)	0.56 (0.05 – 1.67)	1.97 (0.97 – 2.97)	1.05 (0.43 – 1.67)
Non-contact soft-tissue	3.39 (0.68 – 6.10)	5.88 (3.52 – 8.23)	3.62 (1.65 – 5.59)	5.39 (2.96 – 7.81)	5.30 (2.91 – 7.68)	5.49 (2.96 – 8.03)	3.39 (0.68 – 6.10)	5.65 (3.96 – 7.34)	4.78 (3.46 – 6.11)
Growth-related	0.56 (0.04 – 1.67)	0.00 (-)	0.00 (-)	0.00 (-)	0.28 (0.02 – 0.83)	0.31 (0.03 – 0.90)	0.56 (0.04 – 1.67)	0.00 (-)	0.19 (0.07 - 0.46)
Low back/sacrum/pelvis	1.13 (0.44 – 2.70)	1.22 (0.15 – 2.30)	0.56 (0.21 – 1.33)	1.42 (0.17 – 2.66)	0.00 (-)	1.83 (0.37 – 3.30)	1.13 (0.44 – 2.70)	1.31 (0.50 – 2.13)	0.77 (0.23 – 1.30)
Knee	0.56 (0.05 – 1.67)	0.98 (0.02 – 1.94)	0.84 (0.11 – 1.78)	0.57 (0.22 – 1.35)	1.67 (0.33 – 3.01)	0.61 (0.24 – 1.46)	0.56 (0.05 – 1.67)	0.79 (0.16 – 1.42)	1.05 (0.43 – 1.67)
Ankle	0.00 (-)	1.96 (0.60 -3.32)	0.00 (-)	0.00 (-)	0.56 (0.22 – 1.33)	0.61 (0.24 – 1.46)	0.00 (-)	1.05 (0.32 – 1.78)	0.38 (0.01 – 0.76)
Thigh	0.00 (-)	2.20 (0.76 – 3.64)	2.78 (1.06 – 4.51_	3.40 (1.48 – 5.33)	3.62 (1.65 – 5.59)	2.44 (0.75 – 4.13)	0.00 (-)	2.76 (1.58 – 3.94)	2.97 (1.92- 4.01)
Hamstring muscle	0.00 (-)	0.49 (0.19 – 1.17)	1.11 (0.02 – 2.21)	1.70 (0.34 – 3.06)	2.23 (0.68 – 3.78)	0.92 (0.12 – 1.95)	0.00 (-)	1.05 (0.32 – 1.78)	1.43 (0.71 – 2.16)

*Lower compared to CENT; †lower compared to CD; *GK*, goalkeeper; *CD*, central defender; *LD*, lateral defender; *CM*, central midfielder; *LM*, lateral midfielder; *FWD*, centre-forward; *CENT*, central playing positions; *LAT/FWD*, lateral and forward playing positions.