

# The Experience of Menstruation During Sports Activity in Taekwondo

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## **ABSTRACT**

Intense sports training increases the frequency of menstrual cycle disorders. The aim of this study was to examine female taekwondo athletes (N = 33), active competitors, about their experience of menstruation, their physical ability to train and compete, as well as their mental ability. Another objective was to determine the connection between the frequent reduction in body weight before the competition and the occurrence of various menstrual disorders, using the questionnaire survey compiled for this research. The negative effects of menstruation that most affect the physical fitness of the participants are the physical symptoms of premenstrual syndrome and severe menstrual cramps, while the emotional symptoms of premenstrual syndrome most affect their mental preparation. Menstruation did not show a limiting effect on achieving sports success and participation in sports activities at full intensity, except in sparring activities and explosiveness training. Among female athletes who have the experience of intentional weight loss before the competition 51.5% declare this affects their menstrual regularity. It is important to respect the individual characteristics of female athletes during menstruation. Training programs should include plans for determining body weight and long-term body composition.

**Keywords:** female athletes; menstrual cramps; pain; premenstrual syndrome; rapid weight loss

## INTRODUCTION

Menstruation can cause difficulties in sport performance. The menstrual cycle itself lasts an average of  $28 \pm 7$  days (Topalović, 2010). The menstruation is the initial phase, the early follicular phase, of the menstrual cycle which is characterized by menstrual bleeding which lasts 4–6 days (Carmichael et al., 2021). The first menstruation occurs around the age of 12 or 13 (Ozbar et al., 2016) and lasts until around the age of 50 (Topalović, 2010).

The issue of women's participation in physical activities, due to their differences from men, is as old as women's participation in sports. Because of the menstrual cycle, women's bodies have always been much more complex to research in medical science. Therefore, the question of how to balance menstruation with sports life is one of the most important and most common questions addressed to sports physicians (Medved, 1987). The impact of the menstrual cycle on athletic performance is still largely a mystery (Laske et al., 2022). Female athletes, just like women who do not engage in professional sports, may have various menstrual disorders, the most common of which are amenorrhea, menorrhagia (Topalović, 2010), dysmenorrhea (Proctor & Farquhar, 2006) and premenstrual syndrome (PMS) (Choi, 2017). Also, in athletes, it has been observed that menarche, the first period, starts a bit later (between the ages of 13 and 14), compared to the general population (Medved, 1987). In their study involving 48 taekwondo athletes, Kishali et al. (2006) reported that the mean age at menarche was  $13.92 \pm 0.19$  years. In addition, some studies have shown that intense physical activity plays a role in a delayed menarche (Czajkowska et al., 2019; Wodarska et al., 2013).

Sports training significantly increases the frequency of menstrual cycle disorders. The earlier they start training, the higher is the percentage of young women who struggle with menstrual disorders. This percentage can be up to 44% in women participating in competitive sports, while in sports disciplines that require weight loss, the frequency of menstrual disorders can be 75–79% (Witkoś & Wróbel, 2019). There are numerous factors that can affect menstrual disorders in female athletes: type of sports discipline, training intensity, number of training sessions per week, low energy balance, low body mass index, body fat percentage, inadequate eating habits and psychological stress related to competitions (Castelo-Branco et al., 2006). Menstruation with a regular rhythm is considered an indicator of a woman's good general health. Any deviation from the normal rhythm can be a sign of overtraining. Unfortunately, for many young women engaged in sports activities, amenorrhea is a desired situation that allows them to train intensively during the month, as well as achieve better results in competitions (Witkoś & Wróbel, 2019).

Doing sports during menstruation divides opinions, but generally professional athletes do not want to allow menstruation and the menstrual cycle to affect their participation in sports (Ozbar et al., 2016). Relatively small number of absences reported during training may be the result of internal and external pressures on athletes to perform (Findlay et al., 2020). It is accepted that moderate sports activity during menstrual bleeding is not harmful for women who train regularly, moreover, as stated by Medved (1987), movement can reduce possible menstrual complaints. Prado et al. (2021a) report that exercise at moderate intensity promotes more positive psychological responses compared to high-intensity exercise. More than 77% of female athletes experience

negative effects of menstruation, the most common being cramps, back pain and headaches (Martin et al., 2018). Observations at the 1952 Summer Olympics in Helsinki showed that physical fitness during menstruation was reduced in only about 25% of women, in 50% of them it was unchanged, and in 25% it was increased (Medved, 1987). It is not clear that there is an optimal phase for performance during menstrual cycle (Meignié et al., 2021). Prado et al. (2021b) consider that the menstrual cycle is a natural barrier for women to adhere to physical exercises. Šalaj (2009) emphasizes the importance of adjusting training during menstruation; thus, athletes with heavy and painful menstruation are recommended to stop sports for one to two days or at least reduce the intensity of training, which especially affects endurance exercises, jumps, and exercises for the abdominal muscles.

Martial arts such as taekwondo, with different weight categories, can be even more demanding for female athletes because they include punches, kicks and blocks, performed while standing or while the body is in motion (Mailapalli et al., 2015). The results of the research on female judo athletes by Itaka et al. (2022), indicate that menstrual symptoms may be more severe in lightweight classes with greater weight loss. Therefore, we considered that even in taekwondo athletes, frequent weight loss before competitions could be associated with the development of various menstrual disorders.

The aim of this study was to examine female taekwondo athletes about their experience of the influence of menstruation on their physical ability to train and compete, as well as their mental ability. Additionally, the objective was to determine the relationship between the frequent weight loss before competitions and the development of various menstrual disorders.

## **METHOD**

### ***Participants***

The research was conducted on a convenient sample of 33 female taekwondo athletes, active competitors from eight taekwondo clubs from different Croatian cities. The mean age of the participants was 18.2 ( $\pm$  2.98) years. The most common age was 19 years.

### ***Procedure***

The research was conducted completely anonymously, and data confidentiality was guaranteed to the participants. The study was conducted in full accordance with the Declaration of Helsinki. The data were collected through questionnaires that the participants had to fill out. Also, the subjects had to fill out a special form in which they signed their consent to participate in this research, which was collected separately from the questionnaire. The completed questionnaires were inserted into a box, and their processing was started only after the data collection was completed, to ensure the anonymity of the participants. The research was conducted from November 2021 to February 2022.

### ***Instrument***

The instrument was compiled for the purposes of this research. In addition to sociodemographic data, other questions refer to determining the difficulties that menstruation causes during sports.

These questions can be grouped into several units. One unit refers to difficulties that occur during menstruation (e.g., amenorrhea, menstrual cramps) with 11-point visual analogue scale (VAS) for pain (from 0 – no pain to 10 – the worst possible pain). Another unit refers to difficulties (accompanying symptoms) that most affect physical fitness during training, the third to difficulties that mostly affect mental fitness during training. The other part of the instrument is assembled of 20 questions that additionally assess sports rhythm during menstruation with offered answers from 1 – “no, not at all”, to 5 – “yes, completely”, and seven questions about the influence of menstruation on specific sports activities with three possible answers “yes, quite a lot”; “yes, a little” and “no, not at all”. Apart from that, we put three questions about weight control strategies (answers from 1 – “never”, to 4 – “always”), and five questions about their influence on some aspects of menstrual cycle (answers from 1 – “no, not at all”, to 5 – “yes, completely”).

We checked the structure of the 20-question Scale of Experience of Menstrual Difficulties in female athletes, compiled for this research, using Principal component analysis, which yielded six factors that together explain 74% of the variance. All observed factors were not interpretable, and based on the scatter plot, we chose two factors that together explain 34.6% of the variance. The first factor explains 20.5% of the variance, and 15 items are projected onto it, for example item *Can you associate certain days of the menstrual cycle with better personal performance?*. According to the items content, the first factor can be called the Effect of menstruation. The second factor explains additional 14.1% of the variance with only four items, for example *Do you play sports during the menstruation?*. All four items refer to the regime of sports activities during menstruation, so can be called the Sports regime. The first item was excluded from further data processing because it did not show satisfactory saturation with either of those two factors. Items that are negatively related to the factors were recoded for the purpose of expressing the total subscales' scores. The total score is divided by the number of belonging items, in order to make the results easier to compare on the scale from 1 to 5.

### **Statistical analysis**

Data were analyzed using the software package SPSS, version 22 (SPSS Inc., Chicago, IL, USA). The data were processed via the methods of descriptive and inferential statistics. Considering the relatively small sample and the deviation of some results from the normal distribution, non-parametric procedures in inferential statistics were preferred. I.e., the Kolmogorov-Smirnov test was significant for 44 quantitative variables out of a total of 52. In descriptive statistics, the arithmetic mean was used because of its greater precision compared to the median.

## **RESULTS**

Based on the data on body weight and body height of female athletes, their body mass index was calculated (Table 1).

**Table 1.** Descriptive statistics for data on body composition and menstruation (N = 33)

	<b>M</b>	<b>SD</b>	<b>M<sub>d</sub></b>	<b>Min</b>	<b>Max</b>
Body weight (kg)	61.97	10.203	60	45	99
Body height (cm)	165.39	27.597	170	155	183
Body mass index (kg/m <sup>2</sup> )	21.357	2.598	21.16	17.15	31.25
Age at menarche	12.833	1.418	12.5	9	17
Duration of the menstrual cycle	29.73	7.678	28	21	70
Duration of menstruation	5.53	0.901	5	4	7
Pain during the first day of menstruation	5.09	2.887	6	0	9

Legend: M—Mean; SD—Standard Deviation; M<sub>d</sub>—Median; Min—Minimum; Max—Maximum.

The average body mass index is 21.4, so it could be concluded that most female athletes have a normal body mass index. The mean age of first menstruation is 12.9, while the median is 12.5. The median of the duration of the menstrual cycle is 28 days, while the mean value is 29.7 with considerable variability – the SD is 7.7 days. The maximum duration of the menstrual cycle, which is 70 days, stands out. The duration of menstruation's median is 5 days, which is close to the mean value – 5.5. The minimum and maximum values, and the duration of menstruation are in the normal range for all participants.

The participants rated the pain during the first day of menstruation on a scale from 0 to 10, where 0 means no pain and 10 the worst possible pain. The average intensity of pain that taekwondo athletes feel during the first day of menstruation is 5.1 with a median of 6, which can be characterized as moderate/fair pain.

In terms of sports regime and experience, the participants have been training for an average of 11.4 years. In the last 6 months, female athletes have been training an average of  $9.74 \pm 2.64$  hours per week. The median is close to the mean value, it is 10, with the range from 4.5 to 17 hours per week.

Table 2 shows the difficulties related to menstruation that are present in the participants, and which difficulties affect physical and mental preparation during training or competition. It was possible to choose more than one answer.

**Table 2.** Difficulties related to the menstrual cycle for certain activities of female athletes, expressed in percentages

<b>Difficulty</b>	<b>Difficulties in general</b>	<b>Impact on physical fitness</b>	<b>Impact on mental preparation</b>
Amenorrhea	12.1	0	6.1
Heavy menstrual bleeding	24.2	30.3	18.2
Severe menstrual cramps	57.6	45.5	24.2
PMS – emotional symptoms	66.7	36.4	63.6
PMS – physical symptoms	54.5	48.5	21.2
Other	6.1	0	0

Five participants indicated that they did not have any menstrual disorder. The most common menstrual disorder that occurs is PMS – emotional symptoms (66.7%), followed by severe menstrual cramps (57.6%). Other menstrual disorders were selected by only two participants, one wrote the answer bloating and the need for food, while the other mentioned cramps a day or two before the bleeding started. In the question that examines the influence of menstruation on physical fitness, the most common response of female athletes was PMS – physical symptoms (48.5%), followed by menstrual cramps. Regarding the impact on psychological well-being, the most often selected answer (63.6%) was PMS – emotional symptoms (irritability, tension, anxiety, restlessness, anger, etc.). The average number of difficulties during the menstrual cycle is 2.2, while the median and mode are 2. The average number of disorders affecting the physical fitness of female athletes is 1.6, the median and mode are 2. For disorders that affect the mental fitness of taekwondo athletes, the average number is 1.3, while the median and mode are 1.

Participants were asked which of the emotional symptoms has the greatest influence on their participation in sports activities at full intensity. Change in mood affects the most (18 participants; 54.5%), followed by irritability with a frequency of 12 (36.4%), then anxiety emphasized by 8 female athletes (24.2%), tension with a frequency of 7 (21.2%), anger was selected by four athletes (12.1%), and disturbance by 3 (9.1%). Only two female athletes chose the category other (6.1%), in which they mentioned fatigue or anxiety. The average number of difficulties experienced by female athletes is  $M = 1.6$ , while the median and mode are 1. For five athletes (15.2%) emotional symptoms do not affect their participation in sports activities. From Table 3, it is evident that the effect of menstruation is more pronounced in the experience, than it is manifested in the sports regime.

**Table 3.** Descriptive statistics for the factors of the Scale of menstrual experience in female athletes (N = 33)

Factors	M	SD	$M_d$	Min	Max	TR
The effect of menstruation	2.527	0.636	2.60	1	3.87	1–5
Sport regime	1.417	0.413	1.25	1	3	1–5

Legend: M—Mean; SD—Standard Deviation;  $M_d$ —Median; Min—Minimum; Max—Maximum; TR—Theoretical Range.

Therefore, the changes experienced by female athletes due to menstruation are evident more than in the sports regime. The scores for factors on a scale of 1 to 5 have been reduced, with the answer 1 meaning “no, not at all” and 5 “yes, a lot”. The statement *Do you do sports during the menstruation?* showed  $M = 4.76$  and  $SD = 0.435$  with a median of 4. For both statements, the lowest answer was 4 on a scale of 1 to 5. The participants mostly rate their menstrual cycle as regular ( $M = 4.12$  with  $SD = 0.96$ , and median 4).

The lowest mean value appeared for question *Do you miss the competition because of your menstruation?* ( $M = 1.12$ ;  $SD = 0.415$ ) which shows that respondents mostly do not avoid the competition because of menstruation. To the question *How prone are you to intentionally delaying your menstruation during the competition?* the arithmetic mean is 1.27 with the standard deviation of 0.674, and median 1, which indicates that most of the participants are not at all willing to intentionally postpone menstruation

during the competition. A total of 81.8% participants chose answer “not at all”. Furthermore, they are not prone to miss training due to menstruation ( $M = 1.61$ ;  $SD = 0.827$ ;  $Md = 1$ ).

The following are the results of the degree of impediment caused by menstruation in certain activities. It is an ordinal scale, so only the medians will be shown. For the activities of running/sprints, stretching, strength exercises, endurance exercises, explosiveness exercises and sparring, the dominant answer was “yes, a little”, while for the mobilization exercises, it was the answer “no, not at all”.

Mostly, the pain caused by menstruation does not limit respondents in stretching and dynamic mobilization activities. The most severe limitation was shown in sparring, where 39.4% of the participants chose the answer “yes, a little”, and 33.3% chose the answer “yes, a lot”, and the same percentage of answers was also recorded in exercises for explosiveness.

Also, the relationship between the regulation of body weight and the menstrual cycle was of interest to us. Therefore, the participants were first asked whether they included such procedures in their sports practice. The optional answers ranged from 1 – “never” to 4 – “always”. The statement with the highest mean value is the one in which the participants state that they maintain their current body weight before competition (Table 4).

**Table 4.** Descriptive statistics of intentional weight loss or weight gain before competition

Statement	M	SD	$M_d$	Min	Max	TR
Before the competition, I maintain the current body weight	2.79	0.893	3.00	1	4	1–4
I have to lose a certain body weight before the competition	2.70	0.984	3.00	1	4	1–4
I have to gain a certain body weight before the competition	1.21	0.485	1.00	1	3	1–4

Legend: M—Mean; SD—Standard Deviation;  $M_d$ —Median; Min—Minimum; Max—Maximum; TR—Theoretical Range.

The average level of agreement is 2.8, and as many as 36.4% of participants chose the answer often, and 24.2% the answer always. A somewhat contradictory result was obtained for the statement related to the intentional weight loss before competition – the arithmetic mean is 2.7 which also indicates moderate frequency (answer 3 refers to often). Indeed, the highest percentage of selected answers is often – 33.3%, and then sometimes (30.3% of participants), but as many as 24.2% of participants are always exposed to this experience. The lowest mean value was recorded for the intentional weight gain before the competition. The average level of agreement is 1.2, indicating that they almost never do this. 81.8% of participants chose the answer never.

Furthermore, the participants were asked how body weight regulation affects the individual characteristics of the menstrual cycle. The optional answers ranged from 1 – “no, not at all” to 5 – “yes, completely”. The highest arithmetic mean was determined for the statement that a consistently greater weight loss or gain before the competition affects the regularity of menstruation. The average level of agreement is 3.16 (Table 5), which correlates with the answer “neither yes nor no”.

**Table 5.** Descriptive statistics of the relationship of intentional weight loss or weight gain before competition and the occurrence of menstrual disorders

<b>To what extent do you notice that the constant greater loss or gain of kilograms before the competition affects:</b>	<b>M</b>	<b>SD</b>	<b>M<sub>d</sub></b>	<b>Min</b>	<b>Max</b>	<b>TR</b>
The regularity of your menstrual cycle?	3.16	1.369	4.00	1	5	1–5
Mental condition during menstruation?	3.06	1.181	3.00	1	5	1–5
Heavy menstrual bleeding?	2.61	1.256	3.00	1	5	1–5
Menstrual cramps?	2.52	1.208	3.00	1	5	1–5
Duration of menstruation?	2.32	1.194	2.00	1	5	1–5

Legend: M—Mean; SD—Standard Deviation; Md—Median; Min—Minimum; Max—Maximum; TR—Theoretical Range.

The most frequent answer to the mentioned question was “mostly yes” (39.4%), and 12.1% chose the answer “yes, completely”, which makes up more than half of the sample in total. The lowest mean score ( $M = 2.32$ ) was present for the last statement.

We will also refer to the correlations between the variables, which were checked using the nonparametric Spearman’s Rho coefficient. Only some significant correlations greater than 0.2 will be listed. The correlation between age and intensity of pain on the first day of menstruation is  $\rho = 0.405$ ;  $P = 0.019$ ; i.e., the older the athlete, the greater the pain on the first day of menstruation. Furthermore, pain on the first day of menstruation is greater as the number of hours of training per week increases ( $\rho = 0.457$ ;  $P = 0.008$ ). A negative correlation was found between the menarche age and pain on the first day of menstruation ( $\rho = -0.464$ ;  $P = 0.006$ ), as well as between the duration of the menstrual cycle and the maintenance of the current body weight before the competition ( $\rho = -0.417$ ;  $P = 0.016$ ). The correlation between the menarche age and menstrual disorders is  $\rho = -0.446$ ;  $P = 0.009$ . It can be concluded that the later the menarche started, the less the disorders were among the participants. There is a statistically significant positive correlation between pain on the first day of menstruation and menstrual disorders affecting physical fitness ( $\rho = 0.534$ ;  $P = 0.001$ ) and mental fitness ( $\rho = 0.442$ ;  $P = 0.010$ ). This indicates that the greater the pain during the first day of menstruation, the greater the impact of menstrual disorders on the physical and mental fitness of female athletes during training or competition.

## DISCUSSION

The aim of the research was to examine female taekwondo athletes about their experience of menstruation, their physical ability to train and compete, and their mental ability during the menstruation. Also, the goal was to determine the connection between the frequent reduction in body weight before the competitions and the occurrence of various menstrual disorders.

According to the research results, on average the participants have been involved in sports for more than 11 years. It is also possible to see an intensive weekly number of training hours. In



addition, it can be confirmed that the body mass index of the examined taekwondo athletes is within normal values, which was expected considering their performance of sports activities. The average age of first menstruation is 12 years (42.4% of examined athletes). Most of the other female athletes (44.1% of the sample) got their first period between the ages of 13 and 15. Dušek (2001) states that in athletes who started training before menarche, a delay of the first menstruation was observed for almost a year, in contrast to athletes who already had their period when they started training. This indicates that intense sports training before menarche delays menarche itself. Possible reasons for the delay of menarche in female athletes may be a reduced amount of fat tissue and the physical and psychological stress to which female athletes are exposed (Dušek, 2001). The duration of the menstrual cycle and the menstruation itself proved to be normal in most of our participants, which we can relate to the findings of the study by Ozbar et al. (2016) where 75% of female athletes had normal duration of menstruation. According to their research, only 8.8% of the female athletes reported painful menstruation, 55.6% of them considered that it is sometimes painful, and 35.6% that it is painless, while a total of 73% of the participants stated that their menstruation has normal duration of 3 to 5 days. In the research of Czajkowska et al. (2019) the pain level of the participants during menstruation was estimated as an average of 1.95. On the other hand, in our research, the average pain level of the participants was 5.1, which indicates a medium pain.

As negative effects of menstruation, i.e. menstrual disorders, which the participants reported, the most common were PMS – emotional symptoms (66.7%), PMS – physical symptoms (54.5%) and severe menstrual cramps (57.6%), while the least response was for the absence of menstruation (12.1%), and the answer that denied the presence of the disorder (15.2%). According to Martin et al. (2018), the most negative effects of menstruation are menstrual cramps, but also symptoms such as back pain, headache and bloating, which the participants of our study indicated “rarely” or “not at all”. According to the abovementioned, it is not surprising that in the examined taekwondo athletes, PMS – physical symptoms and severe menstrual cramps limit their physical fitness the most. Also, menstrual cramps are the second most common disorder, along with the emotional symptoms of PMS, i.e. those disorders that have the most impact on mental fitness. Of the emotional symptoms that occur during the premenstrual phase, a total of 54.5% of the participants stated that mood changes had the greatest impact on their participation in sports activities with full intensity. According to the obtained results, the examined taekwondo athletes did not state that menstruation has a limiting effect on achieving sports success and participating in sports activities at full intensity. In total, 75.8% of the participants indicated that the fact that menstruation affects their sports success does not apply to them at all or mostly. Contrary to our finding, Bruinvels et al. (2016) point out that more than half of professional British female marathon runners feel their menstrual cycle affects their training and sports performance in some way. Menstrual cycle disorders, such as heavy menstrual bleeding, affect the health of female athletes, and thus their sports success. In that study, 37% of professional female marathon runners reported heavy menstrual bleeding that required medical help. These values are comparable to the results obtained in our study (24.2%), although these are physiologically quite different sports.

Ozbar et al. (2016) state that 97.5% of female athletes participate in sports activities during menstruation, which is in line with our results, where 100% of the participants rated the item

of engaging in sports activities during menstruation as “mostly” and “totally yes”. We can relate to this considering that the lowest level of agreement was expressed on questions about absence from competitions and training during menstruation. Such results can be interpreted with the fact that the assessed athletes have been involved in sports for a rather long time and consider sport as extremely important in their lives (100% of the participants rate sport as important with maximal grades 4 and 5) and they do not want to let menstruation and concomitant problems affect their sports activity and achievements. It is also possible that female athletes do not want to be considered different from male athletes. Therefore, they have accepted menstruation just like the pain which occurs with injuries as part of sports ethics. This can be connected to the Martin et al. (2018) research, where a relatively small number of absences from training and competition was recorded, which may be related to internal and external pressure on female athletes. These pressures may result in professional athletes being more likely to continue training or competing despite having symptoms, compared to the general population or recreational athletes.

Given the fact that taekwondo is a martial sport in which athletes compete in weight categories, many athletes decide to lose weight on purpose. Artioli et al. (2010) state that many judo athletes, in order to qualify for lower weight categories, and to achieve a competitive advantage, use methods that can negatively affect their health and sports performance. By reducing their body weight a few days before the competition, they try to get an advantage against lighter weight, thus weaker rivals. To reduce body weight, they use methods such as restricting food and drink intake, exercising in rubber or plastic suits, using saunas, taking diet pills, and even vomiting. Since taekwondo athletes participate in many competitions through the year, the reduction of body weight is repeated many times throughout their competitive career. To change their body weight before competitions, taekwondo athletes mostly use rapid weight loss exercises 16 to 20 hours before the competition. After the weighing, athletes try to compensate for the loss of nutrients, hydration and try to increase body weight before the first fight (Kazemi et al., 2011). In our research, 24.2% of female athletes marked the answer that they always have to lose a certain body weight before the competition, 33.3% of them often, and 30.3% sometimes. A total of 87.8% of our participants were subjecting themselves to rapid weight loss practices. Almost the same percentages were found in two similar studies: Fleming and Costarelli (2009) found that 87% of the taekwondo athletes would undergo rapid weight loss to make classification, as did 86% of the judo athletes who participated in the study by Artioli et al. (2010).

Ravi et al. (2021) observed that menstrual disorders are more often related to female athletes who train in sports with weight categories, i.e. female athletes who intentionally lose body weight while trying to reach desired body weight. Nazem and Ackerman (2012) demonstrate that the prevalence of secondary amenorrhea, the most discussed menstrual abnormality in female athletes, occurs at higher rates in female athletes compared to the general population, especially in lean-build sports. In our research, taekwondo athletes indicated that pain during the first day of menstruation limits them the most in sparring activities and explosiveness training. Similarly, in professional female soccer players, Mishra & Agashe (2021) observed that the menstrual cycle affects the explosive strength. They also noted that the motor skills of female athletes were reduced during the premenstrual phase and during menstruation.

Based on all the above, awareness and understanding of female athletes and their menstrual cycle should be increased, while providing opportunities to address factors that impair health and sports performance. Symptoms of menstrual dysfunction should be taken seriously, and female athletes who have symptoms should get adequate medical evaluation and appropriate treatment. Guided by the fact that a large percentage of taekwondo athletes reduce body weight intentionally by various methods, it is necessary for coaches, physiotherapists and sports physicians to include plans for determining body weight and long-term body composition in their training programs. Our research could be useful to coaches as an indicator that it is necessary to monitor the menstrual cycle in taekwondo athletes and articulate a training plan respectively. Furthermore, from our research and several earlier studies (Castelo-Branco et al., 2006; Artioli et al., 2010; Kazemi et al., 2011; Nazem & Ackerman, 2012; Ravi et al., 2021) the negative consequences of intentional weight loss in female athletes and its impact on the occurrence of menstrual disorders are highlighted.

## **LIMITATIONS AND FUTURE RESEARCH SUGGESTIONS**

Some of the limitations of this study are the small number of female taekwondo athletes who agreed to participate and the self-assessment regarding the relationship between intentional weight loss before competitions and menstrual disorders. Another limitation was the fact that the research was conducted during the Covid-19 pandemic, when the number of taekwondo competitions was significantly reduced. In future research, by increasing the number of participants, the results would be more credible. In order to assess the impact of intentional weight loss before the competition on the occurrence of menstrual disorders in female athletes, it is necessary to monitor the athletes over a longer period of time, and to keep the menstrual diary in an interdisciplinary professional manner.

## **CONCLUSION**

The taekwondo athletes who participated in this research had the first menstruation occurred a little later than in the general population, but the duration of menstruation and the menstrual cycle are within normal ranges. The pain on the first day of menstruation is intense. Regarding physical fitness during training and competition, the participants are most affected by the physical symptoms of premenstrual syndrome and severe menstrual cramps, while the emotional symptoms of premenstrual syndrome are most present at the level of their mental fitness, with an emphasis on mood changes. In total, 75.8% of the participants indicated that menstruation does not affect their sports success “at all” or “mostly”. For female athletes menstruation does not have a limiting effect on achieving sports success and participation in sports activities at full intensity. Therefore, they participate in sports activities during menstruation, despite the pain they feel during that period, e.g., the least agreement was on the questions about missing competitions and training during menstruation. Female athletes do not want to allow menstruation to affect their sports activity and success in sports.

Among taekwondo athletes who have the experience of intentional weight loss before the competition 51.5% declare this affects their menstrual regularity. Intentional weight loss affects mental condition during menstruation out of 42.5%, heavy menstrual bleeding out of 30.3%, and menstrual cramps and duration of menstruation both with 21.2%.

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