IJSPT
INTERNATIONAL JOURNAL OF SPORTS PHYSICAL THERAPY

Maemichi T, Kumai T. Long-Term Injury Survey in a Japanese University Women's Soccer Team. *IJSPT*. 2025;20(4):572-582. doi:10.26603/001c.132248

Original Research

Long-Term Injury Survey in a Japanese University Women's Soccer Team

Toshihiro Maemichi[1,2a], Tsukasa Kumai[3b]

[1] Faculty of Sport Sciences, Waseda University , [2] Institute of Life Innovation Studies, Toyo University, [3] Faculuty of Sport Sciences, Waseda University

Keywords: Epidemiology, Injury surveillance, Injury rate, Women's soccer

https://doi.org/10.26603/001c.132248

International Journal of Sports Physical Therapy

Vol. 20, Issue 4, 2025

BACKGROUND

Injuries are common in soccer as it is a contact sport. However, longitudinal studies spanning multiple seasons, focused on injuries in female university soccer players in Japan, are lacking. Additionally, broader comparisons on injury patterns remain unexplored. The purpose of this study was to prospectively investigate injuries among female university soccer players over three seasons.

STUDY DESIGN

Descriptive epidemiological study

METHODS

A total of 108 players from a university women's soccer team were included. A qualified athletic trainer assessed injury type (injury or disability), site and severity according to injury occurrence (game or practice) over three seasons. An orthopedic surgeon confirmed the resulting injury.

RESULTS

The overall injury rate was 1.62/1000 athlete exposures. The game injury rate (9.86/1000 athlete exposures) was higher than the practice injury rate (1.39/1000 athlete exposures). Sprains were the most common injury in games and practices; concussions and meniscal tears were also common during games. The lower limbs, particularly the ankles and feet, were the most common anatomical injury sites in both games and practices. Severe injuries requiring long-term withdrawal were frequently observed during games and practices. These included anterior cruciate ligament (ACL) tears, meniscal injuries, and severe concussions, all of which necessitated prolonged recovery periods and withdrawal from team activities.

CONCLUSION

Injury prevention measures should be prioritized for female university soccer players, especially to address the high injury rate during games and the frequent occurrence of severe injuries.

a Corresponding Author:
Toshihiro Maemichi
Faculty of Sport Sciences, Waseda University
2-579-15 Mikashima, Tokorozawa, Saitama, Japan
Telephone: 80-1090-3238
E-mail: t.maemichi@aoni.waseda.jp

b Corresponding Author:
Tsukasa Kumai
Faculty of Sport Sciences, Waseda University
2-579-15 Mikashima, Tokorozawa, Saitama, Japan
E-mail: kumakumat@waseda.jp

LEVEL OF EVIDENCE

3b

INTRODUCTION

Soccer is an extremely popular sport worldwide. The number of female soccer players in Japan is approximately 27,798, according to the Japan Football Association's latest report. (JFA, 2023) In recent years, the number of female soccer players has increased. The Japanese victory in the Fédération Internationale de Football Association (FIFA) Women's World Cup in 2011 served as an opportunity to raise awareness and increase the popularity of women's soccer. The Japan Women's Professional Soccer League, commonly known as the WE League, started in 2021. Japan's female soccer competitions are expected to be further developed and incentivized in the future.

In soccer, injuries occur frequently because of multiple contact plays and sudden physical movements, including sprinting and turning.[1,2] Injury surveys of soccer players conducted in other countries have reported that lower-extremity injuries, such as injuries to the thighs, knee joints, and ankle joints, are common. Moreover, soccer players are considered to be at a high risk for injuries, including muscle strains, sprains, and bruises.[1,3,4] Previous reports have focused on elite athletes, often male soccer players, with only few injury studies focusing on female soccer players.[5] Although several studies have analyzed injuries among female soccer players, most have focused on a single season.[6,7] Consequently, longitudinal studies spanning multiple seasons are limited, particularly those examining female university soccer players in Japan.

Additionally, while this study focused on a single women's university soccer team, broader comparisons, such as those considering injury patterns by position, across different study years, or in relation to other competition levels, remain unexplored.

To date, many soccer-related injury surveys using only one evaluation method have been conducted; nonetheless, the definitions of injury and the calculation methods for its incidence rates differ among reports, making it difficult to compare and study them. Accordingly, FIFA proposed a unified injury investigation method.[8] However, few studies in Japan have used this survey method, and surveys that follow up over several seasons are limited. Therefore, the purpose of this study was to prospectively investigate injuries among female university soccer players over three seasons.

METHODS

PARTICIPANTS

This prospective study included a total of 108 players from a university women's soccer team, all competing at a similar university-level playing standard. Data were collected in real-time over three seasons, with predefined protocols for injury assessment and recording. To analyze the data for each position, the players were divided into four groups according to their position: forward (FW), midfielder (MF), defender (DF), and goalkeeper (GK). The participants practiced two hours a day, six days a week, and had won the 'All Japan Women's University Soccer Championship' and Women's Soccer League multiple times, for which games were held on weekends. Players were classified based on their school year at the university, which corresponds to their academic level and playing experience. The classifications used were Freshman (1st year), Sophomore (2nd year), Junior (3rd year), and Senior (4th year). These terms were used to standardize the categorization and provide a clear understanding of the participants' experience level.

The study was approved by the Institutional Human Research Ethics Committee and conducted in compliance with the principles of the Declaration of Helsinki. Written informed consent was obtained from all participants before data collection.

INJURY ASSESSMENT

All injuries that occurred during the 2018–2020 seasons were investigated. Injuries were recorded separately for each season (2018, 2019, and 2020), and an athlete who sustained injuries in multiple years was counted multiple times. All injuries were recorded by the Japan Sports Association's qualified trainers, and the injuries were confirmed by an orthopedic surgeon. An "injury" was defined as any of the following: (1) an injury that occurred during a soccer practice or game that prevented the player from participating in a practice or game for longer than 1 day; (2) an injury caused by a single external force during a competition, and (3) an injury caused by gradual worsening of symptoms. The survey items included the type, site, and severity of injury and whether the injury occurred during a game or practice.

Injuries were classified into two categories: traumatic injuries or overuse injuries. These were further classified into eight category types: sprains, strains, contusions, fractures, concussions, tendinitis, meniscal tears, or others. These categories included various injury types based on the mechanism of injury, severity, and body part involved. Contusions and concussions were classified as traumatic injuries, not overuse injuries, as these types of injuries result from direct impact or sudden movements rather than repetitive stress. The injured sites were classified into four major areas: head (neck, face and scalp), upper limbs (shoulder, upper arm, elbow, forearm, wrist, hand, and finger), trunk (chest, abdomen, upper and lower back), and lower limbs (thighs, gluteus, knee, lower leg, ankle and foot). The severity of injuries were defined according to the number of days from injury to recovery, as recommended by FIFA: 1–3 days as "minimal," 4–7 days as "mild," 8–28 days as "moderate," and 29 days or more as "severe." The athletic trainer initially classified the injuries based on the mechanism and severity of the injury. The team physician, who was also the surgeon, then confirmed the final diagnosis after reviewing

Table 1. Game and practice athlete-hours

	2018	2019	2020	Total
Number of players	40	37	31	108
Forward	11	14	8	33
Midfielder	13	8	7	28
Defender	8	7	8	23
Goalkeeper	8	8	8	24
Game athlete-hours	1341.4	983.7	313.0	2638.1
Practice athlete-hours	23877.4	41316.0	25755.4	90948.9
Total athlete-hours	25218.9	42299.7	26068.4	93587.0

NOTE: Game athlete-hours and practice athlete-hours for the year 2020 were lower compared to other study years, primarily due to the restrictions imposed by the COVID-19 pandemic. This may have influenced the results, particularly the injury rate comparisons between study years.

the injury details provided by the athletic trainer. The classification by the athletic trainer was performed prior to the physician's confirmation.

Athlete exposure (AE) was defined as a competitor's participation in a game or practice. Game and practice AEs were calculated by multiplying the average number of players participating in each game or practice by the number of games or practices, respectively.

STATISTICAL ANALYSES

The number of injuries per 1000 AEs was calculated by dividing the number of injuries by the number of AEs and multiplying it by 1000. The practice injury rate (PIR) and game injury rate (GIR) were calculated using 95% confidence intervals (CIs) by game and practice. The injury ratio (IRR) represented the relationship between the GIR and PIR and was calculated by dividing the GIR by the PIR. The IRR CI was used to determine differences in the origin (trauma or overuse), type (sprain, strain, contusion, fracture, concussion, tendinitis, meniscal tear, or other), site, and severity of injury during games and practices. The IRR of the games and practices was compared among the three seasons using the χ^2 test. We also calculated the number and percentage of injuries during games and practices according to the player's position and study year. Statistical analyses were performed using IBM SPSS statistics, ver. 26 (IBM Corp., Armonk, NY, USA).

RESULTS

The number of players included each year was as follows: 2018, 40 participants; 2019, 37 participants; and 2020, 31 participants. The participants had an average age, height, and weight of 19.3±1.2 years, 163.5±5.9 cm, and 58.1±6.9 kg, respectively. Table 1 presents the athletes game and practice hours, by position, used to calculate AE's for games and practices.

INJURY INCIDENCE

Table 2 presents the incidence of injuries. A total of 152 injuries were reported during the 2018–2020 seasons, comprising 110 (72.4%) trauma and 42 (27.6%) overuse injuries. Of these, 126 (82.9%) occurred during practice and 26 (17.1%) during games. The overall injury rate was 1.62/1000 AEs (95% CI 1.37–1.88), trauma injury rate was 1.18/1000 AEs (95% CI 0.96–1.40), and overuse injury rate was 0.45/1000 AEs (95% CI 0.31–0.58). The overall PIR and GIR were 1.39/1000 AEs (95% CI 1.14–1.63) and 9.86/1000 AEs (95% CI 6.07–13.64), respectively. The overall IRR was 7.11/1000 AEs (95% CI 5.98–8.24), indicating that the overall GIR was higher than the overall PIR ($p<0.05$). A similar trend was observed within each season from 2018 to 2020.

INCIDENCE OF INJURIES BY POSITION AND YEAR OF STUDY

Table 3 shows the results of injury incidence according to player position and study year. The DF position had the highest frequency of injuries, with 73 (48.0%) cases. There were 50 (32.9%) injuries among MFs, 15 (9.9%) among GKs, and 14 (9.2%) among FWs. DFs had the highest PIR and GIR, 0.67/1000 AEs (95% CI 0.50–0.84) and 4.55/1000 AEs (95% CI 1.98–7.12), respectively. MFs had the highest IRR, 9.72/1000 AEs (95% CI 7.03–12.42). The IRR in GKs was 8.62/1000 AEs (95% CI 4.26–12.98), and in DFs was 6.78/1000 AEs (95% CI 5.23–8.34). The GIRs in DFs, GKs, and MFs were higher than the PIRs ($P<0.05$). Women in their third year had the highest frequency of injuries, with 46 (30.3%) cases, followed by women in their fourth, second, and first years, with 39 (25.7%), 37 (24.3%), and 30 (19.1%) cases, respectively. The PIR was the highest for players in their third year (0.43/1000 AEs; 95% CI 0.29–0.56). The GIR was the highest for players in their first year (3.03/1000 AEs; 95% CI 0.98–5.13). The IRR was the highest for players in their first year, at 12.54/1000 AEs (95% CI 8.05–17.02), followed by that for those in their second, third, and fourth years (8.04/1000 AEs, 95% CI 5.45–10.64; 6.19/1000 AEs, 95% CI 4.40–7.98; and 3.94/1000 AEs, 95% CI 2.70–5.18, respectively). The GIR was higher than the PIR in all study years ($p<0.05$).

TYPE OF INJURY

Table 4 presents the results by injury type. Sprains were the most common injury type (n=54, 35.5%), followed by oth-

Table 2. Total injury rates in a university women's soccer team (2018-20)

		Practice							Game									Total						
		n	(%)	IR	(	95%CI		)	n	(%)	IR	(	95%CI	)	IRR	(	95%CI	)		n	(%)	IR	(	95%CI	)
Total	All injury	126	(100)	1.39	(	1.14	- 1.63	)	26	(100)	9.86	(	6.07 - 13.64	)	7.11	(	5.98 - 8.24	)	*	152	(100)	1.62	(	1.37 - 1.88	)
	Trauma	86	(67.5)	0.95	(	0.75	- 1.15	)	24	(96.2)	9.48	(	5.76 - 13.19	)	10.02	(	8.15 - 11.89	)	*	110	(72.4)	1.18	(	0.96 - 1.40	)
	Overuse	40	(32.5)	0.44	(	0.30	- 0.58	)	2	(3.8)	0.38	(	0.00 - 5.55	)	0.86	(	0.60 - 1.12	)		42	(27.6)	0.45	(	0.31 - 0.58	)
2020	All injury	36	(100)	1.40	(	0.94	- 1.85	)	4	(100)	12.78	(	0.26 - 25.30	)	9.14	(	6.31 - 11.98	)	*	40	(100)	1.53	(	1.06 - 2.01	)
	Trauma	28	(75.0)	1.05	(	0.65	- 1.44	)	3	(75.0)	9.58	(	0.00 - 20.43	)	9.14	(	5.92 - 12.36	)	*	31	(77.5)	1.19	(	0.77 - 1.61	)
	Overuse	8	(25.0)	0.35	(	0.12	- 0.58	)	1	(25.0)	3.19	(	2.58 - 3.81	)	9.14	(	3.17 - 15.12	)	*	9	(22.5)	0.35	(	0.12 - 0.57	)
2019	All injury	52	(100)	1.26	(	0.92	- 1.60	)	9	(100)	9.15	(	3.17 - 15.13	)	7.27	(	5.45 - 9.09	)	*	61	(100)	1.44	(	1.08 - 1.80	)
	Trauma	36	(69.2)	0.87	(	0.59	- 1.16	)	9	(100)	9.15	(	3.17 - 15.13	)	10.50	(	7.43 - 13.57	)	*	45	(73.8)	1.06	(	0.75 - 1.37	)
	Overuse	16	(30.8)	0.39	(	0.20	- 0.58	)	0	0	0.00	(	0.00 - 0.00	)	0.00	(	0.00 - 0.00	)		16	(26.2)	0.38	(	0.19 - 0.56	)
2018	All injury	38	(100)	1.59	(	1.09	- 2.10	)	13	(100)	9.69	(	4.42 - 14.96	)	6.09	(	4.42 - 7.76	)	*	51	(100)	2.02	(	1.47 - 2.58	)
	Trauma	21	(60.5)	0.96	(	0.57	- 1.36	)	13	(100)	9.69	(	4.42 - 14.96	)	10.06	(	6.68 - 13.44	)	*	34	(66.7)	1.35	(	0.90 - 1.80	)
	Overuse	17	(39.5)	0.63	(	0.31	- 0.95	)	0	0	0.00	(	0.00 - 0.00	)	0.00	(	0.00 - 0.00	)		17	(33.8)	0.67	(	0.35 - 0.99	)

Abbreviations: CI, confidence interval; IR, injury rate = injuries per 1000 athlete exposures; IRR, injury rate ratio = game/practice injury rate. * : p<0.05.

Table 3. Total injury rates in a university women's soccer team in 2018–2020 by player position and year of study

	Practice							Game									Total						
	n	(%)	IR	(	95%CI		)	n	(%)	IR	(	95%CI	)	IRR	(	95%CI	)		n	(%)	IR	(	95%CI	)
Position																								
Forward	14	(11.1)	0.15	(	0.07	- 0.23	)	0	0.0	0.00	(	0.00 - 0.00	)	0.00	(	0.00 - 0.00	)		14	(9.2)	0.15	(	0.07 - 0.23	)
Midfielder	39	(31.0)	0.43	(	0.29	- 0.56	)	11	(42.3)	4.17	(	1.71 - 6.63	)	9.72	(	7.03 - 12.42	)	*	50	(32.9)	0.53	(	0.39 - 0.68	)
Defender	61	(48.4)	0.67	(	0.50	- 0.84	)	12	(46.2)	4.55	(	1.98 - 7.12	)	6.78	(	5.23 - 8.34	)	*	73	(48.0)	0.78	(	0.60 - 0.96	)
Goalkeeper	12	(9.5)	0.13	(	0.06	- 0.21	)	3	(11.5)	1.14	(	0.00 - 2.42	)	8.62	(	4.26 - 12.98	)	*	15	(9.9)	0.16	(	0.08 - 0.24	)
School year																								
4	35	(27.8)	0.38	(	0.26	- 0.51	)	4	(15.4)	1.52	(	0.03 - 3.00	)	3.94	(	2.70 - 5.18	)	*	39	(25.7)	0.42	(	0.29 - 0.55	)
3	39	(31.0)	0.43	(	0.29	- 0.56	)	7	(26.9)	2.65	(	0.69 - 4.62	)	6.19	(	4.40 - 7.98	)	*	46	(30.3)	0.49	(	0.35 - 0.63	)
2	30	(23.8)	0.33	(	0.21	- 0.45	)	7	(26.9)	2.65	(	0.69 - 4.62	)	8.04	(	5.45 - 10.64	)	*	37	(24.3)	0.40	(	0.27 - 0.52	)
1	22	(17.5)	0.24	(	0.14	- 0.34	)	8	(30.8)	3.03	(	0.93 - 5.13	)	12.54	(	8.05 - 17.02	)	*	30	(19.7)	0.32	(	0.21 - 0.44	)

Abbreviations: CI, confidence interval; IR, injury rate = injuries per 1000 athlete exposures; IRR, injury rate ratio = game/practice injury rate. *: p<0.05.

ers (n=32, 21.1%) and strains (n=22, 14.5%). Sprains had the highest PIR and GIR among the injury types, at 0.40/1000 AEs (95% CI 0.27–0.53) and 6.82/1000 AEs (95% CI 3.67–9.98), respectively. Meniscal tears had the highest IRR (22.98/1000 AEs, 95% CI 2.84–43.13), followed by sprains (17.24/1000 AEs, 95% CI 12.64–21.83), concussions (11.49/1000 AEs, 95% CI 4.99–17.99), and contusions (3.45/1000 AEs, 95% CI 1.41–5.48). The GIR was higher than the PIR for meniscal tears, sprains, concussions, and contusions ($p<0.05$).

SITE OF INJURY

Table 5 presents the results by injury site. The lower limbs were the most frequently injured site (126 cases, 82.8%). There were 14 (9.21%) head and neck injuries and 11 (7.24%) trunk and back injuries. The PIR of the lower limbs was 1.39/1000 AEs (95% CI 1.25–1.52), and the respective GIR was 8.34/1000 AEs (95% CI 6.56–10.12), which was the highest among those of the different injury sites. The IRR of the upper limbs was the highest, at 34.47/1000 AEs (95% CI 0.00–102.04), followed by that of the head and neck (7.39/1000 AEs, 95% CI, 3.52–11.26) and lower limbs (6.02/1000 AEs, 95% CI 4.97–7.07). The GIR of the upper limbs, head and neck, and lower limbs was higher than the corresponding PIR ($P<0.05$). Among the lower limbs, the ankles and feet were the most frequently injured sites (47 cases, 30.9%). There were 34 (22.3%) cases of thigh and gluteal injuries and 31 (20.3%) of knee injuries. The PIR of the ankles and feet was 0.52/1000 AEs (95% CI 0.43–0.60), and the GIR was 4.55/1000 AEs (95% CI 3.24–5.86), which were the highest among those of the lower limbs. The elbow and forearm had the highest IRR (34.47, 95% CI 0.00–102.04), followed by the knee (8.90/1000 AEs, 95% CI 5.76–12.03), ankle and foot (8.80/1000 AEs, 95% CI 6.29–11.32), and thigh and gluteus (2.03/1000 AEs, 95% CI 1.35–2.71). The GIR of the elbow and forearm, ankle and foot, knee, and head and neck were higher than the corresponding PIR ($p<0.05$). Table 6 provides further details of the injuries. In the lower limbs, which were the most frequently injured parts, ankle and foot inversion sprains, knee and anterior cruciate ligament (ACL) injuries, and meniscal injuries were the most common.

INJURY SEVERITY

Table 7 presents the injury severity results. Most cases were severe (n=63, 41.4%), followed by moderate (n=49, 32.2%), mild (n=18, 11.8%) and minimal (n=22, 14.5%) cases. Severe injuries had a PIR of 0.52/1000 AEs (95% CI 0.37–0.66) and a GIR of 6.06/1000 AEs (95% CI 3.09–9.04), the highest among the different injury severities. Severe injuries also had the highest IRR (11.74/1000 AEs, 95% CI 0.00–14.63), followed by mild (9.85/1000 AEs, 95% CI 0.00–14.40) and moderate injuries (4.81/1000 AEs, 95% CI 0.00–6.16). The GIR was higher than the PIR in severe, moderate, and mild injuries ($P<0.05$).

DISCUSSION

A prospective injury study was conducted in female collegiate soccer players over three seasons. Overall, injuries tended to occur more frequently in games than in practices, as reported in previous studies.[9,10] Furthermore, the current results revealed that the incidence of soccer-related injuries was higher during games than during practices regardless of the playing level, position, or study year. The injury rate was the highest among MFs and DFs during games and practices. Previous reports have shown that GKs have a lower injury rate than players in other positions and MFs experience the highest number of injuries among field players.[11,12] Although a similar trend was observed here, where the number of injuries was the highest for DFs and the lowest for FWs, it is difficult to clarify whether these numbers were influenced by player's sex (only females were studied) or competition level. In contrast, a previous report showed no difference in the frequency of injuries between positions.[13]

There was no significant difference in the injury rate sustained during practices between study years. The reasons for the high injury rate among first-year university players may include changes in practice environment, extended practice periods, improving quality, differing levels of competition and mental stress, and decreasing physical strength due to examinations. However, the authors did not record the medical history of players before entering the university. After entering university and before starting full-scale competitive activities each player's physical condition was assessed including medical history, muscle strength, and flexibility, and athletes were screened for injuries. The authors speculate that prior influences at the site of trauma before entering university may also have influenced the high injury rate among first-year players. However, within their first year at university, the injury rate among first-year students decreased over time, potentially due to improvements in their physical conditioning or their increased experience. Regarding injury site, similar to previous reports,[6,8,14,15] the ankle and knee joints were the most common injury sites, with ligament injuries the most common. The ankle joint is the most frequently injured site during sports activities, accounting for approximately 30% of all sports injuries, of which ankle joint sprains account for approximately 70%. In addition, the re-injury rate is very high and has a significant impact on performance; therefore, the implementation of a preventive program has been described as essential.[16] The risk of sustaining ACL injuries in female soccer players is 2.67 times higher than that in male soccer players.[17] This difference has been attributed to the lower activity of the hamstrings and gluteus maximus in women than in men when changing direction and landing, which are frequent movements in soccer.[18,19] In addition, direction-changing motions unintentionally increase knee valgus angle and valgus moment.[20]

The FIFA 11+ is a preventive program that was created by the FIFA Medical Assessment and Research Centre.[21,22] Numerous interventions have verified the usefulness of this preventive program, reporting a significant decrease

Table 4. Injury rates in a university women's soccer team in 2018–2020 by injury type

	Practice							Game										Total						
	n	(%)	IR	(	95%CI		)	n	(%)	IR	(	95%CI		)	IRR	(	95%CI	)		n	(%)	IR	(	95%CI	)
Sprain	36	(28.6)	0.40	(	0.27	- 0.53	)	18	(69.2)	6.82	(	3.67	- 9.98	)	17.24	(	12.64	- 21.83	)	*	54	(35.5)	0.58	(	0.42	- 0.73)
Strain	21	(16.7)	0.23	(	0.13	- 0.33	)	1	(3.8)	0.38	(	0.00	- 1.12	)	1.64	(	0.96	- 2.33	)		22	(14.5)	0.24	(	0.14	- 0.33)
Contusion	10	(7.9)	0.11	(	0.04	- 0.18	)	1	(3.8)	0.38	(	0.00	- 1.12	)	3.45	(	1.41	- 5.48	)	*	11	(7.2)	0.12	(	0.05	- 0.19)
Fracture	3	(2.4)	0.03	(	0.00	- 0.07	)	0	0.0	0.00	(	0.00	- 0.00	)	0.00	(	0.00	- 0.00	)		3	(2.0)	0.03	(	0.00	- 0.07)
Concussion	9	(7.1)	0.10	(	0.03	- 0.16	)	3	(11.5)	1.14	(	0.00	- 2.42	)	11.49	(	4.99	- 17.99	)	*	12	(7.9)	0.13	(	0.06	- 0.20)
Tendinitis	12	(9.5)	0.13	(	0.06	- 0.21	)	1	(3.8)	0.38	(	0.00	- 1.12	)	2.87	(	1.31	- 4.43	)		13	(8.6)	0.14	(	0.06	- 0.21)
Meniscus tear	3	(2.4)	0.03	(	0.00	- 0.07	)	2	(7.7)	0.76	(	0.00	- 1.81	)	22.98	(	2.84	- 43.13	)	*	5	(3.3)	0.05	(	0.01	- 0.10)
Other	32	(25.4)	0.35	(	0.23	- 0.47	)	0	0.0	0.00	(	0.00	- 0.00	)	0.00	(	0.00	- 0.00	)		32	(21.1)	0.34	(	0.22	- 0.46)

Abbreviations: CI, confidence interval; IR, injury rate = injuries per 1000 athlete exposures; IRR, injury rate ratio = game/practice injury rate. * : p<0.05.

Table 5. Injury rates in a university women's soccer team in 2018–2020 by injured body part

		Practice							Game										Total						
		n	(%)	IR	(	95%CI		)	n	(%)	IR	(	95%CI		)	IRR	(	95%CI	)		n	(%)	IR	(	95%CI	)
Head and Neck	Total	11	(8.73)	0.15	(	0.11	- 0.20	)	3	(11.53)	1.14	(	0.48	- 1.79	)	7.39	(	3.52	- 11.26	)	*	14	(9.21)	0.15	(	0.11	- 0.19)
	Head and Neck	10	(7.93)	0.14	(	0.10	- 0.19	)	3	(11.53)	1.14	(	0.48	- 1.79	)	7.96	(	3.63	- 12.28	)	*	13	(8.55)	0.14	(	0.10	- 0.18)
	Face and scalp	1	(0.79)	0.01	(	0.00	- 0.02	)	0	0.00	0.00	(	0.00	- 0.00	)	0.00	(	0.00	- 0.00	)		1	(0.66)	0.01	(	0.00	- 0.02)
Upper limb	Total	0	0.00	0.01	(	0.00	- 0.00	)	1	(3.84)	0.38	(	0.00	- 0.76	)	34.47	(	0.00	- 102.04	)	*	1	(0.66)	0.01	(	0.00	- 0.02)
	Shoulder and upper arm	0	0.00	0.00	(	0.00	- 0.00	)	0	0.00	0.00	(	0.00	- 0.00	)	0.00	(	0.00	- 0.00	)		0	0.00	0.00	(	0.00	- 0.00)
	Elbow and forearm	0	0.00	0.01	(	0.00	- 0.00	)	1	(3.84)	0.38	(	0.00	- 0.76	)	34.47	(	0.00	- 102.04	)	*	1	(0.66)	0.01	(	0.00	- 0.02)
	Wrist, hand, and finger	0	0.00	0.00	(	0.00	- 0.00	)	0	0.00	0.00	(	0.00	- 0.00	)	0.00	(	0.00	- 0.00	)		0	0.00	0.00	(	0.00	- 0.00)
Trunk and back	Total	11	(8.73)	0.12	(	0.08	- 0.16	)	0	0.00	0.00	(	0.00	- 0.00	)	0.00	(	0.00	- 0.00	)		11	(7.24)	0.12	(	0.08	- 0.15)
	Chest, abdomen, and upper back	0	0.00	0.00	(	0.00	- 0.00	)	0	0.00	0.00	(	0.00	- 0.00	)	0.00	(	0.00	- 0.00	)		0	0.00	0.00	(	0.00	- 0.00)
	Lower back	11	(8.73)	0.12	(	0.08	- 0.16	)	0	0.00	0.00	(	0.00	- 0.00	)	0.00	(	0.00	- 0.00	)		11	(7.23)	0.12	(	0.08	- 0.15)
Lower limb	Total	104	(82.53)	1.39	(	1.25	- 1.52	)	22	(84.60)	8.34	(	6.56	- 10.12	)	6.02	(	4.97	- 7.07	)	*	126	(82.89)	1.35	(	1.23	- 1.47)
	Thigh and gluteus	32	(25.39)	0.37	(	0.31	- 0.44	)	2	(7.69)	0.76	(	0.22	- 1.29	)	2.03	(	1.35	- 2.71	)		34	(22.37)	0.36	(	0.30	- 0.43)
	Knee	23	(18.25)	0.34	(	0.27	- 0.41	)	8	(30.76)	3.03	(	1.96	- 4.10	)	8.90	(	5.76	- 12.03	)	*	31	(20.39)	0.33	(	0.27	- 0.39)
	Lower leg	14	(11.11)	0.15	(	0.11	- 0.20	)	0	0.00	0.00	(	0.00	- 0.00	)	0.00	(	0.00	- 0.00	)		14	(9.21)	0.15	(	0.11	- 0.19)
	Ankle and foot	35	(27.77)	0.52	(	0.43	- 0.60	)	12	(46.15)	4.55	(	3.24	- 5.86	)	8.80	(	6.29	- 11.32	)	*	47	(30.92)	0.50	(	0.43	- 0.58)

Abbreviations: CI, confidence interval; IR, injury rate = injuries per 1000 athlete exposures; IRR, injury rate ratio = game/practice injury rate. * : p<0.05.

Table 6. Injury details of a university women's soccer team in 2018–2020

	Practice	Game
Head and Neck		
Head and Neck	Concussion	Concussion
Face and scalp	Nasal bone fracture	NA
Upper limb		
Shoulder and upper arm	NA	NA
Elbow and forearm	NA	Medial collateral ligament injury
Wrist, hand, and finger	NA	NA
Trunk and back		
Chest, abdomen, and upper back	NA	NA
Lower back	Lumbar spondylosis, sacral stress fracture, myofascial low back pain	NA
Lower limb		
Thigh and gluteus	Quadriceps fasciitis, rectus femoris muscle tear, adductor muscle tear, hamstring muscle strain, iliopsoas muscle strain, femoral lateral epicondyle strain, thigh muscle strain, external obturator muscle strain, groin pain	Thigh muscle contusion
Knee	Anterior cruciate ligament injury/rupture, meniscus injury, patellar tendonitis, Infrapatellar Fat Pad Syndrome, patella bruise	Anterior cruciate ligament injury/rupture, meniscus injury
Lower leg	Peroneal tendonitis, Achilles tendinopathy, medial tibial stress syndrome, triceps surae contusion, peroneal muscle injury, tibia stress fracture	NA
Ankle and foot	Ankle inversion sprain (anterior talofibular ligament injury, calcaneofibular ligament injury), talus bone contusion, Lisfranc joint injury, ankle valgus sprain (triangular ligament injury), Plantar fasciopathy	Ankle inversion sprain (anterior talofibular ligament injury, calcaneofibular ligament injury), heel fat pad inflammation

in the total injury incidence rate and incidence of overuse injuries and severe injuries, confirming its preventive effect.[23,24] In addition, FIFA 11+ reduces the valgus moment of the knee joint, which is considered a risk factor for ACL injuries that frequently occur in female soccer players, and has been recently reported to improve sprinting and jumping abilities.[25-28] As such, FIFA 11+ is a useful program, not only for injury prevention but also for performance improvement and may be useful for these female soccer players.

Concussions have also been previously reported to be a frequent and significant injury in female collegiate soccer players,[29] with an estimated incidence approximately 2.4 times higher than that in their male counterparts.[29] In this study, concussions were one of the most common injuries, highlighting the importance of identifying concussion in female soccer players. Most concussions in soccer are caused by contact with the ball rather than interpersonal contact.[29] Heading is a typical movement unique to soccer required for passing and shooting, however the head suffers a direct physical impact. In the past, based on this factor, changes in rules and concussion-preventive measures were adopted.[30,31] Wearing headgear is a typical example of this. However, previous reports have provided both positive and negative outcomes regarding headgear wearing; thus, its effectiveness is currently unclear.[30-32] In addition, although the importance of concussion prevention is clear, few workplaces are implementing preventive measures.[33] Education regarding sex-related differences is urgent, and further research is required.

In the current results, it was clear that injury severity was higher in games than in practices. Severe injuries were the most common, as were injuries requiring long recovery times. Compared with practice, the intensity of contact is higher in games, and there are many unpredictable factors including variability in opponents. Therefore, it is possible that more severe injuries occur in games, due to higher intensity and unpredictable factors such as opponent variability, while practice may have more potential for injury prevention. In addition to lower-extremity injuries, such as ankle sprains, the participants in this study had several severe injuries that required time to recover including ACL injuries, knee meniscus injuries, and concussions. The severity of these injuries has been previously reported, but the findings have been inconsistent.[14,34] Since this study used the FIFA severity classification, it is difficult to compare the current results with those of previous reports, as only a few studies have used the same classification system. In the future, the authors plan to conduct further investigations based on a unified definition of injury and classification of severity.

Longitudinal epidemiological data collection is the first step toward injury prevention. Although many studies on soccer-related injuries have focused on male individuals

Table 7. Injury rates according to severity of injury in a university women's soccer team in 2018–2020

	Practice							Game											Total						
	n	(%)	IR	(	95%CI)			n	(%)	IR	(	95%CI)			IRR	(	95%CI)				n	(%)	IR	(	95%CI)		
Minimal	22	(17.5)	0.24	(	0.14	-	0.34)	0	0.0	0.00	(	0.00	-	0.00)	0.00	(	0.00	-	0.00)		22	(14.5)	0.24	(	0.14	-	0.33)
Mild	14	(11.1)	0.15	(	0.07	-	0.23)	4	(15.4)	1.52	(	0.03	-	3.00)	9.85	(	0.00	-	14.40)	*	18	(11.8)	0.19	(	0.10	-	0.28)
Moderate	43	(34.1)	0.47	(	0.33	-	0.61)	6	(23.1)	2.27	(	0.45	-	4.09)	4.81	(	0.00	-	6.16)	*	49	(32.2)	0.52	(	0.38	-	0.67)
Severe	47	(37.3)	0.52	(	0.37	-	0.66)	16	(61.5)	6.06	(	3.09	-	9.04)	11.74	(	0.00	-	14.63)	*	63	(41.4)	0.67	(	0.51	-	0.84)

Abbreviations: CI, confidence interval; IR, injury rate = injuries per 1000 athlete exposures; IRR, injury rate ratio = game/practice injury rate. * : $p<0.05$.

and elite athletes, this is one of the first long-term injury studies on female university soccer players. Based on this research, concussion and knee injury preventive measures should be further considered for female soccer players, in addition to preventative measures for other lower-extremity injuries.

This study has some limitations. First, only a single soccer team was included; injury type and frequency may vary depending on the competition level, practice environment, and regional characteristics. Second, a detailed analysis of the injury mechanism was not possible because the authors could not investigate the three relevant categories (contact, non-contact, and other). Finally, a detailed classification of the training content was not performed, prohibiting assessment of training related variables with injury.

CONCLUSIONS

This study is one of the first long-term injury surveys of female university soccer players. The results indicate that soccer-related injuries were found to occur more frequently in games than in practice regardless of the playing level, position, or study year. In addition to injuries to the lower limbs, serious injuries requiring long recovery times were also observed, including concussions.

CONFLICTS OF INTEREST

The authors report no conflicts of interest.

Submitted: August 01, 2024 CDT. Accepted: January 18, 2025 CDT. Published: April 01, 2025 CDT.
© The Author(s)

This is an open-access article distributed under the terms of the Creative Commons Attribution 4.0 International License (CCBY-NC-4.0). View this license's legal deed at https://creativecommons.org/licenses/by-nc/4.0 and legal code at https://creativecommons.org/licenses/by-nc/4.0/legalcode for more information.

REFERENCES

1. Hawkins RD, Hulse MA, Wilkinson C, Hodson A, Gibson M. The association football medical research programme: an audit of injuries in professional football. *Br J Sports Med*. 2001;35:43-47. doi:10.1136/bjsm.35.1.43

2. Rahnama N, Reilly T, Lees A. Injury risk associated with playing actions during competitive soccer. *Br J Sports Med*. 2002;36:354-359. doi:10.1136/bjsm.36.5.354

3. Woods C, Hawkins R, Hulse M, Hodson A. The Football Association Medical Research Programme: an audit of injuries in professional football-analysis of preseason injuries. *Br J Sports Med*. 2002;36:436-441. doi:10.1136/bjsm.36.6.436

4. Junge A, Dvořák J. Football injuries during the 2014 FIFA World Cup. *Br J Sports Med*. 2015;49:599-602. doi:10.1136/bjsports-2014-094469

5. Morgan BE, Oberlander MA. An examination of injuries in major league soccer. The inaugural season. *Am J Sports Med*. 2001;29:426-430. doi:10.1177/03635465010290040701

6. Engström B, Johansson C, Törnkvist H. Soccer injuries among elite female players. *Am J Sports Med*. 1991;19:372-375. doi:10.1177/036354659101900408

7. Östenberg A, Roos H. Injury risk factors in female European football. A prospective study of 123 players during one season. *Scand J Med Sci Sports*. 2000;10:279-285. doi:10.1034/j.1600-0838.2000.010005279.x

8. Fuller CW, Ekstrand J, Junge A, et al. Consensus statement on injury definitions and data collection procedures in studies of football (soccer) injuries. *Clin J Sport Med*. 2006;16:97-106. doi:10.1097/00042752-200603000-00003

9. Brito J, Malina RM, Seabra A, et al. Injuries in Portuguese youth soccer players during training and match play. *J Athl Train*. 2012;47:191-197. doi:10.4085/1062-6050-47.2.191

10. Kuzuhara K, Shibata M, Uchida R. Injuries in Japanese junior soccer players during games and practices. *J Athl Train*. 2017;52:1147-1152. doi:10.4085/1062-6050-52.12.23

11. Aoki H, O'Hata N, Kohno T, Morikawa T, Seki J. A 15-year prospective epidemiological account of acute traumatic injuries during official professional soccer league matches in Japan. *Am J Sports Med*. 2012;40:1006-1014. doi:10.1177/0363546512438695

12. Andersen TE, Larsen Ø, Tenga A, Engebretsen L, Bahr R. Football incident analysis: a new video based method to describe injury mechanisms in professional football. *Br J Sports Med*. 2003;37:226-232. doi:10.1136/bjsm.37.3.226

13. Hawkins RD, Fuller CW. An examination of the frequency and severity of injuries and incidents at three levels of professional football. *Br J Sports Med*. 1998;32:326-332. doi:10.1136/bjsm.32.4.326

14. Söderman K, Alfredson H, Pietilä T, Werner S. Risk factors for leg injuries in female soccer players: a prospective investigation during one out-door season. *Knee Surg Sports Traumatol Arthrosc*. 2001;9:313-321. doi:10.1007/s001670100228

15. Clausen MB, Zebis MK, Møller M, et al. High injury incidence in adolescent female soccer. *Am J Sports Med*. 2014;42:2487-2494. doi:10.1177/0363546514541224

16. Kaminski TW, Hartsell HD. Factors contributing to chronic ankle instability: a strength perspective. *J Athl Train*. 2002;37:394-405.

17. Prodromos CC, Han Y, Rogowski J, Joyce B, Shi K. A meta-analysis of the incidence of anterior cruciate ligament tears as a function of gender, sport, and a knee injury-reduction regimen. *Arthroscopy*. 2007;23:1320-5.e6. doi:10.1016/j.arthro.2007.07.003

18. Malinzak RA, Colby SM, Kirkendall DT, Yu B, Garrett WE. A comparison of knee joint motion patterns between men and women in selected athletic tasks. *Clin Biomech (Bristol, Avon)*. 2001;16:438-445. doi:10.1016/S0268-0033(01)00019-5

19. Zazulak BT, Ponce PL, Straub SJ, Medvecky MJ, Avedisian L, Hewett TE. Gender comparison of hip muscle activity during single-leg landing. *J Orthop Sports Phys Ther*. 2005;35:292-299. doi:10.2519/jospt.2005.35.5.292

20. Ford KR, Myer GD, Hewett TE. Valgus knee motion during landing in high school female and male basketball players. *Med Sci Sports Exerc*. 2003;35:1745-1750. doi:10.1249/01.MSS.0000089346.85744.D9

21. Lauersen JB, Bertelsen DM, Andersen LB. The effectiveness of exercise interventions to prevent sports injuries: a systematic review and meta-analysis of randomised controlled trials. *Br J Sports Med*. 2014;48:871-877. doi:10.1136/bjsports-2013-092538

22. Thorborg K, Krommes KK, Esteve E, Clausen MB, Bartels EM, Rathleff MS. Effect of specific exercise-based football injury prevention programmes on the overall injury rate in football: a systematic review and meta-analysis of the FIFA 11 and 11+ programmes. *Br J Sports Med*. 2017;51:562-571. doi:10.1136/bjsports-2016-097066

23. Steffen K, Emery CA, Romiti M, et al. High adherence to a neuromuscular injury prevention programme (FIFA 11+) improves functional balance and reduces injury risk in Canadian youth female football players: a cluster randomised trial. *Br J Sports Med*. 2013;47:794-802. doi:10.1136/bjsports-2012-091886

24. Silvers-Granelli H, Mandelbaum B, Adeniji O, et al. Efficacy of the FIFA 11+ Injury Prevention Program in the collegiate male soccer player. *Am J Sports Med*. 2015;43:2628-2637. doi:10.1177/0363546515602009

25. Thompson JA, Tran AA, Gatewood CT, et al. Biomechanical effects of an injury prevention program in preadolescent female soccer athletes. *Am J Sports Med*. 2017;45:294-301. doi:10.1177/0363546516669326

26. Bizzini M, Impellizzeri FM, Dvorak J, et al. Physiological and performance responses to the "FIFA 11+" (part 1): is it an appropriate warm-up? *J Sports Sci*. 2013;31:1481-1490.

27. Reis I, Rebelo A, Krustrup P, Brito J. Performance enhancement effects of Fédération Internationale de Football Association's "The 11+" injury prevention training program in youth futsal players. *Clin J Sport Med*. 2013;23:318-320. doi:10.1097/JSM.0b013e318285630e

28. Asgari M, Nazari B, Bizzini M, Jaitner T. Effects of the FIFA 11+ program on performance, biomechanical measures, and physiological responses: a systematic review. *J Sport Health Sci*. 2023;12:226-235. doi:10.1016/j.jshs.2022.05.001

29. Dick RW. Is there a gender difference in concussion incidence and outcomes? *Br J Sports Med*. 2009;43:i46-50. doi:10.1136/bjsm.2009.058172

30. Benson BW, Hamilton GM, Meeuwisse WH, McCrory P, Dvorak J. Is protective equipment useful in preventing concussion? A systematic review of the literature. *Br J Sports Med*. 2009;43:i56-67. doi:10.1136/bjsm.2009.058271

31. Leppänen M, Aaltonen S, Parkkari J, Heinonen A, Kujala UM. Interventions to prevent sports related injuries: a systematic review and meta-analysis of randomised controlled trials. *Sports Med*. 2014;44:473-486. doi:10.1007/s40279-013-0136-8

32. Broglio SP, Cantu RC, Gioia GA, et al. National Athletic Trainers' Association position statement: management of sport concussion. *J Athl Train*. 2014;49:245-265. doi:10.4085/1062-6050-49.1.07

33. Jeffries KK, Girouard TJ, Tandy RD, Radzak KN. Concussion-prevention strategies used in National Collegiate Athletic Association divisions I and II women's soccer. *J Athl Train*. 2020;55:469-474. doi:10.4085/1062-6050-142-19

34. Le Gall F, Carling C, Reilly T. Injuries in young elite female soccer players: an 8-season prospective study. *Am J Sports Med*. 2008;36:276-284. doi:10.1177/0363546507307866