MENSTRUAL STATUS DIFFERENCES OF ELITE TURKISH FEMALE ATHLETES FROM VARIOUS TEAM SPORTS[4]

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Abstract

The aim of this study was to analyze the menstrual status of elite Turkish female athletes from different team sports.

The study universe was composed of elite female athletes playing in basketball, soccer, field hockey and handball teams in the Turkish Premier League and Turkish Super League. The study sample consisted of 133 randomly-selected female athletes playing in soccer (n=33), basketball (n=29), handball (n=27) and field hockey (n= 44) teams competing in these leagues. An 37-item questionnaire was administered to collect data on the demographic and menstrual status of participants. Cronbach's alpha reliability coefficient was found 0.78 for the questionnaire. Frequency distributions of the study data were calculated on the basis of two or more variables. A chi-square test was applied to some items and one-way analysis of variance (ANOVA) was applied to unrelated samples. Data analysis was performed using SPSS 10.0.

No significant relationship was found between menstrual disorders and sport branches (χ^2=3.893, p>.05). A significant relationship was detected between sports branches and changes to the menstrual cycle related to sporting activity (χ^2=12.165, p<.05). 8.3% of participants suffered from menstrual problems after starting sports. No significant relationship was detected between training frequency and menstrual cycle disorders (χ^2=1.178, p>.05). A statistically-significant relationship was found between sports branches and the effects of menstruation on the sports activity in favor of the female athletes who stated that they were psychologically affected by menstruation (χ^2=15.53, p<.05) and that they experienced psychological symptoms related to menstruation (χ^2=15.53, p<.05).

It is concluded that sports activities can affect the menstrual-cycle and that, among elite Turkish female athletes, such effects occur most commonly as psychological symptoms.

Key words: Menstruation, Female Athletes and Menstrual Disorders.

DEĞIŞIK TAKIM SPORLARINDAKI TÜRK ELIT KADIN SPORCULARIN MENSTRUEL DURUMLARININ DEĞERLENDIRILMESI

Özet

Bu çalışma, Türk bayan elit takım sporcularının menstruel durumlarını değerlendirmek amacıyla yapılmıştır.

Araştırmanın evrenini 1. lig ve süper ligdeki basketbol, futbol, çim hokeyi ve hentbol bayan takım sporcuları oluşturmaktadır. Örneklemini ise bu liglerde müsabakalara katılan rastgele yöntemiyle seçilen futbolda n=33, basketbolda n=29, hentbolda n=27 ve çim hokeyinde n=44 olmak üzere toplam 133 bayan sporcu oluşturmaktadır. Araştırmada veri toplama aracı olarak sporcuların demografik bilgilerini ve menstruel durumlarını belirlemeye yönelik 37 sorudan oluşan bir anket uygulanmıştır. Anketlerden elde edilen verilerin iki ya da daha çok değişkene ilişkin frekans dağılımlarını çıkarılmış, bazı sorular için kay-kare testi bazılarında içinde ilişkisiz örneklemler için tek faktörlü varyans analizi (Anova) uygulanmıştır. Anket için cronbach's alpha güvenilirlik kat sayısı 0.78 olarak bulunmuştur. Verilerin değerlendirilmesinde ve hesaplanmış değerlerin bulunmasında SPSS 10.0 istatistik programı kullanılmıştır.

Anket sonuçlarına göre branşlar ile menstruel düzensizlikler arasında anlamlı bir ilişki bulunamamıştır (χ^2=3.893, p>.05). Branşlar ile sportif aktivitenin menstruel periyodu değiştirme durumları arasında anlamlı bir ilişki bulunmuştur (χ^2=12.165, p<.05). Sporculardan spora başladıktan sonra adet ile ilgi problemleri olanlar %8.3 olarak belirlenmiştir. Antrenman sıklığı ile menstruel siklus düzensizlikleri arasında anlamlı bir ilişki bulunamamıştır (χ^2=1.178, p>.05). Branşlar ile menstruasyonun sportif aktiviteyi etkileme durumları arasında psikolojik olarak etkilendiğini belirten sporcular lehine anlamlı bir ilişki bulunmuştur (χ^2=15.53, p<.05).

Sonuç olarak, Türk elit bayan takım sporcularında sporun menstruel periyodu değiştirebildiği ve menstruasyonun sportif aktiviteyi daha çok psikolojik olarak etkilediği dükünülmektedir.

Anahtar Kelimeler: Menstruasyon, Bayan Sporcular, Menstruel Düzensizlikler

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INTRODUCTION

The misconceptions that prevented women from participating in sports activities for long years have been recently overcome thanks to the scientific studies on the efficiency of women in sports activities. The playing of sports during any phase of life is no longer a "disadvantage" for women. However, female athletes may suffer from some sports-related health problems, including menstrual disorders.

The menstrual cycle is characterized by hormone-induced changes within the reproductive organs each month. The regularity of menorrhea depends on hypothalamus-pituitary-ovary coordination and, in turn, the changes occurring in the endometrium of the target organ. Each cycle stars at the first day of the menstruation and ends before the first day of the next menstruation. The average length of the menstrual cycle is 28 days, while some regular cycles within the range 21-35 days may also be encountered (17).

There are many internal and external factors effective on the menstrual cycle, such as physiological and morphological structure, nutrition, various organ deformities and diseases (9).

Amenorrhea is the absence of the menstrual cycle for three months or longer. Prolactin hypersecretion is the most common cause of pituitary-induced amenorrhea. Patients with such a problem generally suffer from hypoestrogenemia-induced secondary amenorrhea (1).

Exercise, hypoglycemia, surgical intervention and stress are among the other causes of PRL increase. It has been shown that increased PRL levels can be temporary and that such temporary increases may negatively affect fertility. It has been suggested that increased PRL levels during the middle of the menstrual cycle may prevent fertilization and implantation (26).

PRL can be inhibited by changes in the sympathetic activity of athletes and by other hormones. PRL levels of the trained people have been found to be lower than those of sedentary people. Exercise-induced PRL may lead to menstruation changes, as it may result in inhibition of the ovarium functions of female athletes.

Female athletes may suffer from menstrual disorders such as primary and secondary amenorrhea, oligomenorrhea, short luteal phase and anovulation. It has been stated that menstrual disorders are more frequently reported in sports that require low body weight and slim body structure for better performance. Athletes involved in such sports may suffer from reduction in hypothalamus GnRH pulsation, a decrease in LH and FSH pulsatile secretion and amenorrhea as a result of ovary stimulation defects. Hyperandrogenism is another reason for amenorrhea in athletes (2, 19, 32, 34). The reasons for changes in the reproductive systems of female athletes are not well-known, but weight loss; changes in energy consumption, diet and muscle-fat ratio; exercise-induced physiological and emotional stress; and acute or chronic effects of exercise are known to result in menstrual disorders (15, 16, 23).

The prevalence of menstrual disorder-induced osteoporosis in female athletes is not known. However, high rates of nutrition disorders have been observed in long-distance runners with oligo/amenorrhea. Moreover, lumbar vertebra (-5%), hip (-6%) and total body (-3%) bond mineral density of these athletes have been found to be lower than those of athletes with a regular menstrual cycle (10).

Oteoporosis is triggered by a decrease in the level of the hormone estrogen. In a study of 200 athletes in premenstrual phase, a 10% decrease was recorded in the lumbar vertebra density of athletes suffering from amenorrhea. Female athletes with oligo/amenorrhea and late-onset menarche have been reported to suffer more from stress fractures (15). Both situations underline the relationship between menstrual disorders and

osteoporosis. Osteoporosis-induced bone losses may be irreversible, and wedge-shaped vertebral fractures may affect the posture and lead to life-long changes. Early diagnosis and treatment of the female athlete triangle "eating disorders - amenorrhea - osteoporosis" is of great importance for health (35).

Menstrual disorders experienced by female athletes may have short-term effects, such as infertility and long-term effects, such as osteoporosis. The frequency of menstrual disorders and related problems suffered by female athletes varies on an individual basis as well as between sports disciplines. While some women are not subject to changes in the pre-menstruation and menstruation period, others can experience physical, behavioral and psychological changes and disorders.

Monthly-repeated regular cyclical changes occur in the menstruation process, which is one of the most special periods of women's lives. There is no clear consensus on whether athletic performance is affected by these changes and exercise-induced menstrual disorders. The present study aimed to identify some characteristics of menstruation amongst elite Turkish athletes playing team sports and the effects of menstruation on their performance.

MATERIAL AND METHODS

Sample Characteristics: The menstrual status of female athletes playing elite-level handball, soccer, field hockey and basketball teams was evaluated. A questionnaire was administered to 133 athletes involved in handball (n=27), soccer (n=33), field hockey (n=44) and basketball (n=29).

Table 1. Physical Characteristics of Participants

Variables	Handball (n=27)	Soccer (n=33)	Field Hockey (n=44)	Basketball (n=29)
Age (year)	23.62±3.04	22.21±3.33	19.93±3.87	22.72±2.85
Height (cm)	168.92±6.74	164.30±6.29	164.95±5.56	177.03±5.38
Body Weight (kg)	60.74±5.13	54.87±5.75	52.31±6.25	64.82±7.21
Menarche Age (year)	13.18±1.14	14.15±1.72	13.39±1.50	14±1.16
Age of Starting Sports (year)	12±2.49	12.54±2.41	11.11±1.99	12.10±1.87

Data Collection and Analysis: A 37-item questionnaire was used to obtain information on the demographic characteristics and menstrual status of the athletes. Cronbach's alpha reliability coefficient was found 0.78 for the questionnaire. A frequency distribution of the questionnaire data was produced on the basis of two or more variables. A Chi-square test was applied to some items and one-way analysis of variance (ANOVA) was used for unrelated samples. To identify those groups with significant results in ANOVA tests, a Tukey HSD (Honestly Significant Differences) multi-comparison test was conducted on the ANOVA results found to be significant. Statistical analysis was performed using SPSS 10.0.

RESULTS

Table 2. Branch Comparison on the basis of Menarche Age

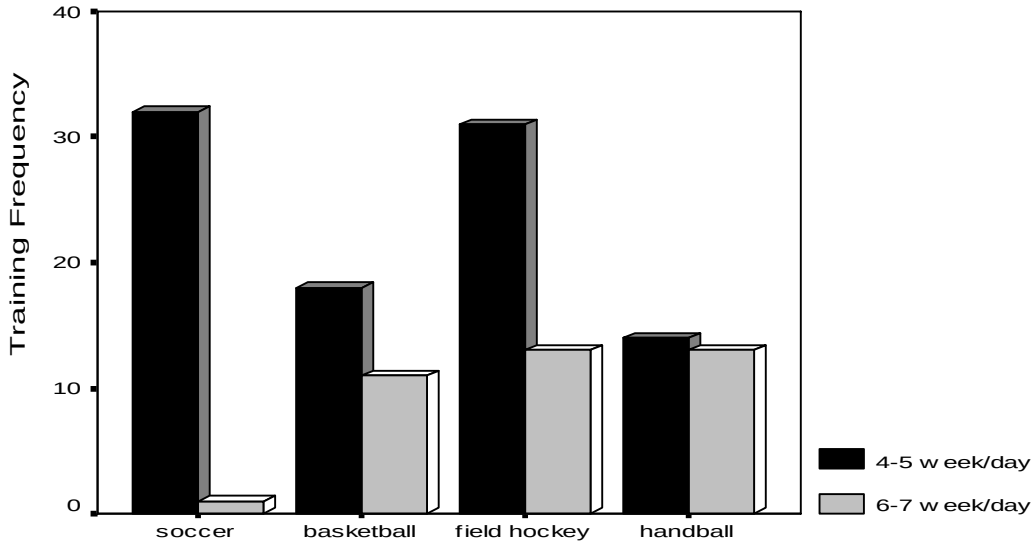
Menarche Age (Year)	N	Mean Rank	sd	g^2	p
Soccer	33	73.03	3	5.01	0.17
Basketball	29	73.60			
Field Hockey	44	66.14			
Handball	27	53.94			

No significant difference was observed when the sports branches were compared on the basis of menarche age (p>.05).

Table 3. Comparison of Branches on the basis of Age of Starting Sports

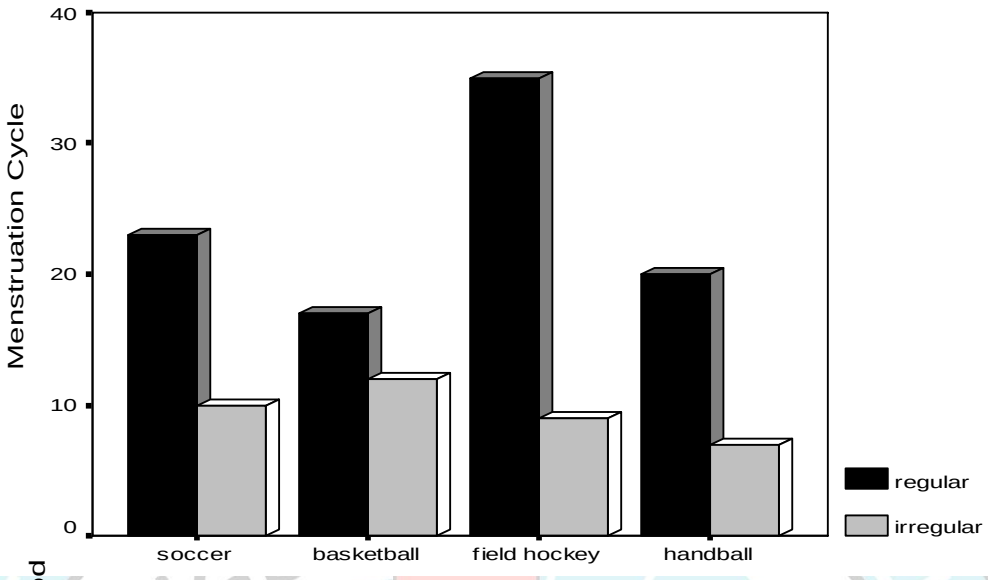
Age Of Starting Sports (Year)	N	Mean Rank	sd	g^2	p
Soccer	33	76.17	3	3.44	0.33
Basketball	29	67.09			
Field Hockey	44	61.66			
Handball	27	64.41			

No significant difference was recorded when the sports branches were compared on the basis of age of starting sports (p>.05)



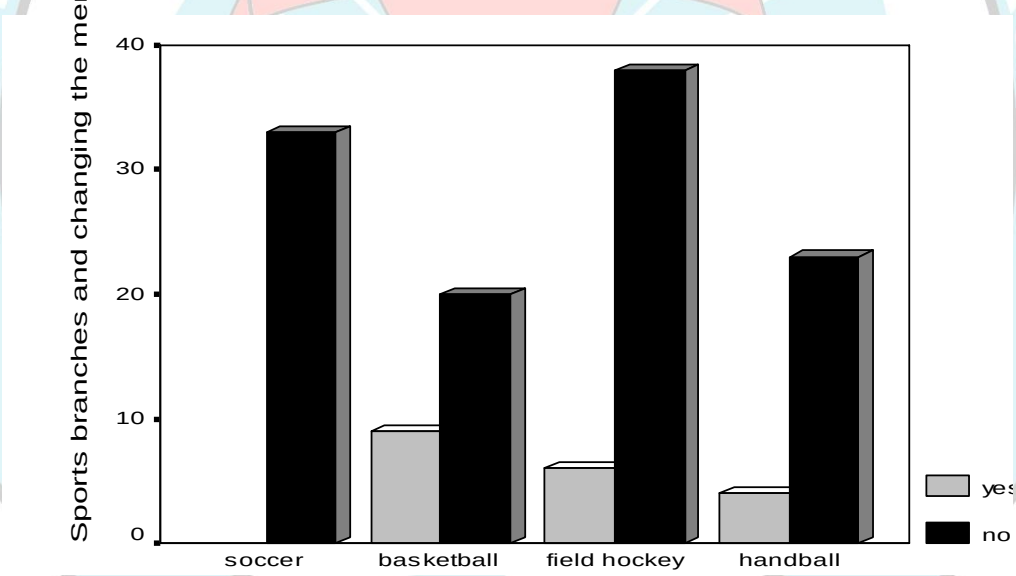
g^2=16.88 sd=3 P=0.001

Fig 1. 48.1% of the handball players and 37.9% of the basketball players practiced 6-7 days/week and 97% of the soccer players practiced 4-5 days/week. The relationship between the type of sport and practice frequency was found to be significant (p<.05).



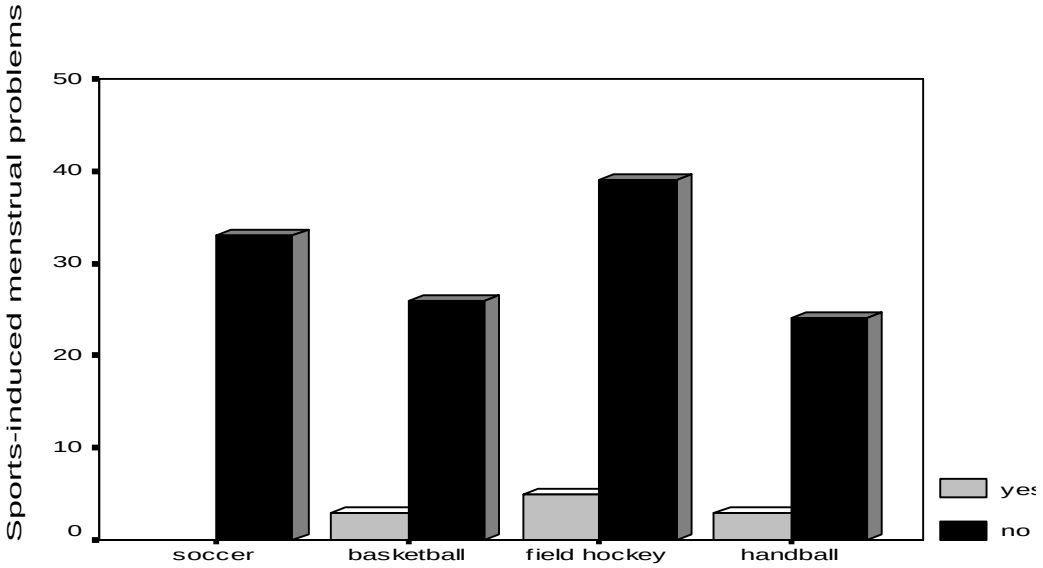
χ^2=3.89 sd=3 P=0.27

Fig 2. Basketball was found to be the sports branch with the highest rate of menstrual cycle disorders (41.4%) and field hockey showed the lowest menstrual cycle disorders (20.5%). However, the difference between the menstrual cycle regularity of the athletes playing different sports was found to be insignificant (p>0.05).



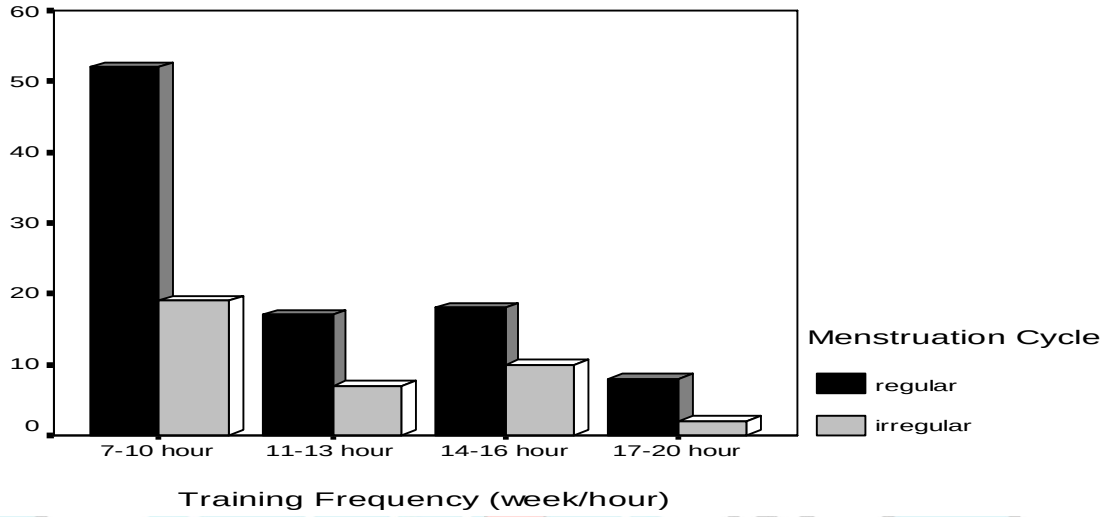
χ^2=12.16 sd=3 P=0.007

Fig 3. Comparison between the sports branches on the basis of the menstrual period changes resulting from sports activity showed that the biggest menstrual period changes were within the basketball group (31%). Amongst soccer players, sports activity was found to make no change on the menstrual period. A significant relationship was revealed between the sports branches on the basis of the menstrual period changes caused by the sports activity (p<0.05).



χ^2=3.98 sd=3 P=0.26

Fig 4. Field hockey players suffered from sports-induced menstrual problems most (11.4%) while soccer players experienced no such problems. No statistically significant relationship was found between the sports branches on the basis of sports-induced menstrual problems (p>0.05).



χ^2=1.178 sd=3 P= .758

Fig 5. No significant relationship was found between training frequency (week/hr) and menstrual cycle (p>0.05). Athletes training for 14-16 hr/week were found to experience most menstrual cycle disorders.

Table 4. Comparison of sports branches on the basis of physical and psychological effects of menstruation on sports activity

Types of Sport		Physical	Psychological	Not Effecting	Total
Soccer	N	7	8	18	33
	%	21.2	24.2	54.5	100
Basketball	N	13	9	7	29
	%	44.8	31	24.1	100
Field Hockey	N	12	20	12	44
	%	27.3	45.5	27.3	100
Handball	N	10	13	4	27
	%	37.0	48.1	14.8	100
Total	N	42	50	41	133
	%	31.6	37.6	30.8	100

χ^2=15.53 sd=6 P= 0.01

A significant relationship was found between the sports branches on the basis of the physical and psychological effects of menstruation cycle on sports activity ($p<0.05$). Basketball players were found to experience the most physical effects (44.8%); handball players the most psychological effects (48.1%) and; soccer players experienced the fewest effects (54.4%).

Table 5. Distribution of Menstruation Problems, the Period When These Problems Are Experienced and Sports-Induced Menstrual Disorders

	Variables	%	Soccer	Basketball	Field Hockey	Handball	Total
Distrubition of the Problems Felt Before or During Menstruation	Unrest	%	14.70	35.29	26.47	23.52	25.6
	Nervousness	%	21.25	26.25	32.5	20.0	60.9
	Crying Fit	%	25.0	25.0	-	50.0	3.0
	Nausea	%	-	36.36	18.18	45.45	8.3
	Sense of fullness in the stomach	%	25.58	30.23	18.60	25.58	33.8
	Stomachache	%	20.89	28.36	20.89	29.85	50.4
	Headache	%	23.07	7.69	23.07	46.15	9.8
	Backache	%	28.81	20.34	16.95	33.90	44.4
	Swelling and pain in the breasts	%	33.33	33.33	-	33.33	6.8
When the Menstrual Problems Experienced	1-3 days before menstruation	%	53.3	55.6	39.5	51.9	48.8
	4-7 days before menstruation	%	6.7	18.5	4.7	18.5	11
	1^{st}-3^{rd} day of menstruation	%	33.3	25.9	44.2	25.9	33.9
	During menstruation	%	6.7	-	11.6	3.7	6.3
Distribution of Menstrual Disorders	3-5 days before	%	30.0	40.0	20.0	10.0	31.3
	3-5 days after	%	33.33	20.0	20.0	26.66	46.9
	1-2 months delay	%	25.0	75.0	-	-	12.5
	3-6 months delay	%	-	50.0	50.0	-	6.3

The most commonly-encountered menstrual problem was found to be nervousness (60.9%), experienced mostly 1-3 days before menstruation (48.8%).The most common sports-induced menstrual disorder was found to be a delay in menstrual cycle of 3-5 days (46.9%).

Table 6. Competing during Menstrual Period, Frequency of Menstrual Problems and Effects of Menstruation on Sports Activity

	Variables	%	Soccer	Basketball	Field Hockey	Handball	Total
Competing in Menstrual Period	Yes	%	97	100	95.5	92.6	96.2
	No	%	3	-	4.5	7.4	3.8
Frequency of Menstrual Problems	Always	%	37.5	46.4	60.5	50	49.6
	Once in 2-3 months	%	12.5	17.9	7	19.2	13.2
	Rarely	%	50	35.7	32.6	30.8	37.2

96.2% of the study participants stated that they competed during menstruation and 49.6% stated that they always suffered from menstrual cycle problems.

DISCUSSION

The present study investigated the menstrual status of 133 elite Turkish athletes involved in team sports (basketball, field hockey, soccer and handball). The effects were determined of menstruation on sports activity.

Comparison between sports branches on the basis of menarche age did not indicate a significant difference ($p>0.05$). Previous studies have shown that female athletes playing heavy and tiring sports suffer from delayed menarche due to the clinical and biochemical abnormalities in gonadal functions; luteal phase defects; oligo/amenorrhea and anovulation more frequently than other athletes (8, 24, 29).

Previous studies suggest that menstrual disorders are observed more frequently in athletes than sedentary people. It has been suggested that heavy and tiring exercises during pre-puberty may result in delayed menarche and, subsequently, amenorrhea (1, 17).

No significant relationship was found between team athletes and regularity of menstrual cycle, however, it was found that most disorders were experienced amongst basketball players (41.4%) and the least disorders in field hockey (20.5%). While 71.4% of all athletes stated that they experienced regular menstruation, the remaining 28.6% experiences some form of menstrual disorder. In a study carried out by Kin *et al*., 45.6% of 103 athletes from various sports suffered from menstrual period disorders while the remaining 54.3% had regular periods (22). The differences in hormonal changes between two exercises were analyzed by observing elite female athletes undertaking 60 minutes exercise on a bicycle ergometer at 60% VO_2 max. This analysis revealed a significant prolactin increase during the follicular phase and luteal phase. A progressively-increased bicycle ergometer exercise by basketball players produced similar results. It was concluded that daily heavy and tiring exercises may lead to menstrual disorders by increasing prolactin levels (26, 27). Many previous studies have shown that malnutrition and heavy training programs may result in menstrual disorders in athletes (3, 18, 29, 36). When compared to team sports such as basketball, volleyball and handball, a trend has developed in Turkey for women to play field hockey. The training frequency of female hockey players was found to be lower than that of basketball and handball players. The fact that field hockey players suffer from fewer menstrual disorders than those in other sports may result from the lower training frequency.

A significant relationship was detected between the sports types on the basis of the menstrual changes caused by sports activity ($p<0.05$). Sports activity affected the menstrual cycle to the greatest extent amongst basketball players (31%), whereas no changes in the menstrual cycle were reported amongst soccer players. Overall, 14.3% of all athletes experienced changes in the menstrual cycle, while 85.7% experienced no changes. A previous study conducted in USA reported on 425 female athletes from 7 universities, who were involved in, athletics, endurance, team and anaerobic sports. Participants were analyzed in terms of eating disorders, menstrual disorders and skeletal-muscle injuries. It was found that 31% of participants suffered from menstrual disorders. No significant relationship was detected between the groups in terms of menstrual disorders and it was found that study participants with eating disorders suffered from menstrual disorders more than other athletes (4). A study of the menstrual status of 127 Swiss mid/long distance runners showed that 25% of the participants suffered from menstrual disorders (6). Another study suggested that anemia and menstrual disorders were encountered in female athletes more frequently than sedentary people (28). Soccer players were found to train for 4-5

days a week. When compared to other sports, this was found to be the lowest training frequency. The finding that training frequency is related to sports-induced menstrual disorders is consistent with the findings of the present study.

A balanced relationship has to be established between hypothalamus-pituitary-ovary for the continuity of the normal functioning of the reproductive organs. A defect at any step of the endocrine system results in menstrual cycle disorders (12, 31).

Physical training and exercise result in distinct changes in body weight, body fat ratio, body temperature, emotional status and hormonal secretion. These changes affect the hypothalamus, the control mechanism of the endocrine system, front lobe of the pituitary gland and ovaries. This situation may lead to some changes in the menstrual cycle (12).

Oligomenorrhea was observed in 12.5% and amenorrhea in 6.3% of the athletes. Menstrual disorders varied according to the type of sporting activity. Previous studies in this field detected varying levels of amenorrhea and oligomenorrhea were detected in 24% (Shangold and Levine) and 26% (Sanborn *et al*.) of athletics players; in 79% (Abraham *et al*.), 59% (Brooks Gunn *et al*.) and 34% (Glass *et al*.) of ballerinas and dancers; and 12% (Sanborn *et al*.) of swimmers and cyclist (33). A group of 91 long-distance runners aged 18-26 were studied in terms of eating disorders and menstrual disorders. It was found that athletes suffering from oligo/amenorrhea had important eating disorders (10). Amenorrhea was observed in 17%, oligomenorrhea in 13% and menstrual cycle disorders in 48% of 23 female national volleyball players (5).

Athletes may limit their food intake in the belief that low body weight and sport-specific ideal weight can help to increase performance in some sports. Such application can initially be successful, by burning unnecessary body fat reserves and forcing the body to use its reserves. However, it is known that the use of all protein reserves of the metabolism due to overloading of the body during physical training may prevent cell production in the sex hormones and prevent menorrhea (1).

While the frequency of amenorrhea amongst the general population is 2-5%, it has been shown to reach 44% amongst female athletes. Low energy intake, unbalanced nutritional intake, eating disorders and psychological stress amongst female athletes involved in long and tiring training schedules may lead to amenorrhea (7, 21).

The present study found no significant relationship between training frequency and menstrual cycle status. However, disorders were found to be suffered mostly by those athletes who trained for 14-16 hours per week.

Problems experienced before and during menstruation were listed as unrest (25.6%), nervousness (60.9%), crying fits (3), nausea (8.3%), sense of fullness in the stomach (33.8%), stomachache (50.4%), headache (9.8%), backache (44.4%) and swelling and pain in the breasts (6.8%). 48.4% of the participating athletes stated that they felt the symptoms specific to premenstrual syndrome 1-3 days before and 11% of the athletes 4-7 days before menstruation. It has been suggested that premenstrual syndrome results from neurohormonal and neurotransmitter changes and that some symptoms of this syndrome can be eliminated via a healthy diet, sodium and caffeine reduction and exercise (13). Some studies have shown that menstrual period pains and edemas are not related to sports and that physical activity reduces symptoms of dysmonorrhea (8).

As a result of the symptoms and physical, behavioral and psychological changes seen during the menstrual cycle; personal differences may be observed in the participation of female athletes in trainings and competitions during this

period: the rate of participation in competitions during menstrual period has been found to be 96.2% and with 3.8% of athletes not participating in competitions during the menstrual period. Among the female athletes who participated in the Tokyo games, 69% stated that they competed during menstruation, 34% that they only trained and 31% that they competed occasionally At the same time, many female swimmers stated that they swam during menstruation without encountering any problems (9).

With regard to athletes' personal views on the effects of menstruation on sports activity: 31.6% of the participant athletes stated that they were physically affected, 37.6% that they were psychologically affected and 30.8% that they were not affected. In a study by Carol *et al*. (1991), 50% of the participating athletes stated that their menstrual period negatively affected their performance (9). In contrast, other studies have suggested that menstruation has no effect on performance (11, 20). In another study, 50.49% of the athletes stated that menstruation affected their sporting performance while the remaining 49.51% stated that it had no effect on performance (22). These differing results illustrate the contradictory findings of studies of the effects of menstruation on athletic performance. A previous study examined the effects of various phases of menstruation on performance, and found that performance was negatively affected during menstruation amongst 31% of the athletes (14).

While athletic amenorrhea is the most extreme menstrual disorder, other disorders may lower estrogen level and negatively impact both health and fertility. Energy balance, exercise density, hard training, body weight and body composition, eating disorders, physical and psychological stress are the main factors in menstrual disorders. Although there are personal differences, the reproductive reaction is quite vulnerable to exercise and diet-related stress. Nutritional problems and low energy intake, which are commonly encountered in female athletes, result in a decrease in protein, carbohydrate and essential fatty acid reserves. It was found that menstrual disorders resulting from negative energy balance may be treated via establishment of a sound energy balance and that normal reproductive function can be restored (25).

In conclusion, elite Turkish female athletes suffer from some menstrual disorders and some problems specific to the menstrual cycle. Menstruation mainly affects sporting performance from a psychological perspective. Despite these negative factors, a great majority of the athletes participate in competitions during menstruation. Taking into consideration the pressure to achieve sporting success, modern athletes are not able to reduce their training schedule or to avoid strenuous exercise. However, heavy and frequent exercise may lead to some disorders of the reproductive system. New methods should be developed for the prevention and treatment of such disorders, particularly within sports for which low boy weight is of great importance.

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