

# Awareness and Knowledge of Medical Issues Related to Female Athletes Among Track and Field Coaches

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**Introduction:** Little is known regarding medical knowledge pertaining to female athletes among track and field coaches and their interactions with female athletes regarding medical problems.

**Methods:** Participants were track and field coaches (369 males and 43 females) with Japan Sport Association certification and they completed an anonymous survey on their knowledge of medical problems pertinent to female athletes including whether the coaches knew about the female athlete triad and relative energy deficiency in sports; their feelings about female athletes' use of contraceptive pills; whether they speak about menses with the female athletes; and whether they have a gynecologist for consultation regarding their medical problems.

**Results:** Female coaches were significantly more likely to be aware of the triad (odds ratio (OR), 3.44;  $p = 0.003$ ); to have access to a physician able to address the gynecological problems of female athletes (OR, 9.22;  $p < 0.001$ ); and to talk to their female athletes about menses (OR, 2.30;  $p = 0.015$ ) than their male counterparts. Coaches with more experience tended to be aware of the triad and relative energy deficiency in sports compared with those with  $\leq 5$  years of experience.

**Conclusion:** Female coaches are aware of the triad, talk about menses with their female athletes, and have access to a physician who can address gynecological problems with compared to male counterparts. Educating all coaches on these problems is essential to provide adequate support to female athletes.

**Keywords:** track and field, relative energy deficiency in sports, female athlete triad syndrome

## Introduction

Track and field is a multievent sport that includes both power events, such as jumping, throwing, and sprinting, and endurance events, such as long-distance running. Thus, there is potential for a wide range of injuries and illnesses. According to the Japan Association of Athletics Federations (JAAF), the most common injury was tendon and ligament injuries in track and field athletes who compete at the national level and 15.9% of sprinters and 19% of long-distance runners experienced stress fractures in college.<sup>1</sup> Furthermore, 62.3% of national-level collegiate long-distance runners have been found to have anemia, and more than half of female national-level high school long-distance runners have amenorrhea.<sup>1</sup> However, unfortunately, many of them answered that they have never received medical attention for them.<sup>1</sup> Both athletes and coaches should be aware of these common injuries and illnesses and how to prevent and treat them. Such knowledge keeps athletes healthy and could enhance their performance levels.<sup>2</sup> However, a Canadian study on soccer coaches found that only 29.8% used existing injury prevention programs.<sup>3</sup> Furthermore, although it has been well-established that balance programs prevent injuries, less than 30% of coaches were found to include a balance program in their warm-up.<sup>4</sup> Brown et al revealed that only 30% of coaches have heard of the female athlete triad (the triad) which is an interrelationship of low energy availability with or without disordered eating, menstrual irregularities or amenorrhea

and low bone mineral density.<sup>5</sup> Moreover, less than 25% of female adolescent non-athletes seek medical attention for secondary amenorrhea in Japan,<sup>6,7</sup> and a previous study demonstrated that although 40% of the elite-level female track and field athletes had menstrual disorders including oligomenorrhea, none sought medical attention.<sup>8</sup> This suggests that some athletes are not being diagnosed even if they have symptoms that require medical attention, including the triad, owing to a lack of medical knowledge in both the athletes and their coaches. Moreover, low estrogen pills are often used by female athletes to treat dysmenorrhea and delay menstruation to prevent its interference with competitive events. However, a survey in Japan found that many coaches object to their female athletes using low estrogen pills owing to potential weight gain.<sup>9,10</sup> Yet, without sufficient medical knowledge, coaches' decisions could risk endangering their athletes.

A good coach–athlete relationship is important for both parties because they spend a large amount of time together and often share values and feelings. Mottaghi and others have reported a significant positive relationship between the anxiety levels of athletes and their coaches.<sup>5,11–15</sup> Although sports coaching is still male dominant, sex is an important factor in the coach–athlete relationships, and it has been conjectured that the lack of understanding on how to engage with female athletes exacerbates male dominance in sports.<sup>16</sup> Thus, several studies have emphasized the need for more female sports coaches, although the numbers remain far from equal.<sup>17,18</sup>

To the best of our knowledge, there have been no previous studies on track and field coaches' medical knowledge or awareness of problems affecting female athletes or of differences in this knowledge according to the coach's characteristics in Japan.

Thus, this study aimed to investigate the medical knowledge and awareness pertaining to female athletes among track and field coaches and their interactions with female athletes regarding medical problems. The objective of this study was also to determine the characteristics, including sex of the coaches with and without such knowledge and awareness.

## Materials and Methods

This was a cross-sectional study in which an online anonymous survey was disseminated to track and field coaches in Japan via email, who were found through the mailing list of JAAF. A panel of experts, including the Chair of the Coaching Committee and the Chair of the Medical Committee of JAAF, reviewed the survey, which was revised based on the advice of the panel. The participants were the same as those in a previous study and the survey was distributed in spring of 2021.<sup>19</sup>

A total of 5241 track and field coaches with Japan Sport Association certification were invited to participate in the study. The distributed survey gathered demographic information from participants regarding their sex, affiliations, years of coaching, whether the coaches themselves were athletes and the level they had attained as an athlete if they were one, and their coaching environment including what event they coach and the sex of their athletes. Although the numbers were small, because there are few national events for elementary school athletes, we included those elementary school coaches too. The main part of the survey consisted of questions regarding respondents' awareness of the triad and relative energy deficiency in sports (RED-S), their opinions on the use of low estrogen pills by female athletes, the gynecological medical attention received by the female athletes, and whether they had easy access to physicians able to address gynecological problems including team physicians. Answers were selected from a scale of set responses, with “Often” and “Sometimes” being considered as positive responses and “Rarely” and “Never” as negative responses.

## Statistical Analysis

All data were analyzed using Stata 16.1 (Stata Corporation, TX, USA). A *p*-value <0.05 was considered statistically significant. Chi-squared tests were performed to investigate the differences between male and female coaches. Multivariate logistic regression was utilized to determine the independent variables and coaches' backgrounds were included in the model. Odds ratios (OR) and associated 95% confidence intervals (CIs) were calculated to determine the strength of the model.

## Results

A total of 412 coaches participated in the study (response rate 7.9%). Of the participants, 89.6% were males and 10.4% were females. Affiliations varied, but 57.8% of the coaches were affiliated with schools. We found that 71.4% of respondents had coached athletes on a national level and 93.5% used to be track and field athletes themselves. Moreover, 55.5% of the coaches trained athletes who had competed at a national or international level, and 91% coached both male and female athletes. Details of the participants are listed in [Table 1](#).

Furthermore, 58.0% and 53.5% coaches were familiar with the triad and RED-S, respectively. In addition, 74.4% and 82% of female and male coaches, respectively, were not hesitant that their female athletes sought medical attention for gynecological problems, such as amenorrhea and dysmenorrhea. However, 32.6% and 16.8% female and male coaches, respectively, were reluctant for their female athletes to use low estrogen pills. The complete survey results are presented in [Table 2](#) and chi-squared analysis revealed considerably more female than male coaches to be aware of the triad, to talk

**Table 1** Characteristics of the Participants

	%	N
<b>Affiliation</b>		
Elementary school	6.1	25
Junior high school	15.5	64
High school	31.3	129
University/college	4.9	20
Club teams	25.5	105
Corporate team	3.6	15
Others	13.1	54
<b>Age</b>		
<19 years	2.7	11
20–29 years	4.9	20
30–39 years	20.6	85
40–49 years	30.3	125
50–59 years	28.2	116
60–69 years	10.7	44
70–79 years	2.7	11
<b>Years of coaching</b>		
<5 years	11.9	49
5–9 years	18.5	76
10–14 years	18.2	75
15–19 years	12.6	52
20–29 years	20.2	83
30–39 years	14.6	60
≥40 years	4.1	17

(Continued)

**Table 1** (Continued).

	%	N
<b>Coaching events</b>		
Sprinting events	5.3	24
Jumping events	1.6	7
Throwing events	2.2	10
Distance events	12.8	58
All of the above	78.1	353
<b>In what events?</b>		
Sprinting events	37.6	143
Jumping events	17.1	65
Throwing events	8.2	31
Distance events	32.1	122
Combined events	5.0	19
<b>Your level as an athlete</b>		
International	8.1	31
National	47.4	182
Region	19.0	73
Prefecture	22.9	88
Hobby	2.6	10

**Note:** The questions are listed in bold font.

**Table 2** Summary of Sex Differences in the Survey Responses of Sports Coaches

	Female (%)	Male (%)	P-value
<b>Are you aware of the triad? (yes)</b>	74.4	56.1	<b>0.021</b>
<b>Are you aware of RED-S? (yes)</b>	64.3	52.2	0.138
<b>To what extent do you object to female athletes seeking medical attention for gynecological problems</b>			0.100
To a great extent	9.3	6.8	
Somewhat	2.3	5.2	
Very little	14.0	5.2	
Not at all	74.4	82.9	
<b>To what extent do you object to female athletes using low estrogen pills</b>			0.073
To a great extent	32.6	16.8	
Somewhat	14.0	16.3	

(Continued)

**Table 2** (Continued).

	Female (%)	Male (%)	P-value
Very little	27.9	27.1	
Not at all	25.6	39.8	
<b>Do you discuss menstrual issues with female athletes?</b>	81.4	56.6	<b>0.002</b>
<b>Do you have a physician who can discuss gynecological problems with female athletes? (yes)</b>	46.5	11.1	<b>&lt;0.001</b>

**Note:** The statistical significance and the questions that were asked are shown in bold font.

**Abbreviations:** The triad, female athlete triad (an interrelationship of low energy availability with or without disordered eating, menstrual irregularities or amenorrhea and low bone mineral density); RED-S, relative energy deficiency in sport (the result of insufficient caloric intake and/or excessive energy expenditure).

about problems regarding menses with athletes, and to have a physician able to discuss gynecological problems with female athletes including a team physician.

The results of the logistic regression analysis for each of the main survey questions are described below and summarized in [Table 3](#).

**Table 3** Results of the Logistic Regression Analysis (Statistically Significant Data Only)

	Odds Ratio	95% CI	p-value
<b>Are you aware of the triad? (yes)</b>			
<u>Sex (Ref: Male)</u>			
Female	3.59	[1.58, 8.17]	0.002
<u>Age (Ref: &lt;29 years)</u>			
30–39 years	0.19	[0.06, 0.57]	0.003
40–49 years	0.26	[0.09, 0.74]	0.011
50–59 years	0.30	[0.10, 0.92]	0.036
60 years+	0.17	[0.05, 0.60]	0.006
<u>Affiliation (Ref: Club team)</u>			
Elementary school	0.31	[0.10, 0.94]	0.039
High school	2.30	[1.18, 4.49]	0.015
University/college	9.02	[1.80, 45.25]	0.008
<u>Coaching years (Ref: &lt;5 years)</u>			
5–9 years	4.33	[1.72, 10.93]	0.002
15–19 years	3.53	[1.29, 9.67]	0.014
20–29 years	3.31	[1.23, 8.88]	0.018
≥ 30 years	4.32	[1.40, 13.36]	0.011

(Continued)

Table 3 (Continued).

	Odds Ratio	95% CI	p-value
<u>Events in which the coach was a former athlete (Ref: Sprinting events)</u>			
Jumping events	0.37	[0.19, 0.73]	0.004
<b>Are you aware of RED-S? (yes)</b>			
<u>Affiliation (Ref: Club team)</u>			
University/college	4.18	[1.05, 16.54]	0.042
<u>Years of coaching experience (Ref: &lt;5 years)</u>			
5–9 years	3.40	[1.43, 8.10]	0.006
15–19 years	2.84	[1.09, 7.38]	0.032
≥30 years	3.75	[1.29, 10.91]	0.015
<u>Events in which the coach was a former athlete (Ref: Sprinting events)</u>			
Jumping events	0.52	[0.27, 0.99]	0.045
Combined events	0.33	[0.12, 0.95]	0.041
<b>Object to athletes seeking medical attention for gynecological problems</b>			
<u>Coaching years (Ref: &lt;5 years)</u>			
10–14 years	0.32	[0.12, 0.91]	0.032
15–19 years	0.13	[0.03, 0.48]	0.003
≥30 years	0.21	[0.06, 0.76]	0.017
<b>Object to athletes taking low estrogen pills</b>			
<u>Affiliation (Ref: Club team)</u>			
High school	0.45	[0.23, 0.87]	0.017
Other	0.44	[0.20, 0.96]	0.038
<u>Coaching years (Ref: &lt;5 years)</u>			
10–14 years	0.38	[0.16, 0.90]	0.028
≥30 years	0.32	[0.11, 0.95]	0.040
<b>Talk about menses with athletes</b>			
<u>Sex (Ref: Male)</u>			
Female	5.07	[1.99, 12.94]	0.001
<u>Affiliation (Ref: Club team)</u>			
High school	3.01	[1.47, 6.16]	0.003
University/college	5.80	[1.17, 28.77]	0.031

(Continued)

**Table 3** (Continued).

	<b>Odds Ratio</b>	<b>95% CI</b>	<b>p-value</b>
<b>Coaching years (Ref: &lt;5 years)</b>			
10–14 years	4.97	[2.01, 12.28]	0.001
15–19 years	3.78	[1.36, 10.49]	0.011
20–29 years	7.47	[2.66, 20.93]	< 0.001
≥30 years	13.81	[4.23, 45.03]	< 0.001
<b>Have a physician who can discuss gynecological problems with female athletes (yes)</b>			
<b>Sex (Ref: Male)</b>			
Female	9.22	[4.00, 21.27]	<0.001
<b>Affiliation (Ref: Club team)</b>			
University/college	8.28	[2.16, 31.82]	0.002
Corporate team	11.3	[2.68, 47.71]	0.001

**Note:** The questions are listed in bold font.

**Abbreviations:** The triad, female athlete triad; RED-S, relative energy deficiency in sport; 95% CI, 95% confidence interval.

## Awareness of the Triad

Significantly more female than male coaches were aware of the triad (OR, 3.59;  $p = 0.002$ ). Considerably more coaches under the age of 30 years were aware of the triad than those aged 30 years and more. Coaches affiliated with high schools (OR, 2.30;  $p = 0.015$ ), universities/colleges (OR, 9.02;  $p = 0.008$ ), and club teams knew significantly more and those affiliated with elementary schools (OR, 0.31;  $p = 0.039$ ) knew less compared to those affiliated with club teams. Those with less than 5 years of coaching experience were less likely to be aware of the triad than those with more than 5 years of coaching experience. Those who used to be a jumper had significantly lower awareness of the triad compared to those who used to be a sprinter (OR, 0.37;  $p = 0.004$ ).

## Awareness of RED-S

Neither the sex nor the age of coaches was related to their knowledge of RED-S. Coaches affiliated with a university/college (OR, 4.18;  $p = 0.042$ ) were aware of RED-S than those affiliated with a club team. Significantly fewer number of coaches who used to compete in jumping (OR, 0.52;  $p = 0.045$ ) and combined (OR, 0.33;  $p = 0.041$ ) events were aware of RED-S than those who were former sprinters.

## Opposed to Female Athletes Seeking Medical Attention for Gynecological Problems

Those with a coaching experience of 10–19 years and more than 30 years were significantly less opposed to athletes seeking medical attention for gynecological problems than those with less than 5 years of experience.

## Opposed to Female Athletes' Use of Low Estrogen Pills

Neither the sex nor the age of coaches was associated with their opposition to female athletes' use of low estrogen pills. Coaches of high school athletes (OR, 0.45;  $p = 0.017$ ) were less opposed than coaches of club teams. Also, compared to those with less than 5 years of coaching experience, those with 10–14 years (OR, 0.38;  $p = 0.028$ ) and more than 30 years (OR, 0.32;  $p = 0.040$ ) of coaching experience were less likely to be opposed to female athletes' use of low estrogen pills.

## Discussion of Menses with Female Athletes

Female coaches were significantly more likely than their male counterparts to talk about menses with their female athletes (OR, 5.07,  $p = 0.001$ ). Coaches of high school (OR, 3.01;  $p = 0.003$ ) and university/college teams (OR, 5.80;  $p = 0.031$ ) were significantly more likely to talk about menses with their female athletes than coaches of club teams. Those with more than 10 years of coaching experience were significantly more likely to discuss menses with their female athletes than coaches with less than 5 years' experience.

## Access to a Physician (Including Having a Team Physician) Able to Address the Gynecological Problems of Female Athletes

Female coaches were significantly more likely than their male counterparts to have access to a physician able to address the gynecological problems of female athletes (OR, 9.22;  $p < 0.001$ ). Coaching at a university/college (OR, 8.28;  $p = 0.002$ ) or for a corporate team (OR, 11.30;  $p = 0.001$ ) was also positively related to the likelihood of having access to such a physician.

## Discussion

In this study, we surveyed sports coaches to determine their medical knowledge, awareness and attitudes toward female athletes. A total of 412 coaches responded to our survey, 89.6% of whom were males. This reflects the sex imbalance among track and field coaches, both in Japan and internationally.<sup>20,21</sup> Our participants were Japan Sport Association-certified sports instructors who had attended seminars on medical problems affecting female athletes. However, less than 60% of the coaches we surveyed were aware of the triad and RED-S. A previous study on American collegiate coaches found that 63.7% had heard of the triad, and 48.3% were able to identify the three components of the triad.<sup>22</sup> Our results indicated that female coaches are considerably more aware of the triad than their male counterparts. This suggests that female coaches are generally more knowledgeable about medical problems that affect female athletes. Our regression analysis found a positive relationship between the female sex and knowledge of the triad. Since RED-S was defined later than the triad, awareness of the triad was higher than that of RED-S.<sup>23,24</sup> Coaching high school and college teams was also positively related to knowledge of the triad. This may be because coaches affiliated with high schools and higher education institutions are more exposed to learning. Although, long-distance runners are more prone to encounter the triad than track and field athletes those coaches who were long-distance runners during their own athletic careers were no more likely to be aware of the triad than sprinters.<sup>25,26</sup> This is problematic because although the respondents were mostly males (89.6%), we would still expect those who had previously been involved in an event where the triad is common to be more aware of the problem than other coaches.<sup>25,26</sup> An age of 20–29 years was positively related to knowledge of the triad and RED-S, suggesting greater awareness among younger coaches. This is a positive sign for future coaching.

A total of 11.9% of coaches indicated that they were opposed to their female athletes seeking medical attention for gynecological problems “to a great extent” or “somewhat”. This is concerning because it could have significant detrimental effects on the health of female athletes. Moreover, 34.3% of coaches were opposed to their female athletes using low estrogen pills “to a great extent” or “somewhat”. Surprisingly, although there was only a small number of female coaches and there were no statistical differences between coach sexes, female coaches were considerably more opposed than their male counterparts to their female athletes using low estrogen pills. Low estrogen pills are often prescribed for dysmenorrhea which is prevalent among young females and in fact, Sundell et al reported that 67% of the women experienced dysmenorrhea at 24 years of age.<sup>27,28</sup> It is speculated that coaches who object to low estrogen pills do so because of potential side effects such as nausea and weight gain due to water retention.<sup>29–31</sup> Female athletes can also use low estrogen pills to manipulate their menstrual cycle so that it will not interfere with their games or training, which may be beneficial. Use of low estrogen pills is low in Japan compared with western countries possibly because of cultural differences and concerns about side effects.<sup>29–31</sup> However, this is changing, and use of low estrogen pills among Japanese female athletes increased from 7% of those who participated in the 2012 London Olympics to 27% of those who participated in the 2016 Rio Olympics although this is still low compared with other countries.<sup>32,33</sup> We also found a higher proportion of coaches with less than 5 years of coaching experience who objected to their athletes seeking



gynecological medical attention and using low estrogen pills than the proportion of more experienced coaches. Thus, these also reflect the fact that the coaches gain knowledge by coaching experiences.

Because the prevalence of dysmenorrhea is high in young females, coaches should know that advising young female athletes not to take low estrogen pills or other medications for its treatment is unethical. Although fear of the possible side effects is understandable; it is important to be aware that their incidence differs between individuals and coaches should not interfere with an athlete's medical decisions or the advice of medical professionals without sufficient knowledge.<sup>30–34</sup>

Significantly more female coaches (81.4%) than male coaches (56.6%) discussed about menses with female athletes. This possibly arises from the taboo against bringing up this topic with men, which makes it harder for male coaches.<sup>35–37</sup> Coaching at high schools and colleges was positively related to discussing menses with female athletes. This may be because these coaches spend time with the athletes outside of training because the majority of coaches in Japanese schools are faculty members.<sup>38</sup> Less experience in coaching was negatively related to menses discussion. We speculate that more recently qualified coaches may be reluctant to bring up the topic until they have built relationships with their athletes. Female coaches were significantly more likely than male coaches to have a physician with whom female athletes could discuss gynecological problems, and female sex showed a positive correlation with this in logistic regression analysis. This is possibly because female coaches have more easy access to gynecologists or feel more comfortable than their male counterparts discussing gynecological problems with their team physician if they have one. This is important for the health of female athletes.

This study had several limitations that should be noted. Because we did not test the respondents' knowledge of what exactly the triad and RED-S are, it is possible that some coaches who claimed to know about these did not. Because the survey was sent to officially licensed coaches, our respondents would have received some education on relevant subjects, making them more knowledgeable than coaches who are not officially licensed and there could have been a selection bias. Thus, future studies should focus on coaches at different professional levels, including those who are not officially licensed as those who are not officially licensed may not have much knowledge because they have not taken the lectural courses required to be licensed. In addition, the majority of our survey respondents were males, reflecting the high sex imbalance in this profession in Japan and future studies with more female coaches are essential. Unfortunately, most aspects of sports and roles associated with it are male-dominated, both in Japan and internationally and future studies should endeavor to include a broader demographic of coaches and should expand the survey outside of Japan.<sup>39</sup> In addition to the existence of a pay gap and fewer female events in the Olympics,<sup>40,41</sup> the lack of female coaches in most sports is a global problem. In this study, although it turned out that female coaches were more aware of medical issues related to female athletes compared to male counterparts, the percentage of female coaches was only 10.4%. Thus, it is possible that many female athletes may not be getting medical attention because of the lack of coaches' knowledge and awareness of medical problems related to female athletes. In order to promote sex equality in sports, it is important for both male and female coaches to have knowledge and awareness regarding medical problems related to female athletes and have to have more female coaches in the field to support female athletes. Thus, educating coaches by providing the opportunity to attend courses to obtain such knowledge is essential.

## Conclusions

In this study, we found that more female than male coaches are aware of the triad, talk about menses with their female athletes, and have access to a physician who can address gynecological problems. Having access to a physician, including a team physician, who can discuss gynecological problems with coaches and athletes is vital to the health and wellbeing of female athletes. While the necessity and importance of female coaches have been demonstrated in research dating back to 2009, sex imbalance remains and only 10.4% of the respondents in this study were female coaches. Our survey results also indicated that many coaches are not comfortable with their athletes seeking medical attention for gynecological problems or using low estrogen pills. It is apparent that coaches could benefit from more training and education to ensure they are fully equipped with the medical knowledge needed to support their athletes.

## Abbreviations

OR, Odds ratios; CIs, associated 95% confidence intervals; JAAF, the Japan Association of Athletics Federations; the triad, female athlete triad; RED-S, relative energy deficiency in sports.

## Ethics Statement

The study was approved by the Ethics Review Procedures Concerning Research with Human Subjects Group of the authors' affiliated institutions (approval number, 20190170). Signed statements of informed consent to participation and publication were obtained from the participants before the study.

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## Disclosure

The authors certify that there is no conflict of interest with any financial organization regarding the material discussed in the manuscript.

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