



## Injuries in Japanese Collegiate Women's Soccer Players during Games and Practices

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### Abstract

**Objective:** Despite the increase in soccer injuries as the population of women's soccer grows, few sports injury studies of women's soccer have been conducted in Japan. The purpose was to prospectively examine the incidence, sites, types, and situations of injuries in Japanese collegiate women's soccer players during games and practices for three seasons.

**Methods:** Eighty-nine players participated in this study. Data on all game and practice injuries were collected using an injury sheet. Injury Rates (IRs) were calculated by month, position, injury site, injury type, and injury situation.

**Results:** The overall IR (3.20/1000 Athlete-Hours [AHs]) was low, and the game IR (6.58/1000 AHs) per was 4.11 times higher than the practice IR (1.60/1000 AHs) ( $p < 0.05$ ). The game IR was highest in March (1.35/1000 AHs) of the pre-season, with that in May (1.06/1000 AHs) and October (0.58/1000 AHs) of the in-season being higher than the practice IRs ( $p < 0.05$ ). The midfielders (game IR: 3.19/1000 AHs, practice IR: 0.73/1000 AHs) were most injured during games and practices. Lower limb injuries (game IR: 4.93/1000 AHs, practice IR: 1.23/1000 AHs) were highest during games and practices, with sprains (3.87/1000 AHs) and contusions (1.16/1000 AHs) more common during games. The rate of injuries caused by body contact (game IR: 4.06/1000 AHs, practice IR: 0.73/1000 AHs) was highest during games and practices.

**Conclusion:** The game IR was higher than the practice IR. A future task is to reduce the game IRs in the pre-season and the early and late in-seasons.

**Keywords:** Female football; Injury rates; Periodization; Recovery; Epidemiology

### Introduction

Soccer is the most popular sport in the world and is no exception in Japan. The number of registered soccer players in all categories is the highest in Japan, with 899,560 players [1]. Among them, the number of women's soccer players registered is 28,765 and despite being a popular sport that has been on the rise in the last five years, little research on women's soccer injuries has been conducted in Japan.

Soccer is categorized as a type of contact or collision sport, and the number of soccer-related injuries is increasing with the increasing number of players [2]. Internationally, many prospective studies of women's soccer injuries in junior, college age, and professional or elite athletes have been reported [3-10]. However, in Japan, as far as we know, there has been only one prospective study by Oda et al. [11] of women's soccer using the international index of Injury Rate (IR) per 1000 Athlete-Hours (AHs), so the actual situation is still unknown [12].

With the increasing numbers of the women's soccer population, more and more regional tournaments and national tournaments are being held. Therefore, there is an urgent need for injury analysis and injury prevention measures.

The purpose of this study was to clarify the actual condition of injuries through a three-year prospective study of collegiate women's soccer players using the international index of IR per 1000 AHs.

### Methods

#### Participants

A total of 89 players who belonged to the Aichi Prefecture Women's Soccer League Division 1 and belonged to the A University Women's Football Club from 2016 to 2018 at the level of the All Japan University Women's Football Championship [2016: 29 players Goal Keepers (GKs):3 Defenders (DFs):10 Mid Fielders (MFs):14 Forwards (FWs). (2017:30 players GKs:2, DFs:10, MFs:14, FWs:4, (2018:30 players GKs:4, DFs:10, MFs:13, FWs:3) participated in this study (Table 1). The average age, height, weight, body mass index, and playing years were  $20.7 \pm 1.1$  years,  $158.7 \pm 4.7$  cm,  $52.7 \pm 3.9$  kg,  $21.0 \pm 1.3$  kg/m<sup>2</sup>, and  $12.0 \pm 2.9$  years, respectively.

The women's soccer league seasons to which the team in this study belonged were pre-season (February-April), early in-season (May-August), late in-season (September-December), and off-season (January). There was a transition period of 2-3 weeks between the early and late in-seasons, and there were 3-6 full rest days during that period. In addition, the team practiced about 2 hour at a time, five times a week during the season, and had a recovery time twice a week (once a week: complete rest, once a week: individual conditioning).

This study was performed according to the Declaration of Helsinki and approved by the Ethics Committee of Aichi Toho University (Approval No. 28-06, June 16th, 2016).

Before participation, each player was informed of the risks and benefits of the study, after which written, informed consent was obtained.

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**Table 1:** Physical characteristics in a collegiate women's soccer team. 2016-2018. DF: Defenders; FW: Forwards; GK: Goal Keepers; MF: Mid Fielders

Position	N	Collegiate women's soccer team				
		Age(years)	Height(cm)	Body mass(kg)	BMI(kg/m <sup>2</sup> )	Playing Experience (years)
GK	9	20.3 ± 1.1	164.9 ± 4.5	57.2 ± 2.7	21.1 ± 0.8	11.6 ± 1.4
DF	30	20.6 ± 1.0	157.7 ± 4.2	53.0 ± 2.7	21.3 ± 0.9	12.5 ± 1.9
MF	41	20.8 ± 1.1	157.2 ± 3.8	50.9 ± 3.8	20.6 ± 1.6	11.9 ± 3.6
FW	9	20.7 ± 1.3	162.1 ± 3.8	55.9 ± 2.0	21.3 ± 0.7	11.6 ± 2.9
Total	89	20.7 ± 1.1	158.7 ± 4.7	52.7 ± 3.9	21.0 ± 1.3	12.0 ± 2.9

**Definition of injury**

The definition of injury in this study was any injury that occurred (including a traumatic or overuse injury and a disease related to sport) as a result of participating in games and practices, and 1. Injury resulting in taking a break from or missing one or more team practices or missing a game, 2. Injury treated at a medical institution or by alternative medicine after injury, and 3. Including head and face injuries (including concussion) even if the injury did not result in missing practices or the game, including one of the above three points [13,14]. A traumatic injury was defined as an injury caused by an identifiable event (i.e., an injury with sudden onset caused by body contact or other contact with a ball, ground, or other objects). An overuse injury was defined as an injury with gradual onset (i.e., associated with repetitive micro trauma) and without an identifiable responsible event. A recurrent injury was defined as an injury of the same type and at the same site as an index injury that occurred after a player's return to full participation after the initial injury. Illnesses or injuries unrelated to soccer were not included.

**Data collection**

A full explanation of how to record the team diary and injury record sheet was given to each member of the coaching staff and the student athletic trainers. During three seasons from 2016-2018, team diary entries were recorded by the student athletic trainers after every practice and game, and an injury survey was performed weekly by the student athletic trainers under the supervision of an athletic trainer certified by the National Athletic Trainers' Association-Board of Certification (NATA-BOC). Regarding the team diary, information about team practices, games, date, place, practice hours, number of games, number of players who participated in each practice and game, etc. were recorded after every practice and game. Regarding the injury

survey, injury date, place of injury, injury area (head and neck, upper limb, trunk and back, lower limb, and others), injury type, injury situation (Body contact, Other contact, No contact) were recorded after diagnosis from a physician or alternative medical specialist [4,13-15]. As the definition of a game, in addition to official games including the Tokai league and the prefectural league, a game was a cup match, an interleague match, and a training match held between multiple teams. The team was visited regularly to confirm that the team diary entries were being made and that the injury survey was conducted. Except for the university championship 45 min half, the match time of the official game was 40 min half in the Tokai league and 35 min half in the prefectural league. Cup games and interleague games were held with halves of 30 or 35 min, and in some cases, 2-3 games were held a day. If the game was played in a different format, it was recorded in the team diary each time.

**Exposure and incidence of injury**

In this study, 1000 AHs, including the activity time of practices and games, were used as an index in order to examine the actual condition of injuries during practices and games. This index is calculated as 1 Athlete-Hour (AH) when one athlete participates in a game or practice for 1 hr. Game AHs were calculated from the total game hours and the number of players who participated in each game, and practice AHs were calculated from the total practice hours and the number of players who participated in each practice [12] (Table 2). The number of injuries that occurred during games and practices was divided by each AH to calculate the IR per 1000 h (Game IR, Practice IR). The 95% Confidence Interval (CI) during games and practices was also calculated. The Game Practice Rate Ratio (GPRR) represented the relationship between the game IRs and the practice IRs and was calculated by dividing the game IR by the practice IR with the 95% CI.

**Table 2:** Game and practice athlete-hours in a collegiate women's soccer team, 2016-2018

Measure	Collegiate women's soccer team			Total
	2016	2017	2018	
No. of players	29	30	30	89
No. of practices	157	141	143	441
Average practice hours	20 ± 0.2	2.0 ± 0.3	2.0 ± 0.1	2.0 ± 0.2
Practice athlete-hours	7608	7067.3	7195.5	21870.8
No. of games	122.4	141.7	151.5	416
Game athlete-hours	2923.4	3346.8	4071.4	10341.6
Total athlete-hours	10531.4	10414.1	11266.9	32212.4

**Statistical analysis**

The  $\chi^2$  test was used to compare the number of injuries and their percentage (%). To compare the injury rates between games and practices according to injury area, injury type, and injury situation, the GPRRs and their 95% CIs were estimated. Generally, when the 95% CI includes 1, no significant difference is present at the 5% level, and when the 95% CI does not include 1, a significant difference is present at the 5% level [16]. Excel Statistics 2015 (version 1.03, Social

Survey Research Information, Tokyo, Japan) was used for the data analysis, and the significance level was set at the 5% level in each case.

**Results**

The overall IR was 3.20/1000 AHs. The overall game IR and practice IR were 6.58/1000 AHs and 1.60/1000 AHs, respectively. The overall GPRR was 4.11 (95% CI: 2.73-6.18); the overall game IR was significantly higher than the overall practice IR ( $p < 0.05$ , Table 3).

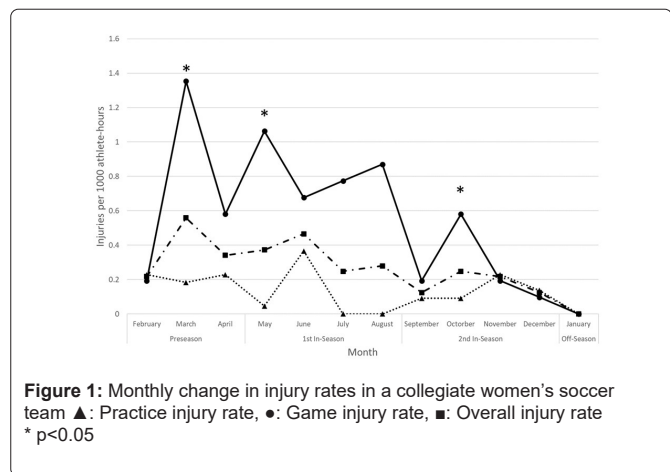
**Table 3:** Injury rates during games and practices in a collegiate women's soccer team, 2016-2018.

Measure	2016		2017		2018		3 seasons		Total
	Practice	Game	Practice	Game	Practice	Game	Practice	Game	
No. of injuries	13	24	13	24	9	20	35	68	103
Injury rates (per 1000 athlete-hours)	1.71	8.21	1.84	7.17	1.25	4.91	1.60	6.58	3.2
(95% CI)	(0.78-2.64)	(4.93-11.49)	(0.84-2.84)	(4.30-10.04)	(0.43-2.07)	(2.76-7.07)	(1.07-2.13)	(5.01-8.14)	(2.58-3.82)
Incidence rate ratio (Game/practice rate ratio)	Referent	4.8	Referent	3.9	Referent	3.93	Referent	4.11	
(95% CI)		(2.45-9.44)		(1.98-7.66)		(1.79-8.63)		(2.73-6.18)	

Regarding monthly injuries (Figure 1), injuries during games were highest in March (20.6%, 1.35/1000 AHs), which is the pre-season. Injuries during games were significantly higher in May (16.2%, 1.06/1000 AHs) of the early in-season and in October (8.8%, 0.58/1000 AHs) of the late in-season than during practices ( $p < 0.05$ ). Regarding injuries by seasons, there were 35% in the pre-season (February-April) (games:32.4%, practices:40%), 42.7% in the early in-season (May-

August) (games:51.5%, practices: 25.7%), and 22.3% (games:16.2%, practices:34.3%) in the late in-season (September-December).

By positions, the MFs had the highest injury rate of 1.52/1000 AHs (47.6%), followed by the DFs at 1.18/1000 AHs (36.9%), the GKs at 0.28/1000 AHs (8.7%) and the FWs at 0.22/1000 AHs (6.8%) (Table 4). In particular, the MFs had the highest injury rate during games and practices.



With regard to injury sites, the IR of lower limb injuries was highest during games (N=51, 75.0%) and practices (N=27, 77.1%), with the game IR at 4.93/1000 AHs and the practice IR at 1.23/1000 AHs (Table 5). The game IR was found to be 3.99 times higher than the practice IR ( $p < 0.05$ ). However, there was no significant difference between the game IR and the practice IR for other body parts except the lower limbs. During games, the foot/ankle joint (N=35, 51.5%) was the most injured, followed by the thigh/gluteal area (N=10, 14.7%). Similarly, during practices, the foot/ankle joint (N=16, 45.7%) was the most injured, followed by the knee joint (N=5, 14.3%) and the thigh/gluteal area (N=5, 14.3%), respectively.

Sprains were the most common during games (N=40, 58.8%) and practices (N=16, 45.7%), followed by contusions during games (N=12, 17.6%) and strains during practices (N=5, 14.3%) (Table 6). The IRs of sprains (3.87/1000 AHs) and contusions (1.16/1000 AHs) were significantly higher during games than during practices, at 5.29

**Table 4:** Injury rates by positions in a collegiate women's soccer team, 2016-2018. CI: Confidence Interval; IR: Injury Rate; DF: Defenders; FW: Forwards; GK: Goal Keepers; MF: Mid Fielders.

Player position	Practice			Game			Game/practice rate ratio(95%CI)	Total		
	N	%	IR(95%CI)	N	%	IR (95%CI)		N	%	IR (95%CI)
FW	4	11.4	0.18 (0.00-0.36)	3	4.4	0.29 (-0.04-0.62)	1.59 (0.35-7.09)	7	6.8	0.22 (0.06-0.38)
MF	16	45.7	0.73 (0.37-1.09)	3.3	49	3.19 (2.10-4.28)	4.36 (2.40-7.92)	49	47.6	1.52 (1.45-1.60)
DF	14	40	0.64 (0.30-0.98)	2.4	35	2.32 (1.39-3.25)	3.63 (1.88-7.01)	38	36.9	1.18 (0.80-1.55)
GK	1	2.9	0.05 (-0.04-0.14)	8	12	0.77 (0.24-1.31)	16.92 (2.12-35.28)	9	8.7	0.28 (0.10-0.46)

**Table 5:** Injury rates by anatomical areas in collegiate women's soccer team, 2016-2018.

Anatomical area	Practice			Game			Game/ practice rate ratio (95%)	Total		
	N	%	IR(95%CI)	N	%	IR(95%CI)		N	%	IR(95%CI)
Head and neck	4	11.4	0.18 (0.00-0.36)	4	5.9	0.39 (0.01-0.77)	2.11 (0.53-8.46)	8	7.8	0.25 (0.08-0.42)
Upper limb	0	0	0	4	5.9	0.39 (0.01-0.77)	0	4	3.9	0.12 (0.10-0.46)
Trunk and back	4	11.4	0.18 (0.00-0.36)	5	7.4	0.48 (0.06-0.91)	2.64 (0.71-9.84)	9	8.7	0.28 (0.10-0.46)
Lower limb	2.7	77.1	1.23 (0.77-1.70)	5.1	75	4.93 (3.58-6.29)	3.99 (2.51-6.37)	78	75.7	2.42 (1.88-2.96)
Others	0	0	0	4	5.9	0.39 (0.01-0.77)	0	4	3.9	0.12 (0.00-0.25)

**Table 6:** Injury rates by injury type in a collegiate women's soccer team, 2016-2018.

Injury Type	Practice			Game			Game/ practice rate ratio (95%)	Total		
	N	%	IR(95%CI)	N	%	IR (95%CI)		N	%	IR (95%CI)
Sprain	16	45.7	0.73 (0.37-1.09)	40	59	3.87 (2.67-5.07)	5.29 (2.96-9.44)	56	54	1.74 (1.28-2.19)
Strain	5	14.3	0.23 (0.03-0.43)	7	10	0.68 (0.18--1.18)	2.96 (0.94-9.33)	12	12	0.37 (0.34-0.41)
Contusion	4	11.4	0.18 (0.00-0.36)	12	17	1.16 (0.50-1.82)	6.36 (2.05-19.67)	16	16	0.50 (0.25-0.74)
Stress fracture	1	2.9	0.05 (-0.04-0.14)	1	1.5	0.10 (-0.09-0.29)	2.11 (0.13-33.81)	2	1.9	0.06 (-0.02-0.15)
Meniscus tear	2	5.7	0.09 (-0.04-0.22)	1	1.5	0.10 (-0.09-0.29)	1.06 (0.10-11.6)	3	2.9	0.09 (-0.01-0.20)
Concussion	2	5.7	0.09 (-0.04-0.22)	1	1.5	0.10 (-0.09-0.29)	1.06 (0.10-11.66)	3	2.9	0.09 (-0.01-0.20)
others	5	14.3	0.23(0.03-0.43)	6	8.8	0.58 (0.12-1.04)	2.54 (0.77-8.32)	11	11	0.34 (0.14-0.54)

and 6.36 times, respectively ( $p < 0.05$ ). In particular, ankle sprains were the most common during games ( $N=33$ , 48.5%) and practices ( $N=13$ , 37.1%), followed by hamstring strains (games:  $N=4$ , practices:  $N=3$ , overall  $N=7$ , 6.8%) and knee joint sprains (including medial collateral ligament, lateral collateral ligament, and anterior cruciate ligament sprains, games:  $N=3$ , practices:  $N=3$ , overall  $N=6$ , 5.8%).

Regarding injury situations (Table 7), body contact was the most common during games and practices, with the game IR of 4.06/1000 AHs and the practice IR of 0.73/1000 AHs, followed by no contact (game IR: 1.16/1000 AHs, practice IR: 0.27/1000 AHs) and other contact with a ball, the ground, or other objects (game IR: 0.77/1000 AHs, practice IR: 0.23/1000 AHs). The game IRs of body contact, no contact, and other contact were 5.55 times, 4.23 times, and 3.38 times higher than the practice IRs, respectively (all  $p < 0.05$ ).

**Table 7:** Injury rates by injury situations in a collegiate women's soccer team, 2016-2018.

Injury situation	Practice			Game			Game/ practice rate ratio (95%)	Total		
	N	%	IR(95%CI)	N	%	IR(95%CI)		N	%	IR(95%CI)
Body contact	16	45.7	0.73 (0.37-1.09)	42	61.8	4.06 (2.83-5.29)	5.55 (3.12-9.87)	58	56.3	1.80 (1.34-2.26)
other contact	5	14.3	0.23 (0.03-0.43)	8	11.8	0.77 (0.24-1.31)	3.38 (1.11-10.34)	13	12.6	0.04 (0.36-0.44)
No contact	6	17.1	0.27 (0.05-0.49)	12	17.6	1.16 (0.50-1.82)	4.23 (1.59-11.27)	18	17.5	0.56 (0.30-0.82)
Other / unknown	8	22.9	0.37 (0.11-0.62)	6	8.8	0.58 (0.12-1.04)	1.59 (0.55-4.57)	14	13.6	0.43 (0.21-0.66)

## Discussion

This was a three-year prospective study of injuries in collegiate women's soccer players using the international index of 1000 AHs. In the collegiate women's soccer players in this study, the game IR (6.58/1000 AHs) was significantly higher than the practice IR (1.60/1000 AHs). This result is consistent with the results of previous

studies with elementary school age [13] and youth age groups from junior high school to high school [3,8,9,17-19], and elite athletes [5-8,20-22]. Therefore, it was clarified that the soccer injury rate with 1000 AHs as an index is higher during games than during practices, regardless of age category (the elementary school generation to college age) or competition level.

The overall IR including the game IR and practice IR in the present study was 3.20/1000 AHs. A previous study of collegiate female soccer players showed an overall IR of 4.6/1000 AHs, which was 0.70 times lower in the present study [11]. In addition, compared with previous studies of elite female athletes from the Swedish premier league and the German national league, whose competition levels are higher than the subjects of this study [5,7,21], the overall IRs were 4.6-6.8/1000 AHs, and the overall IR of this study was 0.47-0.70 times lower than that of the previous studies. On the other hand, in a previous study of the American women's professional soccer leagues [6], the overall IR was 1.93/1000 AHs, and the overall IR in the present study was 1.66 times higher than that of the previous study. From these facts, the higher the competition level is, the higher the IR tends to be, but this is not always the case. However, in the category of collegiate women's soccer, the IR of the present study showed a low value, so it can be inferred that this team played soccer in an environment with a low injury rate.

In Japanese collegiate women's soccer teams, team practice is generally held six times a week. However, the team in this study practiced five times a week for about 2 h once during the season, and it was speculated that such a low frequency of practices affected the IR. In fact, the practice IR (1.60/1000 AHs) in the present study was significantly lower than the practice IR (4.5/1000 AHs) in the previous study [11]. This result may be due to the fact that, in addition to the low practice frequency, the recovery time was set to twice a week, and the practice time during the season was about 2 hr., which is a factor showing the low IR during practices.

On the other hand, the game IR of the present study was 6.58/1000 AHs, which was 1.34 times higher than the game IR (4.9/1000 AHs) of female athletes in the same university category [11]. However, among female athletes from other countries, the game IR of female elite athletes was 12.6 to 23.3/1000 AHs [5-7, 21], and the game IR of elite female athletes in the youth age group (15-19 years old) was 19.6 to 22.4/1000 AHs [3, 8]. Compared to these previous studies, the collegiate women's soccer players in the present study had markedly lower IR during games. This result may have reflected the intensity during games due to the difference in the competition level between the teams in the league to which the team of the present study belongs.

Regarding the monthly injury rate, the game IR (1.35/1000 AHs) was the highest in March of the pre-season. As Hawkins and Fuller [22] indicated, this could be due to the fact that the physical condition of the players has not reached an appropriate level despite the increase of the number of pre-season games and of the practice intensity in the pre-season. In this study, the game IR in the early in-season was highest in May (1.06/1000 AHs), showing a different tendency from the previous study of collegiate women's soccer [11]. In addition, the game IR in the late in-season was highest in October (0.58/1000 AHs), consistent with the result of the previous study [11]. This may be due to fatigue and poor conditioning because the women's soccer season began in earnest in the late in-season, and many games including official games were played every weekend. A previous study reported that, during the soccer season, muscle catabolism began at the beginning of the season, showing poor performance towards the late season, due to inadequate rest and recovery [23]. In the present study, peaks of the game IRs were observed in the pre-season, early in-season, and late in-season, respectively. For this reason, we need to review the training plan using periodization and introduce a 2-week tapering to reduce the game IR each season [24,25] and it is a future task to consider injury prevention measures.

The most injured position during games and practices was the MFs, followed by the DFs. This result is consistent with previous studies of women's professional soccer and men's elite soccer [6,26]. On the other hand, a previous study of men's professional soccer showed that there was no difference in injury rates between positions [27]. It has been pointed out that, in modern soccer, a given position constantly changes according to the flow of the game, and the DFs and FWs repeatedly play opposite roles during the game. Therefore, it is difficult to clarify the characteristics of injuries by position, and it is a future task, because the IR by positions is likely to be affected by the difference in the offensive or defensive system of the team and the game situation.

In the present study, the incidence of lower limb injuries was highest during both games and practices (game IR: 4.93/1000 AHs, practice IR:1.23/1000 AHs), accounting for 75.7% of overall injuries. This result was similar to previous studies of college age players [4, 11]. In addition, a similar tendency was observed in female elite athletes from other countries (60%-84.9%) [5-7,21] and female athletes of the youth age group (83.4%-86.0%) [3,8]. Therefore, lower limb injuries are the most common in women's soccer regardless of age category or competition level, accounting for more than 60-80% of all injuries. In the present study, since the foot and ankle joints were the most frequently injured, the introduction of the 11+ program [28,29] advocated by FIFA. The implementation of a neuromuscular training program should be considered to prevent lower limb injuries [5].

Regarding injury types, the incidence of sprain injuries was the highest during games and practices, followed by contusions and strains during games and by strains and contusions during practices. In terms of overall injuries, sprains were the most common, at 54.4%, followed by contusions at 15.5% and strains at 11.7%. This result showed the same tendency as the previous study of German elite female athletes (sprains: 29.0%, contusions: 20.7%, strains: 15.2%) [5]. Previous studies of youth levels in other countries and elite female soccer players [6,8,21] showed different trends, but sprains, muscle strains, and contusions are considered to be common injuries to women's soccer players.

Regarding injury situations, injuries caused by body contact (61.8%) were the most common during games, followed by no contact (17.6%) and other contact with a ball, the ground, or other objects (11.8%). This result is consistent with the previous study of collegiate women's soccer [4]. It is thought that injuries caused by body contact were the most common during games. In addition, injuries caused by body contact (45.7%) were the highest during practices. However, in the previous study, no contact was the most common, at 56.0% during practices, followed by other contact with a ball, the ground, or other objects (24.0%) and body contact (16.0%), which was different from the present study [4]. Peterson et al. [30] reported that approximately 50% of all injuries in the U-14 to U-18 age category were injuries caused by physical contact, half of which were associated with foul play. In recent years, with the rapid development of women's soccer, the athletic ability of women's players has improved, and the increase in tackles and foul play during games would affect the occurrence of injuries.

In Japanese college sports, there are no surveillance systems that collect as much injury data as in the United States [14]. In addition, on college teams, only coaching staff such as head and assistant coaches accompany the team, but medical staff such as certified athletic trainers and physiotherapists very rarely accompanies the team. Therefore, there is a limitation to collecting detailed data related to an

injury survey (injury severity, injury mechanism, recovery period, internal factors of individual athletes etc.). In the present study, an injury analysis of a collegiate women's soccer team was conducted, but it was considered necessary to further analyze the injuries by comparing Japanese women's soccer by league or competition level.

## Conclusion

This study is one of the few prospective studies in which injuries were investigated in collegiate women's soccer players for three years. The overall IR, including games and practices, was lower than that in previous studies, and the game IR was higher than the practice IR. In particular, the low practice IR may have been affected by the low practice frequency and the controlled practice environment. On the other hand, the game IR was higher than that in the previous study and was the highest in March of the pre-season. The IR by positions was highest for the MFs, and the IRs of lower limb and sprain injuries were highest during games and practices. Injuries caused by physical contact were the most common during games and practices. A future task is to reduce the peak of game injury rates in the pre-season, early in-season, and late in-season by reviewing the training plan using periodization and introducing the tapering method.

## Conflict of Interest

The authors have no conflicts of interest relevant to this article.

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