UEFA Women's Elite Club Injury Study: a prospective study on 1527 injuries over four consecutive seasons 2018/2019 to 2021/2022 reveals thigh muscle injuries to be most common and ACL injuries most burdensome

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ABSTRACT

Objective Injuries in women's football (soccer) have scarcely been investigated, and no study has been conducted in the highest competitive level involving club teams from different countries. Our aim was to investigate the time-loss injury epidemiology and characteristics among women's elite football players over four seasons.

Methods 596 players from 15 elite women's teams in Europe were studied prospectively during the 2018/2019 to 2021/2022 seasons (44 team seasons). Medical staff recorded individual player exposure and time-loss injuries. Injury incidence was calculated as the number of injuries per 1000 playing hours and injury burden as the number of days lost per 1000 hours.

Results 1527 injuries were recorded in 463 players with an injury incidence of 6.7 (95% CI 6.4 to 7.0) injuries per 1000 hours and a nearly fourfold higher incidence during match play compared with training (18.4, 95% CI 16.9 to 19.9 vs 4.8, 95% CI 4.5 to 5.1; rate ratio 3.8, 95% CI 3.5 to 4.2). Thigh muscle injuries (hamstrings 12%, 188/1527, and quadriceps 11%, 171/1527) were the most frequent injury, while anterior cruciate ligament (ACL) injury had the highest burden (38.0 days lost per 1000 hours, IQR 29.2–52.1) with median days lost of 292 (IQR 246–334) days. Concussions constituted 3% (47/1527) of all injuries, with more than half of them (55%, 26/47) due to ball-related impact.

Conclusion An elite women's football team can expect approximately 35 time-loss injuries per season. Thigh muscle injury was the most common injury and ACL injury had the highest injury burden.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Injuries in women's football have scarcely been investigated, and no study has been carried out at the highest competitive level involving club teams from different countries followed across several seasons.

WHAT THIS STUDY ADDS

⇒ An elite women's football team can expect 35 time-loss injuries per season (1.5 injuries per player) with a nearly fourfold higher incidence during match play compared with training.

⇒ Hamstring muscle injury was most frequent (12%), closely followed by quadriceps muscle injury (11%).

⇒ Anterior cruciate ligament (ACL) injury was infrequent (2%) but had the highest injury burden.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ Our study increases the knowledge and understanding of injury epidemiology among women's elite football players and opens opportunities for further substudies.

⇒ This study underlines the importance of implementing and evaluating preventive measures for frequent injuries such as thigh muscle injuries, and injuries with high burden and potentially negative long-term consequences such as ACL injury and concussion.

INTRODUCTION

Nearly 1.4 million women were registered football players in Europe in 2017 according to the Union of European Football Associations (UEFA),[1] with around 3.600 of them being professional or semiprofessional. As concluded in several recent reviews,[2–7] women's football injuries have been scarcely investigated. Two of these reported very similar injury incidences for women's elite football as in men's elite football; 5.6–5.7 injuries per 1000 hours in total, 3.2–3.3 in training, and 19.1–19.5 in matches.[3 6] Additionally, most injuries were located

at the knee, thigh and ankle, and the most frequent injury types were joint/ligament injuries, muscle injuries and contusions/haematomas.

Even if there are several studies on elite women's club teams,[8–17] no previous study has included teams from the highest competitive club level in different European countries, as has been a matter of routine for the past two decades in men's football.[18 19] In addition, most of the data collection in the previous studies on women's elite football took place more than a decade ago when a majority of players were not fully professional. Therefore, the aim of this study was to investigate the time-loss

injury epidemiology and characteristics among women professional football players in Europe during four consecutive seasons, 2018/2019 to 2021/2022.

MATERIAL AND METHODS

Using the same design as for the UEFA Elite Club Injury Study (ECIS),[20] the UEFA Women's Elite Club Injury Study (WECIS) was launched in July 2018. The methodology adheres to the guidelines of the original consensus statement for football,[21] and mostly to the International Olympic Committee (IOC) consensus statement,[22] and where applicable, its recently published football consensus extension.[23]

Study population

This study is ongoing with findings reported for the 2018/2019 to 2021/2022 seasons, including the 2020 lockdown due to the COVID-19 pandemic. In most European countries, the football season starts with a pre-season in July and the first half of August, followed by a competitive season from approximately the middle of August, ending in May. During 2019/2020, all major European first leagues cancelled the remaining matches (between four and eight matches left) from March 2020 due to the COVID-19 pandemic except for the German Frauen-Bundesliga which was temporarily paused and restarted in June 2020. All 2020/2021 league matches started as planned in the middle of August 2020. Conversely, the Swedish first league, Damallsvenskan, which has a spring to autumn season was postponed from the planned start in April to June 2020 and ended in late November with the 2021 season starting as usual in April. No league or cup matches were cancelled due COVID-19 during the second half of 2020 nor throughout the 2021 season.

Before commencing the study, forms and the data collection procedures were tested in a pilot study from January to May 2017/2018. A convenient sample of 12 teams selected by UEFA based on the UEFA league coefficient with champions and runners-up from associations 1–8 and champions from associations 9–12 being directly qualified to the Women's Champions League, and on the inclusion of their men's counterparts in the ECIS. All data from these months are excluded from this report as decided a priori because of expected incomplete data collection. Two pilot study teams did not deliver complete data from July 2018 and were excluded. Following inception, another five teams based on the same inclusion criteria were added resulting in six teams delivering complete four-season data, four teams complete three-season data, three teams complete two-season data and two teams complete one-season data (online supplemental table 1). Except for one team, all teams were ranked among the top five in the highest national leagues of Europe.

All first team squad players (most being professionals, some being amateurs) were informed about the study by their team physician at the start of pre-season, or when joining the team later during the season, and provided written consent. Players who left during the season for a team outside the WECIS were included for their entire time of participation.

Study procedure

All teams were requested to appoint a contact person in the club medical staff at each season start, usually the team physician, to inform the players about the study and to be responsible for the data collection. To ensure that the study methodology was followed, each contact person was provided with a study manual containing all operational definitions and other relevant information of the data collection procedure with practical examples

as well as the three study forms. All football exposure and injuries that occurred during team activities were recorded on standard forms which were sent to the study group each month. The first author reviewed the reported data and, if there were any missing non-optional or unclear data, immediate feedback was sent back to the contact person to enable corrections of the reports.

Exposure and injury registration

Baseline data regarding anthropometrics and leg dominance were collected at player inclusion. Training and match exposure (in minutes) with the club and the national team was registered for each player on an attendance record. All football-related injuries were noted on a one-page injury card with compulsory tick-box alternatives on type of training/match, injury type/location, injury mechanism, and so on, and an optional free text on diagnosis and further information such as specified muscle, tendon or ligament involvement. Injuries were classified into different severity categories (table 1), and tabulated according to the recommendations in the recent football-specific consensus extension.[23]

Patient involvement

This research was done without patient (player) involvement. Patients were not invited to comment on the study design or to contribute to the writing of the article.

Equity, diversity and inclusion

This study was conducted on women's elite football players exclusively. All teams included were from high-income countries with no representation from middle-income or low-income countries. There are four men and three women in the author list with varying nationalities, professions and fields of expertise.

Statistical analysis

Only full season data were included in the analyses meaning that teams who delivered incomplete data or data for part of a season were excluded for that season. Continuous data for anthropometrics and exposures are presented as mean with SD. Injury incidence was calculated as the number of injuries per 1000 hours, as described in table 1, with 95% CI. Injury incidences were compared as a rate ratio (RR) with 95% CI using Poisson regression with number of injuries as the dependent variable and including exposure hours as offset. Injuries were also expressed as the average number of injuries per a typical 23-player squad team per season. Days lost were presented as median with IQR. Injury burden was defined as the number of days lost per 1000 hours, as described in table 1,[23 24] and is expressed as median with IQR. Differences in injury proportions between training and match play was analysed using the χ^2 test. All analyses were two-sided and the significance level was set at $p < 0.05$. All analyses were carried out in line with the checklist for statistical assessment of medical papers (CHAMP) statement,[25] using SPSS (IBM SPSS Statistics for Windows, V.27.0. Armonk, NY USA: IBM Corp). A statistical significance level of $p < 0.05$ was applied.

RESULTS

There were 596 unique players with a mean team squad size of 23 (SD 3.2) players. Mean player age was 23 (SD 4.4) years, height 169 (SD 6.3) cm and body mass 62 (SD 6.5) kg.

Table 1 Operational definitions

Exposure	Training or match with the club's first and reserve teams and any national team
Training	Scheduled physical training activity under the guidance of the coaching team
Match	Competitive or friendly match against another team
Training attendance	Players' active and full participation in scheduled team training
Match availability	Players' availability for match play regardless of being picked by the coach
Injury	Any physical complaint sustained by a player that resulted from a football match or football training and led to the player being unable to take full part in future football training or match play (time-loss injury)
Traumatic onset injury	Injury with sudden onset and known cause
Gradual onset injury	Injury with insidious onset and no known trauma
Contact injury	Injuries due to contact with another player or an object
Injury incidence	Number of injuries per 1000 player hours ((Σ injuries/Σ hours)×1000)
Injury burden	Number of days lost per 1000 player hours ((Σ days lost/Σ hours)×1000)
Recurrent injury	Injury of the same type and at the same site as an index injury occurring previously during the same season
Early recurrence	Recurrent injury that occurs within 2 months after return to full participation from the index injury
Injury severity	Number of days from injury to medical clearance. A player was considered injured until the medical team allowed full participation in team training sessions and being available for match play
Slight	Injury that results in 0 days lost from training or match
Minimal	Injury that results in 1–3 days lost from training or match
Mild	Injury that results in 4–7 days lost from training or match
Moderate	Injury that results in 8–28 days lost from training or match
Severe	Injury that results in >28 days lost from training or match

Exposure and injuries

Detailed data on exposure, injury incidence and injury burden (season-by-season and overall) are presented in table 2. The overall exposure was 227 922 hours (195 945 training, 31 977 match) during 44 team seasons with 1129 player seasons. The mean training attendance was 77% (2.8) and the mean player availability for match selection 85% (2.5).

In total, 463 (78%) of the players incurred 1527 injuries which means that a typical 23-player squad could expect 35 injuries per season. The overall injury incidence was 6.7 (95% CI 6.4 to 7.0) injuries per 1000 hours with a fourfold higher incidence during match play than training (18.4, 95% CI 16.9 to 19.9 vs 4.8, 95% CI 4.5 to 5.1; RR 3.8, 95% CI 3.5 to 4.2, p<0.001). The training injury incidence during the 2018/2019 season was significantly lower than the 2020/2021 (RR 0.7, 95% CI 0.6 to 0.9, p=0.001) and 2021/2022 seasons (RR 0.7, 95% CI 0.6 to 0.8, p<0.001), whereas the 2019/2020 COVID-19 affected season had a significantly lower training injury incidence than only the 2021/2022 season (RR 0.8, 95% CI 0.7 to 1.0, p=0.029) (table 2). However, the 2019/2020 COVID-19 affected season had a significantly lower match injury incidence than all other seasons (2019/2020 vs 2018/2019, RR 0.7, 95% CI 0.6 to 1.0,

Table 2 Team and player exposure data, injury incidence and injury burden during the 2018/2019 to 2021/2022 seasons

	2018/2019		2019/2020		2020/2021		2021/2022		2018/2019 to 2021/2022	
	Mean (SD)		Mean (SD)		Mean (SD)		Mean (SD)		Mean (SD)	
Training sessions										
No/team	183.5 (24.2)		155.4 (35.7)		197.8 (27.3)		182.3 (27.0)		179.1 (32.3)	
No/player	144.2 (50.3)		117.5 (47.5)		154.6 (57.2)		133.5 (51.9)		137.0 (53.6)	
Matches										
No/team	39.8 (6.0)		29.3 (4.9)		40.3 (7.5)		42.4 (6.3)		37.7 (8.0)	
No/player	26.9 (14.2)		19.5 (11.2)		25.9 (15.2)		28.0 (15.6)		24.9 (14.5)	
Player exposure (hours)										
Training	182.5 (66.0)		153.1 (60.7)		203.4 (83.3)		157.6 (66.3)		173.6 (72.5)	
Matches	31.8 (18.9)		22.4 (15.2)		28.7 (19.8)		31.1 (19.7)		28.3 (18.8)	
Total	214.3 (79.8)		175.5 (70.6)		232.2 (94.4)		188.7 (78.8)		201.9 (84.2)	
	N	Incidence (95% CI)	N	Incidence (95% CI)	N	Incidence (95% CI)	N	Incidence (95% CI)	N	Incidence (95% CI)
Injury incidence										
Training	174	3.8 (3.3 to 4.5)	208	4.5 (3.9 to 5.2)	305	5.2 (4.7 to 5.8)	253	5.5 (4.9 to 6.2)	940	4.8 (4.5 to 5.1)
Matches	151	19.2 (16.3 to 22.5)	96	14.2 (11.6 to 17.3)	165	19.9 (17.1 to 23.2)	175	19.4 (16.7 to 22.5)	587	18.4 (16.9 to 19.9)
Total	323	6.1 (5.5 to 6.8)	306	5.7 (5.1 to 6.4)	470	7.0 (6.4 to 7.7)	428	7.8 (7.1 to 8.6)	1527	6.7 (6.4 to 7.0)
	Days	Median (IQR)	Days	Median (IQR)	Days	Median (IQR)	Days	Median (IQR)	Days	Median (IQR)
Injury burden										
Training	3500	76.6 (54.8–88.8)	5783	71.4 (44.4–185.5)	7302	137.2 (83.3–163.3)	5923	152.6 (73.0–180.7)	22 508	110.1 (88.3–138.2)
Matches	3673	356.6 (270.8–687.4)	4534	556.5 (204.3–978.5)	5132	475.3 (434.4–923.4)	4785	479.4 (385.2–768.9)	18 124	537.3 (392.6–678.0)
Total	7173	126.3 (104.3–162.2)	10 317	174.9 (135.7–269.7)	12 434	189.5 (141.0–259.9)	10 708	183.4 (123.9–250.5)	40 632	175.5 (132.3–198.9)

Injury incidence is defined as the number of injuries per 1000 hours and injury burden is defined as the number of days lost per 1000 hours.
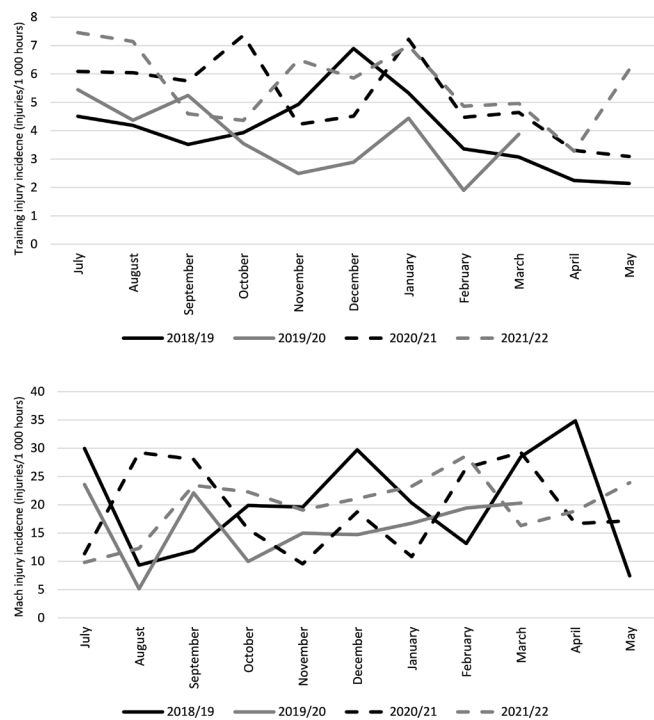
Figure 1 Training and match injury incidences per month during the 2018/2019 to 2021/2022 seasons. Data from April to May 2020 were excluded due to negligible football exposures reported during the COVID-19 lockdown.

p=0.021; 2019/2020 vs 2020/21, RR 0.7, 95% CI 0.6 to 0.9, p=0.008; 2019/2020 vs 2021/2022 RR 0.7, 95% CI 0.6 to 0.9, p=0.014). The monthly distribution of training injury incidence was essentially similar for all seasons studied, while match injury incidences showed no similar clear trend (figure 1). The median injury burden was 176 days lost per 1000 hours, being fivefold higher during match play than training (p<0.001).

In total, 420 (70 %) of the players were called up for international duty at least once. National team play constituted 12% of the exposure (26 502 hours) and 8% of all reported injuries (55 training and 69 match). There were no differences in injury incidence between national team matches and club team matches (16.2, 95% CI 12.8 to 20.5 vs 18.4, 95% CI 16.9 to 19.9, RR, 0.9, 95% CI 0.7 to 1.1, p=0.333).

Injury characteristics and injury mechanisms

Injury data for frequency, incidence and burden are seen in tables 3 and 4. In total, 1304 (85%) of the injuries were in the lower extremities with the thigh, knee and ankle being most frequent. There were 598 muscle injuries (39% of all injuries) and 304 ligament injuries (20% of all injuries).

In all, 53% (802/1523) of the injuries were of acute onset, while 47% (721/1523) had a gradual onset (injury onset missing for four injuries). Traumatic injuries were more common during match play compared with training (63%, 366/584 vs 46% 436/939, p<0.001). Contact injuries accounted for 28% (424/1525) of all injuries and represented a higher percentage for match injuries compared with training injuries (40%, 232/586 vs 20%, 192/939, p<0.001).

Injury severity

Injury severity data are displayed in table 5 and in online supplemental table 2. Severe injuries constituted more than one-fifth of all injuries (21%, 321/1527) which means that the typical 23-player squad could expect seven severe injuries per season. Anterior cruciate ligament (ACL) injury 10% (33/321), quadriceps muscle injury 9% (28/321), and hamstring muscle injury 8% (25/321) were the three most common severe injury diagnoses. The severe injury incidence was fourfold higher during match play than training (4.1, 95% CI 3.4 to 4.8 vs 1.0, 95% CI 0.8 to 1.1; RR 4.2, 95% CI 3.3 to 5.2 p<0.001).

Thigh muscle injuries

Hamstring muscle injury was the most frequent injury representing 12% (188/1527) of all injuries. The typical 23-player squad could thus expect four hamstring muscle injuries per season. The total hamstring muscle injury incidence was 0.8 (95% CI 0.7 to 1.0) injuries per 1000 hours and being fivefold higher during match play compared with training (table 3). The median days lost was 8 (IQR 4–16) days and the median injury burden was 8.3 (IQR 5.9–16.1) days lost per 1000 hours, being 12-fold higher during match play compared with training (table 4). The most frequent injury mechanism was running/sprinting (56%, 104/187, injury mechanism missing for one injury). In all, 125 injuries had optional free-text diagnoses to distinguish between biceps femoris and semimembranosus/semitendinosus; a majority of these (66%, 82/125) were located to the biceps femoris. Every sixth hamstring muscle injury was a recurrence (17%, 32/188) with 26 (81%) being early recurrences.

Quadriceps muscle injury was almost as frequent as hamstring muscle injury representing 11% (171/1527) of all injuries. The typical 23-player squad could thus expect approximately four quadriceps muscle injuries per season. The total quadriceps muscle injury incidence was 0.8 (95% CI 0.6 to 0.9) injuries per 1000 hours and being almost threefold higher during match play compared with training (table 3). The median days lost was 9 (IQR 4–22) days and the median injury burden was 10.1 (IQR 4.8–18.6) days lost per 1000 hours, being fourfold higher during match play compared with training (table 4). The most frequent injury mechanism was running/sprinting with 30% (52/171) of injuries, followed by shooting 23% (40/171). In all, 114 injuries (67%) had optional free-text diagnosis specific to the rectus femoris and the rest were unspecified. Every tenth quadriceps muscle injury was a recurrence (11%, 18/171) with 12 (67%) being early recurrences.

Ankle and knee ligament injuries

Lateral ankle ligament injury was the most frequent ligament injury representing 7% (111/1527) of all injuries. The typical 23-player squad could thus expect 2.5 lateral ankle sprains per season. The total lateral ankle ligament injury incidence was 0.5 (95% CI 0.4 to 0.6) injuries per 1000 hours and being fourfold higher during match play compared with training (table 3). The median days lost was 9 (IQR 5–21) days and the median injury burden was 7.9 (IQR 4.1–13.1) days lost per 1000 hours, being threefold higher during match play compared with training (table 4). More than half of the lateral ankle ligament injuries had a contact mechanism (52%, 58/111). The main mechanisms of contact-related lateral ankle ligament injuries were being tackled (29%, 17/58) and jumping/landing (17%, 10/58). For non-contact lateral ankle ligament injuries, twisting/turning (32%, 17/53) and jumping/landing (26%, 14/53) were the two dominating mechanisms. Every tenth lateral ankle ligament injury was a recurrence (11%, 12/111) with seven being early recurrences.

Table 3 Injury characteristics and incidence rate ratios between match play and training for all four seasons (2018/2019 to 2021/2022)

Injury	Total		Training		Match play			
	N (%)	Incidence (95% CI)	N (%)	Incidence (95% CI)	N (%)	Incidence (95% CI)	Rate ratio (95% CI)	P value
Head/face	60 (4)	0.3 (0.2 to 0.3)	35 (4)	0.2 (0.1 to 0.2)	25 (4)	0.8 (0.5 to 1.2)	4.4 (2.6 to 7.3)	<0.001
Concussion	47 (3)	0.2 (0.2 to 0.3)	29 (3)	0.1 (0.1 to 0.2)	18 (3)	0.6 (0.4 to 0.9)	3.8 (2.1 to 6.8)	<0.001
Neck/cervical spine	11 (<1)	0.0 (0.0 to 0.1)	8 (<1)	0.0 (0.0 to 0.1)	3 (<1)	0.1 (0.0 to 0.3)	2.3 (0.6 to 8.7)	0.219
Shoulder/clavicle	24 (2)	0.1 (0.1 to 0.2)	12 (1)	0.1 (0.0 to 0.1)	12 (2)	0.4 (0.2 to 0.7)	6.1 (2.8 to 13.6)	<0.001
Arm/hand	37 (2)	0.2 (0.1 to 0.2)	24 (3)	0.1 (0.1 to 0.2)	13 (2)	0.4 (0.2 to 0.7)	3.3 (1.7 to 6.5)	<0.001
Sternum/upper back	8 (<1)	0.0 (0.0 to 0.1)	3 (<1)	0.0 (0.0 to 0.0)	5 (<1)	0.2 (0.1 to 0.4)	10.2 (2.4 to 42.7)	0.001
Abdomen	7 (<1)	0.0 (0.0 to 0.1)	7 (<1)	0.0 (0.0 to 0.1)	–	–	–	–
Lower back/pelvis/ sacrum	76 (5)	0.3 (0.3 to 0.4)	61 (6)	0.3 (0.2 to 0.4)	15 (3)	0.5 (0.3 to 0.8)	1.5 (0.9 to 2.7)	0.155
Hip/groin	151 (10)	0.7 (0.6 to 0.8)	99 (11)	0.5 (0.4 to 0.6)	52 (9)	1.6 (1.2 to 2.1)	3.2 (2.3 to 4.5)	<0.001
Muscle injuries	104 (7)	0.5 (0.4 to 0.6)	67 (7)	0.3 (0.3 to 0.4)	37 (6)	1.2 (0.8 to 1.6)	3.4 (2.3 to 5.1)	<0.001
Adductor	66 (4)	0.3 (0.2 to 0.4)	46 (5)	0.2 (0.2 to 0.3)	20 (3)	0.6 (0.4 to 1.0)	2.7 (1.6 to 4.5)	<0.001
Thigh	408 (27)	1.8 (1.6 to 2.0)	245 (26)	1.3 (1.1 to 1.4)	163 (28)	5.1 (4.4 to 5.9)	4.1 (3.3 to 5.0)	<0.001
Muscle injuries	361 (24)	1.6 (1.4 to 1.8)	222 (24)	1.1 (1.0 to 1.3)	139 (24)	4.3 (3.7 to 5.1)	3.8 (3.1 to 4.7)	<0.001
Quadriceps	171 (11)	0.8 (0.6 to 0.9)	120 (13)	0.6 (0.5 to 0.7)	51 (9)	1.6 (1.2 to 2.1)	2.6 (1.9 to 3.6)	<0.001
Hamstrings	188 (12)	0.8 (0.7 to 1.0)	101 (11)	0.5 (0.4 to 0.6)	87 (15)	2.7 (2.2 to 3.4)	5.3 (4.0 to 7.0)	<0.001
Knee	270 (18)	1.2 (1.1 to 1.3)	159 (17)	0.8 (0.7 to 0.9)	111 (19)	3.5 (2.9 to 4.2)	4.3 (3.4 to 5.5)	<0.001
Ligament injuries	107 (7)	0.5 (0.4 to 0.6)	50 (5)	0.3 (0.2 to 0.3)	57 (10)	1.8 (1.4 to 2.3)	7.0 (4.8 to 10.2)	<0.001
Medial collateral	43 (3)	0.2 (0.1 to 0.3)	20 (2)	0.1 (0.1 to 0.2)	23 (4)	0.7 (0.5 to 1.1)	7.0 (3.9 to 12.8)	<0.001
Anterior cruciate	33 (2)	0.1 (0.1 to 0.2)	13 (1)	0.1 (0.0 to 0.1)	20 (3)	0.6 (0.4 to 1.0)	9.4 (4.7 to 19.0)	<0.001
Meniscus/cartilage injuries	56 (4)	0.2 (0.2 to 0.3)	44 (5)	0.2 (0.2 to 0.3)	12 (2)	0.4 (0.2 to 0.7)	1.7 (0.9 to 3.2)	0.115
Lower leg/Achilles tendon	175 (11)	0.8 (0.7 to 0.9)	119 (13)	0.6 (0.5 to 0.7)	56 (10)	1.8 (1.3 to 2.3)	2.9 (2.1 to 4.0)	<0.001
Muscle injuries	91 (6)	0.4 (0.3 to 0.5)	61 (6)	0.3 (0.2 to 0.4)	30 (5)	0.9 (0.7 to 1.3)	3.0 (1.9 to 4.7)	<0.001
Achilles tendon injuries	43 (3)	0.2 (0.1 to 0.3)	31 (3)	0.2 (0.1 to 0.2)	12 (2)	0.4 (0.2 to 0.7)	2.4 (1.2 to 4.6)	0.011
Ankle	209 (14)	0.9 (0.8 to 1.1)	112 (12)	0.6 (0.5 to 0.7)	97 (17)	3.0 (2.5 to 3.7)	5.3 (4.0 to 7.0)	<0.001
Ligament injuries	156 (10)	0.7 (0.6 to 0.8)	90 (10)	0.5 (0.4 to 0.6)	66 (11)	2.1 (1.6 to 2.6)	4.5 (3.3 to 6.2)	<0.001
Lateral ligaments	111 (7)	0.5 (0.4 to 0.6)	68 (7)	0.3 (0.3 to 0.4)	43 (7)	1.3 (1.0 to 1.8)	3.9 (2.6 to 5.7)	<0.001
Foot/toe	91 (6)	0.4 (0.3 to 0.5)	56 (6)	0.3 (0.2 to 0.4)	35 (6)	1.1 (0.8 to 1.5)	3.8 (2.5 to 5.8)	<0.001

Injury incidence is defined as the number of injuries per 1000 hours.

Medial collateral ligament (MCL) injury of the knee was the second most frequent ligament injury representing 3% (43/1527) of all injuries. The typical 23-player squad could thus expect one MCL injury per season. The total MCL injury incidence was 0.2 (95% CI 0.1 to 0.3) injuries per 1000 hours and being sevenfold higher during match play compared with training (table 3). The median days lost was 14 (IQR 7–34) days and the median injury burden was 4.1 (IQR 0.7–8.6) days lost per 1000 hours, being almost 12-fold higher during match play compared with training (table 4). Significantly more MCL injuries had a contact rather than a non-contact injury mechanism (72%, 31/43 vs 28%, 12/43, p<0.004). The main mechanisms of contact-related MCL injuries were being tackled (26%, 8/31) and twisting/turning (16% 5/31). Every 14th MCL injury was a recurrence (7%, 3/43) with all three being early recurrences.

ACL injury was almost as frequent as MCL injury with 33 injuries in 30 players from 11 clubs (online supplemental table 3). It was the second most frequent knee ligament injury representing 2% (33/1527) of all injuries. The typical 23-player squad could thus expect approximately 0.7 ACL injuries per season. The total ACL injury incidence was 0.1 (95% CI 0.1 to 0.2) injuries per 1000 hours and being ninefold higher during match play compared with training (table 3). All ACL injuries except one were diagnosed as total ruptures and all total ruptures were treated with ACL reconstruction (online supplemental table 3). The median days lost, including the partial rupture, was 292 (IQR 246–334) days and the median injury burden was 38.0

(IQR 29.2–52.1) days lost per 1000 hours, being sixfold higher during match play compared with training (table 4). One player with a total ACL injury ended their career, otherwise one player returned to full team training within 6 months (3%), 13 (41%) within 9 months, and 30 (94%) within 12 months. Most ACL injuries had a non-contact mechanism (64%, 21/33). The two dominating injury mechanisms for non-contact ACL injuries were twisting/turning (48%, 10/21) and jumping/landing (24%, 5/21). Being tackled (42%, 5/12) was the main injury mechanism for contact-related ACL injuries.

Concussions
Concussion was the most frequent head injury representing 3% (47/1527) of all injuries. The typical 23-player squad could thus expect one concussion per season. The total concussion incidence was 0.2 (95% CI 0.2 to 0.3) injuries per 1000 hours and being fourfold higher during match play compared with training (table 3). The median days lost was 9 (IQR 6–19) days and the median injury burden was 0.8 (IQR 0–3.9) days lost per 1000 hours, being sevenfold higher during match play compared with training (table 4). In more than one-quarter of cases (28%, 13/47), the player returned to full team training within 6 days. The two main mechanisms of concussion were being hit by a ball (34%, 16/47) and heading the ball (21%, 10/47). Half of all match-related concussions (50%, 9/18) occurred due to heading the ball, while being hit by the ball was the most frequent injury

Table 4 Injury burden for all four seasons (2018/2019 to 2021/2022)

Injury	Total Burden (IQR)	Training Burden (IQR)	Match play Burden (IQR)
Head/face	0.9 (0.8 to 3.9)	1.0 (0.0 to 3.2)	5.0 (0.0 to 16.9)
Concussion	0.8 (0.0 to 3.9)	0.5 (0.0 to 3.2)	3.6 (0.0 to 16.9)
Neck/cervical spine	0.0 (0.0 to 0.3)	0.0 (0.0 to 0.4)	0.0 (0.0 to 0.0)
Shoulder/clavicle	1.7 (0.5 to 4.6)	0.8 (0.0 to 2.7)	0.0 (0.0 to 17.1)
Arm/hand	7.5 (2.1 to 11.3)	4.4 (1.4 to 6.6)	24.2 (5.0 to 49.0)
Sternum/upper back	0.0 (0.0 to 0.1)	0.0 (0.0 to 0.0)	0.0 (0.0 to 0.6)
Abdomen	0.0 (0.0 to 0.3)	0.0 (0.0 to 0.3)	–
Lower back/pelvis/ sacrum	2.3 (1.7 to 4.9)	1.9 (0.2 to 4.2)	2.2 (0.0 to 10.9)
Hip/groin	7.3 (2.5 to 14.0)	5.2 (1.7 to 11.1)	21.0 (0.0 to 26.2)
Muscle injuries	4.2 (1.5 to 4.8)	2.7 (0.6 to 5.5)	11.4 (0.0 to 14.6)
Adductor	3.0 (1.2 to 4.2)	1.8 (0.4 to 4.0)	4.2 (0.0 to 14.3)
Thigh	25.3 (14.3 to 29.0)	15.6 (7.5 to 23.9)	93.1 (45.9 to 118.9)
Muscle injuries	23.4 (12.8 to 27.2)	14.8 (6.9 to 16.8)	76.4 (45.9 to 110.3)
Quadriceps	10.1 (4.8 to 18.7)	6.0 (3.7 to 12.1)	25.2 (3.0 to 54.0)
Hamstrings	8.3 (5.9 to 16.1)	4.1 (1.7 to 7.2)	47.6 (26.8 to 59.5)
Knee	84.5 (53.6 to 101.5)	44.3 (24.6 to 71.2)	266.9 (160.9 to 329.9)
Ligament injuries	41.7 (39.2 to 68.9)	19.1 (1.4 to 37.0)	199.7 (103.5 to 297.6)
Medial collateral	4.1 (0.7 to 8.6)	0.9 (0.0 to 3.3)	10.6 (4.5 to 64.6)
Anterior cruciate	38.0 (29.2 to 52.1)	18.5 (0.0 to 34.0)	117.0 (0.0 to 281.4)
Meniscus/cartilage injuries	15.6 (1.8 to 27.4)	15.0 (0.5 to 30.9)	3.6 (0.0 to 21.2)
Lower leg/Achilles tendon	15.2 (5.7 to 21.7)	13.6 (0.6 to 23.6)	30.2 (9.1 to 41.9)
Muscle injuries	7.7 (3.2 to 10.4)	4.7 (0.0 to 9.5)	8.9 (0.0 to 23.7)
Achilles tendon injuries	1.5 (0.0 to 4.0)	0.6 (0.0 to 3.6)	0.0 (0.0 to 15.8)
Ankle	16.2 (11.2 to 29.2)	9.5 (6.8 to 12.0)	46.9 (26.5 to 130.0)
Ligament injuries	11.0 (8.9 to 20.1)	9.0 (4.3 to 11.5)	38.1 (22.6 to 63.8)
Lateral ligaments	7.9 (4.3 to 13.1)	3.8 (2.2 to 6.9)	12.6 (4.5 to 52.3)
Foot/toe	9.0 (1.2 to 11.3)	7.2 (0.8 to 10.5)	3.2 (0.0 to 43.1)

Injury burden is defined as the number of days lost per 1000 hours.

mechanism during training (48%, 14/29). Every sixth concussion was a recurrence (15%, 7/47) with four being early recurrences.

DISCUSSION

The most important findings were that a typical 23-player squad could expect 35 time-loss injuries per season with a nearly four-fold higher incidence and a fivefold higher burden during match play compared with training. Muscle injuries dominated the injury landscape with hamstring and quadriceps muscle injuries being almost as frequent; however, ACL injury had the highest injury burden.

Match injuries dominate the landscape

The match injury incidence and burden were significantly higher compared with training in general and for relevant injury subtypes such as hamstring muscle injuries, quadriceps muscle injuries, ACL injuries and concussions. We found, however, no difference in injury incidence between national team matches and club team matches which stands in contrast to findings in one systematic review that reported higher incidence in national team matches (55.7 vs 19.5 injuries per 1000 hours).[6] One possible explanation could be that we only included national team events from July to May, while off-season tournaments such as the Women's World Cup, Women's European Championship or the Olympic Games were not included.

Hamstring muscle injury is most frequent

We found hamstring muscle injury to be the most frequent, representing 12% of all injuries. Similar results have been reported in women's football from Scandinavia,[10 16] but a Spanish one-club study reported quadriceps muscle injuries to be more frequent.[15] Interestingly, the number of quadriceps muscle injuries was only marginally lower in our dataset representing 11% of all injuries. Both these numbers contradict results in recent systematic reviews showing that ankle and knee injuries historically have been most frequent.[3 5] It is, therefore, likely that there is a similar trend as seen in men's professional football with a higher playing intensity over time,[26] and an accompanying shift from ligament injuries to muscle injuries.[18]

ACL injury has the highest injury burden

We observed that 3% of all injuries affected the MCL of the knee with 72% being contact related. There are no previous data reported for MCL injury mechanisms in women's football, but this finding is in line with a study on male professional players, which reported the same percentage of MCL injury (3%) and almost the same percentage of contact-related injury mechanisms (75%).[27] Noteworthy, ACL injury was almost as frequent as MCL injury representing 2% of all injuries. This percentage, and the average rate of 0.7 ACL injuries per team and season, is identical to that previously reported for Swedish elite women players during the first decade of the 2000s.[28] Although the injury frequency was identical, the current study showed an average

Table 5 Injury characteristics and severity for all four seasons (2018/2019 to 2021/2022)

Injury	Total	Slight (0 days)	Minimal (1–3 days)	Mild (4–7 days)	Moderate (8–28 days)	Severe (>28 days)
	N	N (%)	N (%)	N (%)	N (%)	N (%)
Head/face	60	4 (7)	5 (8)	14 (23)	29 (48)	8 (13)
Concussion	47	–	3 (6)	11 (23)	25 (53)	8 (17)
Neck/cervical spine	11	1 (9)	1 (9)	6 (55)	2 (18)	1 (9)
Shoulder/clavicle	24	2 (8)	3 (13)	2 (8)	8 (33)	9 (38)
Arm/hand	37	3 (8)	7 (19)	5 (14)	11 (30)	11 (30)
Sternum/upper back	8	1 (13)	2 (25)	3 (38)	2 (25)	–
Abdomen	7	–	2 (29)	1 (14)	4 (57)	–
Lower back/pelvis/ sacrum	76	8 (11)	22 (29)	18 (24)	21 (28)	7 (9)
Hip/groin	151	6 (4)	43 (29)	39 (26)	53 (35)	10 (7)
Muscle injuries	104	4 (4)	30 (29)	27 (26)	41 (39)	2 (2)
Adductor	66	3 (5)	14 (21)	18 (27)	29 (44)	2 (3)
Thigh	408	21 (5)	64 (16)	98 (24)	164 (40)	61 (15)
Muscle injuries	361	17 (5)	57 (16)	84 (23)	150 (42)	53 (15)
Quadriceps	171	10 (6)	29 (17)	38 (22)	66 (39)	28 (16)
Hamstrings	188	7 (4)	28 (15)	46 (25)	82 (44)	25 (13)
Knee	270	8 (3)	39 (14)	45 (17)	67 (25)	111 (41)
Ligament injuries	107	1 (<1)	11 (10)	14 (13)	21 (20)	60 (56)
Medial collateral	43	–	4 (9)	8 (19)	15 (35)	16 (37)
Anterior cruciate	33	–	–	–	–	33 (100)
Meniscus/cartilage injuries	56	2 (4)	6 (11)	–	17 (30)	31 (55)
Lower leg/Achilles tendon	175	9 (5)	17 (10)	46 (26)	65 (37)	38 (22)
Muscle injuries	91	3 (3)	7 (8)	22 (24)	41 (45)	18 (20)
Achilles tendon injuries	43	1 (2)	6 (14)	11 (26)	17 (40)	8 (19)
Ankle	209	6 (3)	32 (15)	50 (24)	78 (37)	43 (21)
Ligament injuries	156	2 (1)	21 (14)	37 (24)	62 (40)	34 (22)
Lateral ligaments	111	2 (2)	17 (15)	25 (23)	46 (41)	21 (19)
Foot/toe	91	4 (4)	22 (24)	18 (20)	25 (28)	22 (24)

days loss of approximately 9 months, which is higher than in the aforementioned study from Sweden (almost 7 months) and in a study from the same period of German women elite players (6 months).[11 29] Given the high frequency of subsequent ACL injuries in women football players,[29 30] ACL-reconstructed players would benefit from the currently recommended approach 'better safe than quick' with a minimum time of 9 months before medical clearance has been suggested to decrease subsequent knee injuries following ACL reconstruction.[31 32]

Do concussions need particular attention?

Our study showed that a women's elite team can expect one concussion every season on average. With a paucity of similar data on women football players, this finding is more than double the 0.4 concussions per team and season reported for male professional players.[33] This comparison should, however, be interpreted with caution due to possible between-sex differences in reporting thresholds and the possibility of increased awareness of concussive symptoms. Nevertheless, more than one-quarter of concussed players returned to play within 6 days after injury, which is similar to the aforementioned study of male players,[33] and earlier than recommended in the latest sports concussion consensus statements.[34] Of particular note was the finding that more than half of the concussions were due to ball-related impact (intentional heading or being hit accidentally by the ball). This suggests that the discussion around ball size, inflation pressure and mass in women's football might need to be revisited.[35]

Perspectives on gradual onset and slight injuries

The occurrence of gradual onset injuries (47%) was almost twice that reported in the recent study of the Irish Women's National League (24%),[9] and also higher than older studies which defined these injuries as overuse or chronic (16%–28%).[8 11–14] The most plausible explanation is the aforementioned shift from, for example, contusions and ligament injuries to muscle injuries at the very top level. This shift in the injury landscape also likely explains that as many as 72% of all injuries were non-contact in nature.

We also found that slight injuries (0 days lost) were more frequent than the 2% found in a recent systematic review.[6] Importantly, slight injuries might be under-reported with a time-loss injury definition in youth or amateur football but should be negligible with the almost daily scheduled activities in women's professional football at this level although some between-club differences in reporting seem to exist.

Research/policy implications

Previous literature on women's football is scarce. Our study extends the knowledge and understanding of injury epidemiology among women's elite football players and opens opportunities for further research. Our findings underline the importance of further research and implementation of preventive measures at all stakeholder levels for frequent injuries such as thigh muscle injuries, but also for injuries with high injury burden and possible negative long-term consequences such as ACL injury and concussion.

Limitations

First, although the methodology was identical to the ECIS,[20] this does not guarantee identical reporting standards. Second, the methodology adhered to the guidelines of the original consensus statement for football,[21] but since the WECIS was launched before the IOC consensus statement and its recent football-specific consensus extension,[22 23] data could not retrospectively be fully arranged according to these recommendations such as the data in online supplemental table 2 and the reporting of football actions for sudden onset injuries which are missing. Third, it was beyond the scope to compare the findings with studies on men's professional football other than the ECIS, and we have mainly focused on comparisons with previous literature on women's football where possible. It would, however, be valuable in carrying out a 'head-to-head' comparison between the ECIS and the WECIS for clubs participating in both studies which should be addressed in the future. Fourth, there was minor data loss for mandatory information such as injury mechanisms, but some optional information such as specifying detailed muscle involvement were missing and will be upgraded to mandatory information from 2023/2024 as per most recent guidelines.[22 23] Fifth, in the interest of brevity, no in-depth analyses on potential differences in injury incidence and injury burden between the 'COVID-19' season 2019/2020 with the other three seasons were carried out as has been done for the ECIS recently.[36] Nevertheless, the 2019/2020 season had a significantly lower training injury incidence than the 2021/2022 season and a significantly lower match injury incidence than all the other three seasons.

CONCLUSION

This study shows that an elite women's team squad can expect approximately 35 time-loss injuries per season with thigh muscle injury being most common and ACL injury most burdensome.

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Online supplemental table 1. Teams included during the 2018/19 to 2021/22 seasons

	2018/19	2019/20	2020/21	2021/22
England (Women's Super League)				
Chelsea FC	X	X	X	X
Manchester City FC	X	X	X	X
France (Feminine Division 1)				
Olympique Lyonnais	X	X	X	-
Germany (Frauen-Bundesliga)				
Bayer 04 Leverkusen	-	-	-	X
FC Bayern München	X	X	X	X
Italy (Serie A Femminile)				
AC Milan	X	X	X	X
Juventus FC	X	X	X	X
Netherlands (Vrouwen Eredivisie)				
AFC Ajax	X	X	X	-
PSV Eindhoven	-	-	X	X
Portugal (1a Divisao Women)				
Sporting Clube de Portugal	-	X	X	X
Spain (Primera Division Femenina)				
Club Atletico de Madrid	-	X	X	-
FC Barcelona	X	X	X	X
Real Madrid CF	-	-	-	X
Sweden (Damallsvenskan)*				
FC Rosengård	X	X	-	-
Linköping FC	X	X	-	X

*Sweden playing spring-autumn

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Online supplemental table 2. Injury severity categories

	Total	0 days	1-3 days	4-7 days	8-28 days	29-90 days	91-180 days	>180 days
Injury	N	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
Head/face	60	4 (7%)	5 (8%)	14 (23%)	29 (48%)	7 (12%)	-	1 (2%)
Concussion	47	-	3 (6%)	11 (23%)	25 (53%)	7 (15%)	-	1 (2%)
Neck/cervical spine	11	1 (9%)	1 (9%)	6 (55%)	2 (18%)	1 (9%)	-	-
Shoulder/clavicle	24	2 (8%)	3 (13%)	2 (8%)	8 (33%)	7 (29%)	2 (8%)	-
Arm/hand	37	3 (8%)	7 (19%)	5 (14%)	11 (30%)	10 (27%)	1 (3%)	-
Sternum/upper back	8	1 (13%)	2 (25%)	3 (38%)	2 (25%)	-	-	-
Abdomen	7	-	2 (29%)	1 (14%)	4 (57%)	-	-	-
Lower back/pelvis/ sacrum	76	8 (11%)	22 (29%)	18 (24%)	21 (28%)	5 (7%)	-	2 (3%)
Hip/groin	151	6 (4%)	43 (29%)	39 (26%)	53 (35%)	8 (5%)	2 (1%)	-
Muscle injuries	104	4 (4%)	30 (29%)	27 (26%)	41 (39%)	2 (2%)	-	-
Adductor	66	3 (5%)	14 (21%)	18 (27%)	29 (44%)	2 (3%)	-	-
Thigh	408	21 (5%)	64 (16%)	98 (24%)	164 (40%)	54 (13%)	7 (2%)	-
Muscle injuries	361	17 (5%)	57 (16%)	84 (23%)	150 (42%)	46 (13%)	7 (2%)	-
Quadriceps	171	10 (6%)	29 (17%)	38 (22%)	66 (39%)	23 (14%)	5 (3%)	-
Hamstrings	188	7 (4%)	28 (15%)	46 (25%)	82 (44%)	23 (12%)	2 (1%)	-
Knee	270	8 (3%)	39 (14%)	45 (17%)	67 (25%)	59 (22%)	14 (5%)	38 (14%)
Ligament injuries	107	1 (<1%)	11 (10%)	14 (13%)	21 (20%)	25 (23%)	2 (2%)	33 (31%)
Medial collateral	43	-	4 (9%)	8 (19%)	15 (35%)	14 (33%)	1 (2%)	1 (2%)
Anterior cruciate	33	-	-	-	-	1 (3%)	1 (3%)	31 (94%)
Meniscus/cartilage injuries	56	2 (4%)	6 (11%)	-	17 (30%)	18 (32%)	9 (16%)	4 (7%)
Lower leg/Achilles tendon	175	9 (5%)	17 (10%)	46 (26%)	65 (37%)	27 (15%)	7 (4%)	4 (2%)
Muscle injuries	91	3 (3%)	7 (8%)	22 (24%)	41 (45%)	16 (18%)	2 (2%)	-
Achilles tendon injuries	43	1 (2%)	6 (14%)	11 (26%)	17 (40%)	3 (7%)	3 (7%)	2 (5%)
Ankle	209	6 (3%)	32 (15%)	50 (24%)	78 (37%)	32 (15%)	10 (5%)	1 (<1%)
Ligament injuries	156	2 (1%)	21 (14%)	37 (24%)	62 (40%)	29 (19%)	5 (3%)	-
Lateral ligament injuries	111	2 (2%)	17 (15%)	25 (23%)	46 (41%)	19 (17%)	2 (2%)	-
Foot/toe	91	4 (4%)	22 (24%)	18 (20%)	25 (28%)	18 (20%)	4 (4%)	-
Total	1527	73 (5%)	259 (17%)	345 (23%)	529 (35%)	228 (15%)	47 (3%)	46 (3%)

Supplemental material

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Online supplemental table 3. Anterior cruciate ligament injuries

Case	Age	Position	Activity	Side	Leg dominance	Previous ACL	Surface	Contact	Associated injuries	Graft	RTT	RTM	Comment
1	35	Forward	Match	Left	Left	Yes	Artificial turf	Yes	MCL, MM and LM	PT	-	-	Career-ending
2	26	Midfielder	Match	Right	Right	Yes	Grass	No	Isolated	PT	192	227	
3	24	Defender	Training	Right	Right	No	Grass	No	Isolated	HT	262	294	
4	26	Midfielder	Match	Left	Right	Yes	Grass	Yes	MM, LM and cartilage	HT	170	237	
5	25	Defender	Match	Left	Right	No	Grass	Yes	MM	PT	246	257	
6	22	Defender	Training	Left	Right	No	Grass	Yes	Isolated	PT	245	320	
7	23	Midfielder	Match	Right	Right	No	Grass	No	MCL, MM and LM	PT	345	350	
8	24	Defender	Match	Right	Right	No	Grass	Yes	MCL	PT	453	472	
9	24	Forward	Training	Right	Right	No	Grass	No	MCL and MM	HT	580	617	
10	26	Defender	Match	Right	Right	No	Grass	No	LM	HT	326	356	
11	19	Defender	Match	Right	Right	No	Artificial turf	No	MCL and LM	PT	538	543	
12	18	Defender	Match	Left	Right	No	Grass	Yes	MCL and MM	HT	204	245	
13	25	Forward	Match	Right	Right	No	Grass	No	MCL and MM	QT	285	335	
14	21	Midfielder	Match	Right	Right	No	Grass	No	LCL and PCL	HT	297	336	
15	22	Defender	Training	Right	Left	No	Grass	No	Isolated	HT	203	232	
16	29	Forward	Match	Left	Right	No	Grass	No	MM	HT	271	290	
17	25	Defender	Match	Right	Left	No	Grass	Yes	MCL, LM and cartilage	HT	214	307	
18	19	Midfielder	Training	Left	Left	No	Grass	No	LCL, MM and LM	PT	286	319	
19	29	Midfielder	Match	Left	Right	No	Grass	Yes	MCL and MM	QT	337	403	
20	23	Forward	Match	Right	Right	No	Grass	Yes	MCL and LM	PT	330	334	
21	33	Defender	Training	Right	Right	Yes	Artificial turf	No	LM	HT	248	267	
22	18	Defender	Training	Right	Right	No	Artificial turf	No	MCL	PT	327	339	
23	19	Forward	Match	Right	Left	Yes	Grass	Yes	MCL and LM	PT	341	390	
24	29	Goalkeeper	Match	Left	Right	Yes	Grass	No	MM	QT	300	301	
25	18	Forward	Match	Right	Right	No	Artificial turf	Yes	MCL, MM and ML	HT	274	-	New ACL before RTM
26	28	Defender	Match	Right	Right	Yes	Grass	Yes	MM	PT	242	270	
27	18	Forward	Training	Left	Right	Yes	Grass	No	LM	HT	298	402	
28	24	Goalkeeper	Training	Right	Right	No	Grass	No	MCL, LCL and MM	HT	269	342	
29	19	Defender	Training	Right	Left	No	Grass	No	LM	PT	324	385	
30	20	Goalkeeper	Training	Left	Right	Yes	Grass	No	MM	PT	314	387	
31	21	Midfielder	Training	Left	Right	No	Grass	No	Isolated	HT	340	380	
32	21	Defender	Match	Right	Left	No	Artificial turf	No	LM	PT	426	503	
33	19	Goalkeeper	Training	Right	Right	No	Grass	No	LM	-	88	103	Partial rupture

ACL, anterior cruciate ligament; HT, hamstring tendon; LCL, lateral collateral ligament; LM, lateral meniscus; MCL, medial collateral ligament; MM, medial meniscus; PT, patella tendon; PCL, posterior cruciate ligament; QT, quadriceps tendon; RTM, return to match; RTT, return to training

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Online supplemental table 4. Contact persons

	2018/19	2019/20	2020/21	2021/22
England (Women's Super League)				
Chelsea FC	Francisco Moreira	Francisco Moreira	Sean Carmody	Sean Carmody Ally Barlow
Manchester City FC	Shoabi Amaan	Rick Porter	Rick Porter	Rick Porter
France (Feminine Division 1)				
Olympique Lyonnais	Jean-Francios Luciani	David Mouriesse	David Mouriesse	
Germany (Frauen-Bundesliga)				
Bayer 04 Leverkusen				Laura Gerlich
FC Bayern München	Bianca Rech Alexandra Milchgießer	Bianca Rech Alexandra Milchgießer	Bianca Rech Alexandra Milchgießer	Bianca Rech Alexandra Milchgießer
Italy (Serie A Femminile)				
AC Milan	Stefano Mazzoni	Stefano Mazzoni	Filippi Nicola	Francesca Conte
Juventus FC	Chiara Vignati	Chiara Vignati	Chiara Vignati	Chiara Vignati
Netherlands (Vrouwen Eredivisie)				
AFC Ajax	Manuela de Jong	Manuela de Jong	Manuela de Jong	
PSV Eindhoven			Wart van Zoest	Rolf Timmermans
Portugal (1a Divisao Women)				
Sporting Clube de Portugal		Filipe Bettencourt	Jorge Fortunato	Jorge Fortunato
Spain (Primera Division Femenina)				
Club Atletico de Madrid		Javier Núñez	Javier Núñez	
FC Barcelona	Eva Ferrer	Eva Ferrer	Eva Ferrer	Eva Ferrer
Real Madrid CF				Suzanne Huurman
Sweden (Damallsvenskan)				
FC Rosengård	Malin Levenstad Amanda Lahti	Malin Levenstad Amanda Lahti		
Linköping FC	Håkan Gauffin	Håkan Gauffin Frida Bylinder		Mattias Karlén