Title: The incidence and burden of injuries in elite English youth female soccer players

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Abstract:

This study aimed to investigate the incidence, severity, and burden of injury in English elite youth female soccer players. Qualified therapists at six English girls' academies prospectively recorded all injuries that required medical attention or caused time loss for matches and training in 375 elite youth female soccer players (under-10 [U10], U12, U14 and U16) during the 2019/2020 season. One hundred- and eleven time-loss injuries (52 from training, 59 from matches) were sustained, resulting in 1,946 days absent (779 days from training injuries, 1,167 days from match injuries) from soccer activities. The injury incidence for matches (9.3 / 1000 hours, 95% CIs: 7.2-11.9) was significantly greater than training (1.1 / 1000 hours, 95% CIs: 0.9-1.5, $p<0.001$). Additionally, the injury burden for matches (183 days lost / 1000 hours, 95% CIs: 142-237) was significantly greater than training (17 days lost / 1000 hours, 95% CIs: 13-22, $p<0.001$). Injury incidence and burden were greatest in the U16 age group, and were found to increase with age. Whilst injury incidence and burden are greater in matches than training, a large proportion of preventable injuries, soft-tissue and non-contact in nature, were sustained in training. Findings provide comparative data for elite youth female soccer players.

Introduction:

Women's soccer has experienced an increase in professionalism and participation numbers (1), although epidemiological injury surveillance studies in elite youth female players are sparse (2, 3). To date, no research has examined injuries at an academy level in England. This is concerning given that injury surveillance forms the initial step of preventive strategies (4-6) that can reduce the impact of injury in youth athletes, improving their health status in addition to facilitating athletic development and performance (7, 8).

Elite youth female soccer injury incidence rates (2) have been reported to be comparable and greater during matches (22.4 / 1000 hours) and training (4.6 / 1000 hours) respectively, than elite senior female soccer players in European and North American leagues (12.6-22.6 / 1000 hours and 1.2-3.8 / 1000 hours, respectively) (9-12). However, previous studies in elite youth female soccer have been conducted in single team settings (2), potentially limiting the generalisability of the findings. This can be overcome by the inclusion of data from multiple teams, which provides a larger sample size for analysis and greater generalisability. Furthermore, studies to date have focused on the incidence and severity of injury without reporting burden (number of days lost per 1000 hours of exposure) (2), an arguably more useful metric to identify injuries presenting the greatest impact on athlete participation (13, 14). As a result, injury burden in elite youth female soccer has not been established.

A further limitation to date is that studies investigating injuries in female soccer have mainly included adolescent (13-18 years) age ranges, and studies including players below 13 years are sparse (15). Thus, in addition to missing key periods of growth and maturation (16), previous studies are not reflective of the age-range (8-16 years) and structure of current elite girls soccer academies. These include increased training exposure and dedicated athletic development sessions in girls as young as 8 years of age (17). The aim of this study was to describe the incidence, severity, and burden of injury in 8 to 16-year-old (Under – 10 years [U10], U12, U14 and U16) elite youth female soccer players within English academies.

Materials and methods:

Participants and study design:

A total of 375 players, training and playing in two-year age bandings (U10, n=62; U12, n=104; U14, n=104; U16, n=105), representing six girls' soccer academies, were included in this observational cohort study, tracking injury in elite youth female soccer players over the 2019/2020 soccer season (September 2019 – March 2020) which was prematurely suspended due to the COVID-19 pandemic. Participants were classified as elite youth athletes based on the definition provided by Mountjoy *et al.* (18). Players were participating regularly in soccer training and competition in accordance to

regulations set out by the English Football Association (17). The development programme consisted of 3-4 hours of training and one match per week (40-60 minute duration) for U10-U12 age groups (7v7 and 9v9, respectively), and 4-6 hours of training and 1-2 matches per week in U14-U16 age groups (11 v 11, 70-80 minute duration) (17). Consent from academy officials and parents, as well as player assent was obtained prior to the start of the study. Ethics approval for this study was obtained from Leeds Beckett University.

Procedures:

All injuries experienced during the study period were diagnosed and recorded on an online data capture sheet by a qualified therapist from each academy. For each reported injury, information including location, type, activity at the time of injury, onset, recurrence, mechanism and severity were recorded in accordance with previous injury consensus statements (19, 20). Injuries were defined as any physical complaint sustained by a player resulting from soccer-related activities, regardless if medical attention was required or if the complaint resulted in time-loss from soccer activities (20). Time-loss injuries were defined as an incident that prevented a player from participating in soccer related activities for 1 or more days following occurrence (19). Injury severity was defined as the number of days lost from match-play or training due to injury (20). All injuries were followed up until the end of the season and therapists estimated the return to play date for individuals that were still classified as injured after the season had ended. Injuries unrelated to soccer activities and/or were sustained outside of academy training or matches were reported but disregarded for analysis.

Exposure:

Team-based exposure was calculated via an end of season questionnaire that was completed by each participating academy, based on the number of players within the squad, the training calendar and matches played during the season. Training exposure was calculated as the number of training weeks multiplied by the number of players exposed (squad size for each age-group), multiplied by weekly training time (19). Match exposure was calculated as the number of matches played multiplied by the number of players in the team (i.e., 7, 9 or 11), multiplied by match duration (i.e., 40-80 minutes (19). This method is consistent with previous methods to quantify exposure based on academy training schedules and fixture lists (2, 21). Player absence for soccer related activities was not considered when calculating team-based exposure.

Data analysis:

All statistical analysis was conducted in R (version 3.6.2, R Foundation for Statistical computing, Vienna, Austria). Injury incidence and burden was calculated as the number of injuries and days lost per 1000 hours respectively, including recurrent injuries using the following formulae:

$$Incidence = (total\ number\ of\ injuries\ /\ \ total\ exposure\ h) x\ 1000$$

$$Burden\ = (total\ number\ of\ days\ lost\ /\ \ total\ exposure\ h) x\ 1000$$

Injury parameter values are reported as number and percentage of total with their corresponding 95% Poisson confidence intervals (CIs). Mean severity was calculated as the total sum of days lost divided by the total count of time-loss injuries. Median severity was calculated as the midpoint of the range of time-loss injury severities in the dataset. Median severity and inter quartile range (IRQ) was reported due to the rightly-skewed distribution of days absence from injury (20). Overall incidence and burden rates (match and training combined) were calculated for each age group to allow for comparisons to previous literature. However, no subsequent analysis was performed due to the spurious rates produced when combing match and training incidence rates (22). Differences in the incidence, mean severity and burden of time-loss injury between injury activity and age group were assessed using Poisson regression. False discovery rate adjusted *post hoc* comparisons for injury activity and age group differences were conducted using the *emmeans* function (emmeans package). Differences in the median severity of time-loss injuries was assessed using Kruskal-Wallis H tests. Age group and injury activity comparisons were conducted using Wilcoxon-Bonferroni tests. Statistical significance was assumed if p-values were ≤0.05.

Results:

Overall results:

During the 2019/20 season, a total of 52,834 hours (46,461 hours training and 6,373 hours match play) of soccer exposure were recorded. One hundred- and forty-two injuries (69 from training, 73 from matches) were sustained. Of these, 111 were time-loss injuries (52 from training, 59 from matches) resulting in 1,946 days absent (779 days from training injuries, 1,167 days from match injuries) from soccer activities. This equated to an overall incidence of 2.1 / 1000 hours (95% CIs: 1.7-2.5, Table 1). The mean and median severity of time-loss injury was 18 (95% CIs: 15-21) and 10 (IQR: 4-22) days with the majority (41%) of injuries causing 8-28 days absence from soccer activities, followed by 4-7 days (23%), >28 days (20%) and 1-3 days (15%) severity time bins. (Table 1). The mean burden of time-loss injury was 37 days lost / 1000 hours (95% CIs: 31-44). Time-loss injuries were most frequently sustained in the lower limb body region with the ankle, knee and hip/groin being the most common location sites injured (Table 2). Muscle strains followed by sprain/ligament injuries and haematomas/contusions/bruises were the most sustained time-loss injury types (Table 3).

********INSERT TABLE 1********

Training and match injuries:

Time-loss injury incidence was significantly greater for matches than training (9.3 / 1000 hours, 95% CIs: 7.2-11.9 vs. 1.1, 95% CIs: 0.9-1.5 / 1,000 hours, respectively, $p<0.001$). The mean and median severity was 20 (95% CIs: 16-26) and 10 days lost (IQR: 8-13) for matches and 15 (95% CIs: 11-20) and 9 (IQR: 7-12) days lost for training. There were no significant differences between match and training mean severity ($p=0.387$) and median severity ($p=0.489$). The burden of time-loss injury was significantly greater in matches than training (183 days lost / 1000 hours, 95% CIs: 142-237 vs. 17 days lost / 1000 hours, 95% CIs: 13-22, respectively, $p<0.001$). Most time-loss injuries were sustained during contact situations for matches (n=37, 63%) whereas non-contact situations accounted for most injuries in training (n=36, 69%; Table 1).

********INSERT TABLE 2********

********INSERT TABLE 3********

Age group differences:

Time-loss injury incidence systematically increased with age and was greatest in the U16 age group (Table 4). The U16 age group presented significantly greater match and training time-loss injury incidence rates than the U10 ($p=0.05$) and significantly greater match incidence rates than the U12 age group ($p=0.02$, Table 4). No significant differences were observed between all other age groups.. All age groups excluding the U10 ($p=0.28$) presented significantly greater time-loss injury incidence rates for matches than training ($p<0.001$). There was a statistically significant difference between age groups for the median severity of training time-loss injuries ($p = 0.017$). The only significant difference in training median severity was between the U12 and U16 age groups ($p=0.014$; Table 4). No significant differences between age groups for the median severity of matches was observed ($p=0.162$). The U16 age group presented significantly greater mean training time-loss injury severity compared to the U12 age group ($p=0.010$). The U10 age group presented significantly greater mean match time-loss injury severity than all other age groups ($p<0.001$). The relationship between the mean severity (consequence) and incidence (likelihood) of time-loss injures, and the resulting injury burden for each age group is illustrated by a risk matrix (Figure 1). The greatest burden of time-loss injury for matches and training was in the U16 age group (Figure 1) which was significantly greater compared to all other age groups ($p<0.001$). The U14 age group presented significantly greater training time-loss injury burden than U10 and U12 age groups ($p<0.001$). No significant differences were observed between U10 and U12 age groups. No differences in match time-loss injury burden were observed between U10 and U14 age groups ($p=0.73$) but both were significantly greater than the U12 age group ($p<0.001$ and $p<0.001$, respectively).

********INSERT TABLE 4********

********INSERT FIGURE 1********

Discussion:

This is the first study to quantify the incidence, severity, and burden of injuries in elite youth female soccer players in England. One hundred and eleven time-loss injuries were captured over a single season. This equated to a mean of approximately 19 time-loss injuries and 324 days absent from soccer activities per academy. The incidence and burden of time-loss injury was significantly greater in matches compared to training (Table 1). Injury incidence increased with age being the greatest in the U16 age group (Table 4). Additionally, relative to other age groups, the burden of time-loss injury at U16 was high, particularly for matches (Figure 1).

A key finding of the present study is that the time-loss injury incidence of matches was markedly greater than training (Table 1). Greater injury incidence rates in matches than training are common in soccer injury surveillance research (2, 23-27) and can be attributed to greater physical demands (28) and number of collisions (9) present in matches compared to training. Indeed, most match injuries were contact in nature whereas non-contact injuries were most prevalent in training in this study (Table 1). Match time-loss injury incidence rates determined in this study are higher than those reported in recreational female youth players in Norway and Sweden (match = 4.6 / 1000 hours, 6-16 years (25), 7.6-9.1 / 1000 hours, 13-17 years (23, 24, 26)). In contrast, training time-loss injury incidence rates were lower (0.4 / 1000 hours, 6-16 years (25), 0.9-1.9 / 1000 hours, 13-17 years (23, 24, 26)). This may be explained by greater match intensities (29) and higher skill level (30) in elite female youth soccer versus recreational counterparts (23-26) whereas lower training time-loss injury incidence rates may be reflective of the increased professionalism and the adoption of injury prevention strategies (31) and allocated athletic development sessions present in English elite youth female soccer academies. The time-loss injury incidence rates of the current study are lower than those reported by Le Gall *et al.* (2) in an elite French youth female soccer academy (match = 22.4 / 1000 hours and training = 4.6 / 1000 hours, 15-19 years). This may be explained by the older age range sampled by Le Gall *et al.* (2) compared to the current study. Older players are subjected to greater training volumes and match demands (32, 33), and are typically bigger, stronger and faster than younger players (34, 35) which increases the potential for more severe contact situations (25). Indeed, Faude *et al.* (36) demonstrated adolescents aged ≥13 years are at a greater risk of sustaining an injury in sport compared to younger counterparts. Additionally, unlike in English academies, all age groups played and trained together in the French female soccer academy (2). The potential

mismatch in body size and physical qualities between players may explain why younger players had the greatest injury incidence and likely contributed to the overall high match and training incidence rates.

The overall mean severity of injuries in the present study, is similar to those reported in a French soccer academy (18 days, (2)) but less than elite youth male soccer (22 days, 11-18 years, (37, 38)). Another key finding of the current study is that the injury burden for matches is markedly greater than training (Table 1). Greater time-loss injury burden in matches compared to training is consistent with trends in international youth female soccer (match = 535 and training = 117 days / 1000 hours, U15-U19) (39). The findings demonstrate that matches pose a greater risk of injury relative to training. However, it is important to note that the number of injuries sustained in training was similar to matches (Table 1). Moreover, the majority of training time-loss injuries were soft-tissue and non-contact in nature. These injuries are deemed preventable through adequate monitoring and management of training loads (40) as well as the implementation of athletic development programs targeting strength (41), aerobic fitness (42) and neuromuscular control deficits (43). Subsequently, these strategies will also serve to better prepare players for matches. Ultimately, practitioners within elite youth female soccer academies should alter the frequency, intensity, volume, and type of training to balance injury risk against performance development.

A key finding of the current study is that time-loss injury incidence increased with age, being greatest at U16 (Table 4). Low injury incidence rates amongst U10 and U12 age groups were observed, supporting previous findings that soccer presents low risk to children 12 years or younger (25). Another notable finding of the current study was that injury burden in the U16 age group was greater than in other age groups, particularly for matches (Figure 1). The trend of increasing incidence and burden with age is consistent with studies in elite youth male soccer (37, 44, 45). Proposed underlying reasons include a rise in exposure (from 3-4 hours of training and 1 match to 4-6 hours of training and 1-2 matches a week, (46)), increased match demands (32, 33) in addition to more advanced maturation (47). Typically, girls attain peak height and body mass at age 15 years (48). However, non-corresponding increases in relative strength with advancing age and maturation has been evidenced in elite youth female soccer players(34). Given that low levels of relative strength is an injury risk factor in youth female athletes, it could be theorized that older players (U14 and U16) are more susceptible to injury due to the increased external load afforded by greater body-size exceeding the tolerance of soft tissues, the main principle underpinning injury (49). Additionally, significant decreases in motor competency (50) and neuromuscular control (51) have been evidenced in post peak height velocity and post-pubertal females ,respectively, potentially contributing to an increased susceptibility to

injury through inefficient movement mechanics. Although associations between growth and maturation have been documented in male youth soccer (52-54), using these findings to inform practice in female youth soccer would be erroneous considering sex differences in growth and maturation (16) ,and physical qualities (55). Therefore, future research concerning female team sport athletes should explore the interaction between injury and growth and maturation.

Limitations

While this study provides valuable insights into the incidence, severity, and burden of injury in elite youth female soccer, it is not without limitations. Firstly, exposure time was collected based on each academy's training calendar and fixtures played during the season, and not on an individual basis, as recommended by consensus statements (19, 20). While this is consistent with previous studies (2, 21), not accounting for player absence and basing training exposure off regular squad sizes may have resulted in an over-estimation of training exposure and subsequently, an under-estimation of injury incidence although match exposure is unaffected due to fixed match team sizes for each age group. However, collecting individual player exposure data was deemed impractical in this context when working with 6 different academies who have limited resources and therefore, the team-based method was chosen. Secondly, the low proportion of non-time-loss and gradual onset injuries (Table 1) reported in the current study may be indicative of the limitations of collecting injury data via medical staff reports, which have been shown to under-estimate the number of gradual onset injuries sustained when compared with direct player report methods (56, 57). However, low compliance rates for direct player self-report methods have been evidenced in previous research (58, 59) and medical practitioners are the most qualified personnel to diagnose and report injuries (60) ensuring accurate diagnoses. Thirdly, injury surveillance was limited to a single season. While this is consistent with previous injury surveillance studies in youth female soccer (23-26), the inherently smaller sample size relative to multiple-season surveillance make it difficult to come to conclusions on the individual types of injuries sustained. For example, only one concussion injury was recorded in the present study whereas surveillance studies over multiple seasons have reported female adolescent soccer players to be at a high risk of concussion (61). Additionally, generalised linear mixed models failed to converge due to the smaller sample size and therefore the effect of team on injury could not be controlled for in our analysis. The current study however is the first to include multiple clubs to delineate injury and establish injury burden in elite youth female soccer players, providing a platform for future surveillance to build on. Additionally, the present study describes previously unexplored injury trends in elite youth female soccer players below the age of 13 years and provides a needed update on the current injury trends in elite youth female soccer across the full academy talent pathway.

Conclusion

This study found injury incidence and injury burden to be the greatest in the U16 age group. Additionally, although the incidence and burden of injury was markedly greater in matches compared to training, a large proportion of injuries were sustained in training. Therefore, whilst injury prevention and athletic development strategies targeting deficits in physical performance are warranted to decrease the injury risk of match-play, efforts should also be directed towards monitoring training load and subsequently altering the frequency, intensity, volume and type of training to balance injury risk against performance development. Based on the findings, these strategies are particularly important for U16 players. Findings from this study can be used as comparative reference data for youth female soccer players and to inform injury risk management strategies.

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Contributorship:

JB, SE, SY were involved in the original concept of the study. All data collection was achieved/supervised by JB, SY and PB. The data analysis was completed by JB with supervision from SW and KS. All tables and figures were designed by JB. JB drafted the original manuscript and KS, BJ, RK, PB, SW and SE provided critical feedback and comments in refining the final submission version.

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Data Sharing Statement:

The data used to produce the current manuscript is private medical data and therefore it cannot be shared.

Patient and Public Involvement Statement:

Individual informed consent from academy officials and parents as well as player assent was obtained prior to the start of the study

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Figures:

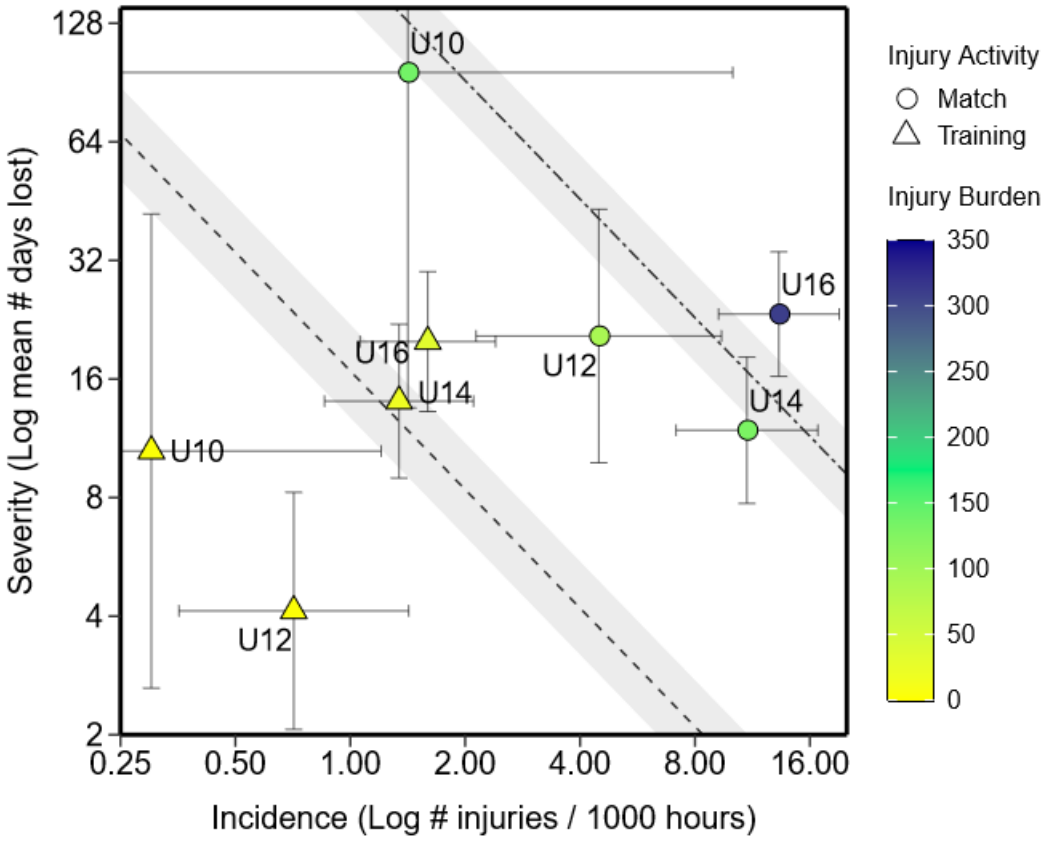

Figure 1: Risk matrix illustrating the burden of time-loss injuries (days lost per 1000 exposure hours) sustained in matches and training for all age groups. The y-axis represents mean severity (days lost to injury, log scale) while the x-axis represents mean incidence (number of injuries per 1000 hours, log scale). The vertical and horizontal error bars represent 95% Poisson CIs. The dashed line represents mean burden for training whilst the two-dashed line represents the mean burden for match-play. The grey area surrounding the average lines for training and matches represent 95% Poisson CIs.. N.B. One U16 ACL injury sustained in match-play resulting in 419 days absence was removed when calculating burden in this matrix due to its disproportionate influence on severity (12.4 standard deviations away from mean severity in U16) and burden estimates.

538 **Tables:**

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Table 1. Number (%) and incidence of all injuries, and the severity and burden for injury onset, mechanism and severity category of time-loss injuries.

	Total				Match				Training			
	Exposure = 52,834 hours				Exposure = 6,373 hours				Exposure = 46,461 hours			
	Number (% of total)	Incidence (95% CIs)	Median Severity (IRQ)	Burden (95% CIs)	Number (% of total)	Incidence (95% CIs)	Median Severity (IRQ)	Burden (95% CIs)	Number (% of total)	Incidence (95% CIs)	Median Severity (IRQ)	Burden (95% CIs)
All injuries	142 (100)	2.7 (2.3-3.2)	-	-	73 (100)	11.5 (9.1-14.4)	-	-	69 (100)	1.5 (1.2-1.9)	-	-
Non time loss	31 (21.8)	0.6 (0.4-0.8)	-	-	14 (19.2)	2.2 (1.3-3.7)	-	-	17 (24.6)	0.4 (0.2-0.6)	-	-
Time loss	111 (78.2)	2.1 (1.7-2.5)	10 (4-22)	37 (31-44)	59 (80.8)	9.3 (7.2-11.9)	10 (4-24)	183 (142-237)	52 (75.4)	1.1 (0.9-1.5)	9 (4-20)	17 (13-22)
Injury onset												
Acute	106 (74.6)	2.0 (1.7-2.4)	9 (4-21)	35 (29-43)	56 (76.6)	8.8 (6.9-1.4)	28 (14-32)	173 (133-225)	50 (72.5)	1.1 (0.8-1.4)	9 (4-20)	16 (12-21)
Gradual	5 (3.5)	0.1 (0.0-0.2)	20 (3-28)	2 (1-4)	3 (4.1)	0.5 (0.2-1.5)	10 (4-22)	10 (3-31)	2 (2.9)	0.0 (0.0-0.2)	12 (7-16)	0 (0-2)
Injury mechanism												
Contact	53 (37.3)	1.0 (0.8-1.3)	8 (4-19)	13 (10-27)	37 (50.7)	5.8 (4.2-8.0)	10 (4-22)	82 (59-113)	16 (23.2)	0.3 (0.2-0.6)	7 (4-19)	4 (2-6)
Non-contact	58 (40.9)	1.1 (0.8-1.4)	10 (5-26)	24 (18-31)	22 (30.1)	3.5 (2.3-5.2)	10 (6-33)	102 (67-154)	36 (52.2)	0.8 (0.6-1.1)	11 (5-22)	13 (10-18)
Injury severity time bins												
1-3 days	17 (12)	0.3 (0.2-0.5)	1 (1-3)	1 (0-1)	10 (13.7)	1.6 (0.8-2.9)	2 (1-3)	3 (2-5)	7 (10.1)	0.2 (0.1-0.3)	1 (1-2)	0 (0-0)
4-7 days	26 (18.3)	0.5 (0.3-0.7)	4 (4-6)	2 (2-4)	10 (13.7)	1.6 (0.8-2.9)	4 (4-6)	8 (4-14)	16 (23.2)	0.3 (0.2-0.6)	4 (4-6)	2 (1-3)
8-28 days	46 (32.4)	0.9 (0.7-1.2)	14 (9-20)	13 (10-17)	25 (34.2)	3.9 (2.7-5.8)	13 (9-17)	55 (37-81)	21 (30.4)	0.5 (0.3-0.7)	19 (11-20)	7 (5-11)
> 28 days	22 (15.5)	0.4 (0.3-0.6)	42 (34-59)	21 (14-32)	14 (19.2)	2.2 (1.3-3.7)	42 (35-66)	118 (69-203)	8 (11.6)	0.2 (0.1-0.3)	38 (33-52)	7 (4-15)

540 Injury incidence, the number of injuries per 1000 exposure hours (95% CI). Severity, days lost to injury (IQR). Injury burden, the number of days lost per
541 1000 exposure hours (95% CI). – indicates variable cannot be calculated for this category. N.B. One ACL injury sustained in match-play resulting in 419 days
542 absence was removed when calculating due to its disproportionate influence on severity and burden estimates.

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Table 2. Overall, match and training injury location number, incidence, median severity, and burden for time loss injuries

	Total				Match				Training			
Region Location site	Number (% of total)	Incidence (95% CIs)	Median Severity (IRQ)	Burden (95% CIs)	Number (% of total)	Incidence (95% CIs)	Median Severity (IRQ)	Burden (95% CIs)	Number (% of total)	Incidence (95% CIs)	Median Severity (IRQ)	Burden (95% CIs)
Head & neck	6 (5.4)	0.1 (0.1-0.3)	4 (2-6)	1 (0-2)	4 (6.8)	0.6 (0.2-1.7)	4 (2-10)	5 (2-14)	2 (3.8)	0.0 (0.0-0.2)	4 (4-4)	0 (0-1)
Head & face	5 (4.5)	0.1 (0.0-0.2)	4 (2-4)	1 (0-2)	3 (5.1)	0.5 (0.2-1.5)	2 (2-13)	4 (1-14)	2 (3.8)	0.0 (0.0-0.2)	4 (4-4)	0 (0-1)
Neck & cervical spine	1 (0.9)	0.0 (0.0-0.1)	6 (6-6)	0 (0-1)	1 (1.7)	0.2 (0.0-1.1)	6 (6-6)	1 (0-7)	-	-	-	-
Upper limb	11 (10.0)	0.2 (0.1-0.4)	17 (11-36)	5 (3-8)	8 (13.6)	1.3 (0.6-2.5)	25 (12-39)	31 (15-62)	3 (5.8)	0.1 (0.0-0.2)	15 (8-22)	1 (0-3)
Shoulder/clavicle	2 (1.8)	0.0 (0.0-0.1)	34 (31-36)	1 (0-5)	1 (1.7)	0.2 (0.0-1.1)	38 (38-38)	6 (1-42)	1 (1.9)	0.0 (0.0-0.2)	29 (29-29)	1 (0-4)
Wrist	4 (3.6)	0.1 (0.0-0.2)	17 (1-36)	2 (1-4)	3 (5.1)	0.5 (0.2-1.5)	33 (17-39)	12 (4-38)	1 (1.9)	0.0 (0.0-0.2)	1 (1-1)	0 (0-0)
Hand/finger/thumb	5 (4.5)	0.1 (0.0-0.2)	15 (14-17)	2 (1-4)	4 (6.9)	0.6 (0.2-1.7)	16 (12-23)	13 (5-33)	1 (1.9)	0.0 (0.0-0.2)	15 (15-15)	0 (0-2)
Trunk	6 (5.5)	0.1 (0.1-0.3)	8 (8-10)	4 (2-8)	5 (8.5)	0.8 (0.3-1.9)	8 (8-10)	29 (12-70)	1 (1.9)	0.0 (0.0-0.2)	8 (8-8)	0 (0-1)
Sternum/ribs/upper back	1 (0.9)	0.0 (0.0-0.1)	8 (8-8)	8 (1-57)	1 (1.7)	0.2 (0.0-1.1)	8 (8-8)	1 (0-9)	-	-	-	-
Lower back / sacrum	5 (4.5)	0.1 (0.0-0.2)	8 (8-10)	4 (1-8)	4 (6.8)	0.6 (0.2-1.7)	9 (7-46)	28 (10-74)	1 (1.9)	0.0 (0.0-0.2)	9 (9-9)	0 (0-1)
Lower limb	87 (79.1)	1.6 (1.3-2.0)	10 (4-21)	28 (23-34)	42 (71.2)	6.6 (4.9-8.9)	10 (4-21)	118 (87-160)	46 (88.5)	1.0 (0.7-1.3)	10 (4-20)	15 (12-21)
Hip/groin	15 (13.5)	0.3 (0.2-0.5)	11 (6-20)	5 (3-9)	7 (11.9)	1.1 (0.5-2.3)	10 (6-17)	19 (9-41)	8 (15.4)	0.2 (0.1-0.3)	12 (6-26)	4 (2-7)
Anterior thigh	9 (8.1)	0.2 (0.1-0.3)	4 (4-12)	1 (1-2)	2 (3.4)	0.3 (0.1-1.3)	6 (5-8)	2 (1-8)	7 (13.5)	0.2 (0.1-0.3)	4 (2-12)	1 (1-2)
Posterior thigh	14 (12.6)	0.3 (0.2-0.4)	19 (6-32)	6 (3-10)	4 (6.8)	0.6 (0.2-1.7)	23 (14-30)	13 (5-35)	10 (19.2)	0.2 (0.1-0.4)	16 (6-32)	5 (2-9)
Knee	18 (16.2)	0.3 (0.2-0.5)	10 (4-20)	7 (4-11)	11 (18.6)	1.7 (1.0-3.1)	12 (4-25)	40 (22-75)	7 (13.5)	0.2 (0.1-0.3)	6 (5-20)	2 (1-5)
Lower leg/Achilles tendon	5 (4.5)	0.1 (0.0-0.2)	8 (6-9)	1 (0-3)	4 (6.8)	0.6 (0.2-1.7)	7 (5-15)	8 (3-21)	1 (1.9)	0.0 (0.0-0.2)	9 (9-9)	0 (0-1)
Ankle	20 (18.0)	0.4 (0.2-0.6)	10 (6-21)	6 (4-9)	10 (16.9)	1.6 (0.8-2.9)	10 (6-19)	24 (13-45)	10 (19.2)	0.2 (0.1-0.4)	14 (6-22)	3 (2-6)
Foot/toe	7 (6.3)	0.1 (0.1-0.3)	8 (5-20)	2 (1-4)	4 (6.8)	0.6 (0.2-1.7)	14 (5-26)	11 (4-29)	3 (5.8)	0.1 (0.0-0.2)	8 (6-14)	1 (0-2)

547 Injury incidence, the number of injuries per 1000 exposure hours (95% CI). Severity, days lost to injury (IQR). Injury burden, the number of days lost per
548 1000 exposure hours (95% CI). – indicates that no time-loss injuries occurred within this category. N.B. One ACL injury sustained in match-play resulting in
549 419 days absence was removed when calculating due to its disproportionate influence on severity and burden estimates.

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Table 3. Overall, match and training injury type number, incidence, median severity, and burden for time loss injuries

	Total				Match				Training			
Injury Type	Number (% of total)	Incidence (95% CIs)	Median Severity (IRQ)	Burden (95% CIs)	Number (% of total)	Incidence (95% CIs)	Median Severity (IRQ)	Burden (95% CIs)	Number (% of total)	Incidence (95% CIs)	Median Severity (IRQ)	Burden (95% CIs)
Muscle strain	37 (33.3)	0.7 (0.5-1.0)	10 (5-20)	11 (8-15)	13 (22.0)	2.0 (1.2-3.5)	10 (4-18)	35 (21-61)	23 (46.2)	0.5 (0.3-0.8)	10 (5-20)	7 (5-11)
Spain/ligament injury	30 (27.0)	0.6 (0.4-0.8)	10 (6-22)	11 (8-16)	19 (32.2)	3.0 (1.9-4.7)	10 (6-19)	60 (38-96)	11 (21.2)	0.2 (0.1-0.4)	20 (6-26)	4 (2-8)
Haematoma/contusion/bruise	19 (17.1)	0.4 (0.2-0.6)	6 (4-10)	3 (2-4)	9 (15.3)	1.4 (0.7-2.7)	6 (3-8)	8 (4-16)	10 (19.2)	0.2 (0.1-0.4)	6 (4-14)	2 (1-3)
Other injuries	10 (9.0)	0.2 (0.1-0.4)	5 (2-24)	3 (2-6)	4 (6.8)	0.6 (0.2-1.7)	5 (2-8)	8 (4-17)	4 (7.7)	0.1 (0.0-0.2)	26 (3-54)	3 (1-7)
Fracture	6 (5.4)	0.1 (0.1-0.3)	36 (24-40)	4 (2-8)	6 (10.2)	0.9 (0.4-2.1)	36 (24-40)	31 (14-68)	-	-	-	-
Other bone injury	5 (4.5)	0.1 (0.0-0.2)	20 (8-42)	4 (2-10)	4 (6.8)	0.6 (0.2-1.7)	25 (6-70)	32 (12-87)	1 (1.9)	0.0 (0.0-0.2)	25 (6-70)	0 (0-3)
Tendinosis	2 (1.8)	0.0 (0.0-0.2)	12 (7-16)	0 (0-2)	-	-	-	-	2 (3.8)	0.0 (0.0-0.2)	20 (20-20)	1 (0-2)
Apophysitis	1 (0.9)	0.0 (0.0-0.1)	28 (28-28)	1 (0-4)	1 (1.7)	0.2 (0.0-1.1)	28 (28-28)	4 (1-31)	-	-	-	-
Concussion	1 (0.9)	0.0 (0.0-0.1)	24 (24-24)	0 (0-3)	1 (1.7)	0.2 (0.0-1.1)	24 (24-24)	4 (1-27)	-	-	-	-

Injury incidence, the number of injuries per 1000 exposure hours (95% CI). Severity, days lost to injury (IQR). Injury burden, the number of days lost per 1000 exposure hours (95% CI). – indicates that no time-loss injuries occurred within this category. N.B. One U16 ACL injury sustained in match-play resulting in 419 days absence was removed when calculating due to its disproportionate influence on severity (12.4 standard deviations away from mean severity in U16) and burden estimates.

Table 4. Total, match and training injury number (%), incidence, severity, and burden for all age groups for time loss injuries

	Total				Match				Training			
	U10	U12	U14	U16	U10	U12	U14	U16	U10	U12	U14	U16
Exposure (hours)	7347	12813	16076	16598	706	1563	1919	2185	6641	11250	14158	14413
Number (% of total)	3 (2.7)	15 (13.5)	40 (36)	53 (47.7)	1 (1.7)	7 (11.9)	21 (35.6)	30 (50.8)	2 (3.8)	6 (11.5)	19 (36.5)	23 (44.2)
Incidence (95% CIs)	0.4 (0.1-1.3)	1.2 (0.7-1.9)	2.5 (1.8-3.4)	3.2 (2.4-4.2)	1.4 (0.2-10.1)	4.5 (2.1-9.4)	10.9 (7.1-16.8)	13.7 (9.6-19.6)	0.3 (0.1-1.2)	0.7 (0.4-1.4)	1.3 (0.9-2.1)	1.6 (1.1-2.4)
Mean Severity (95% CIs)	39 (13-121)	12 (7-20)	13 (9-18)	22 (17-29)	96 (14-682)	21 (10-43)	12 (8-18)	23 (16-34)	11 (3-42)	4 (2-8)	14 (9-22)	20 (13-30)
Median Severity (IQR)	20 (10-58)	5 (3-12)	8 (4-19)	12 (6-28)	96 (96-96)	14 (3-37)	10 (3-14)	9 (6-29)	10 (6-15)	4 (2-5)	8 (4-20)	13 (8-26)
Burden (95% CIs)	16 (5-49)	14 (8-23)	32 (24-44)	68 (52-90)	136 (19-965)	92 (44-193)	130 (85-199)	310 (216-446)	3 (1-13)	3 (1-6)	19 (12-30)	32 (21-48)

Injury incidence, the number of injuries per 1000 exposure hours (95% CI). Severity, days lost to injury (IQR). Injury burden, the number of days lost per 1000 exposure hours (95% CI). – indicates that no time-loss injuries occurred within this category. N.B. One U16 ACL injury sustained in match-play resulting in 419 days absence was removed when calculating injury burden due to its disproportionate influence on severity (12.4 standard deviations away from mean severity in U16) and burden estimates.