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SOME PERFORMANCE PARAMETER CHANGES DURING MENSTRUAL CYCLE PERIODS OF ATHLETES AND NON-ATHLETES

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ABSTRACT

The aim of this study was to determine athletes' and non-athletes' performance parameters during three menstrual cycle periods (pre-menstruation, during menstruation, post-menstruation). 40 athletes (age; 17.25±3.1 years) and 40 non-athletes (age; 17.29±0.7 years) who have a regular menstrual cycle period participated the study. Body weight, body fat ratio, resting heart rate, blood pressures, reaction time, hand grip strength, 20m sprint time and anaerobic power were measured in pre menstruation, during menstruation and post menstruation periods along 3 months. For the statistical analysis, student t-test was used to compare the performance parameters of athletes and non-athletes. One-way analyses of variance were performed to assess differences between menstrual cycle periods.

The mean body heights of athletes and non-athletes were 1.65±0.05 cm and 1.64±0.04 cm respectively. The mean body weights were 59.7±6.13 kg and 57.7±6.9 kg of athletes and non-athletes. The mean menarche age of athletes was 13.47±0.11 years and of non-athletes was 12.62±0.13 years. Menarche ages and resting heart rates were found significantly different ($p<0.05$) between groups but body fat ratio and blood pressures couldn't find significantly different ($p>0.05$). Vertical jump, reaction times, hand grip strength and 20 m sprint parameters were significantly different ($p<0.05$), but anaerobic power values were not found significantly different ($p>0.05$) between two groups. Performance parameters didn't differ between menstrual cycle periods in both athletes and non-athletes ($p>0.05$). It's concluded from this study that athletes attained menarche later than non-athletes. Menstrual cycle periods didn't significantly affect sportive motor performance of basketball, volleyball players, judokas and non-athletes.

Key Words: Menstruation, performance param.

Introduction

In Turkey there is some disagreement regarding sports participation during menses. However it has known that records were broken and medals were taken during all portion of the menstrual cycle. Because of the high intensity training some physical and physiological changes could happen. Changes in body weight, body fat ratio and hormonal secreting values could effect menstrual cycle (B. Bullen, 1985, C.

Gleichauf, D. Roe, 1989, L. Fox, R. Bowers, M. Foss, 1998). Physical and psychological effects as a result of menstrual cycle change person to person. While no changes could happen before or during the menstruation in some females; physical and physiological changes could happen in some females. Although all the athletes were differently affected from the menstrual cycle, there is a common agreement that performance is greater in the post menstrual periods (H. Harrison, 1976, A. Loucks, 1990, J. Ussher, J. Wilding,1991). Anaerobic power is one of the performance parameters and it's related with power of muscle and speed of using ATP-CP system. Reaction ability is positively related with speed (O. İmamoğlu et al, 1996). There isn't much research about the effects of menstrual cycle on these parameters in Turkey. So in this study it's aimed to determine the effects of menstrual cycle on performance in pre-menstrual, menstrual and post-menstrual periods.

Material and method

40 female athletes (age; 17.25 ± 3.1 years) and 40 female non-athletes (age; 17.29 ± 0.7 years) having consented to participated in this study who were active basketball, volleyball players and judokas. All the subjects were healthy and have regular menstrual cycle, and none of them use oral contraceptives. A questionnaire contains some properties and a situation about menstrual cycle was applied to the athletes. The measurements were done pre-menstruation (26-28 day of the cycle), during menstruation (1-6 day of cycle) and post-menstruation (7-12 day of cycle) periods.

Body weight was measured using levelled platform scale (sensitivity±100 gr). The subjects were weighted with shorts and a T-shirt, and without shoes. Height was measured using a portable stadiometer (sensitivity±0.25 cm). The subjects were measured distributed to both feet head positioned in the Frankfurt Horizontal plane.

Vertical jump height was measured by vertical jump meter and, anaerobic power (P) was calculated by this formula P=$\sqrt{4.9}$x Body weight x $\sqrt{\text{Jump Distance}}$. Reaction time measurements were taken by Dekan automatic performance analyser that records time 1/100 second by right hand.20 m sprint test was done by photo-cell. Hand grip strength was measured by 78011 model hand dynamometer that produced La Fayette Instrument Company.

Skin thickness was measured from abdomen, suprailiac, triceps and subscapula by Holtain marked skinfold (sensitivity 0.2 mm) from the right side of the body. Body Fat Percentage (BF) was calculated by this formula, BF= (0.159 x Abdomen) + (0.147 x Suprailiac) x (0,151 x Supscapular) + (0,155 x Triceps) + 5,692 (14). Resting blood pressures and heart rates were measured by 53-600 digital Samsung marked tansiometer in the morning after wake up and sitting 5 minute on the chair.

Statistical Analyses: Student t-test was used to compare the performance parameters of athletes and non-athletes. One-way analyses of variance were performed to assess differences between menstrual cycle periods. Values are expressed as means ± standard deviations.

Results

Physical and physiological characteristics of subjects were given in table I. The mean body heights of athletes and non-athletes were 1.65±0.05 cm and 1.64±0.04 cm respectively. The mean body weights were 59.7±6.13 kg and 57.7±6.9 kg of athletes and non-athletes. The mean menarche age of athletes was 13.47±0.11 years and of non-athletes was 12.62±0.13 years. Menarche ages and resting heart rates were found significantly different (p<0.05) between groups but body fat ratio and blood pressures were not found significantly different (p>0.05). Motor performance parameters of athletes and non-athletes were given in table II. Vertical jump, reaction times, hand grip strength and 20 m sprint parameters were significantly different (p<0.05), but anaerobic power values were not found significantly different (p>0.05) between two groups. Motor performance parameters between pre, post and during menstrual cycle periods were given in table III. Performance parameters didn't differ between menstrual cycle periods in both athletes and non-athletes (p>0.05). When heart rate and blood pressure parameters were compared between menstrual cycle periods (table IV), no significant differences were found.

Discussion

The mean body height and weight of athletes were 16,5±0.05 cm and 59.7±6.13 kg, of non-athletes were 1.64±0.04 cm and 57.7±6.9 kg. The menarche ages were 13.47±11 years for athletes and 12.62±0.13 years for non-athletes. The body weight and body fat ratio values were not significantly different between three menstrual cycle periods (p>0.01). The menarche ages, abdomen skin thickness and heart rate of two groups were found significantly different (p<0.05). Age, body weight, height, body fat ratio, triceps, suprailiac, and subscapula skin thickness, resting blood pressures were not found significantly different (p>0.05) between two groups.

It has determined that females who began sports in the early ages attained menarche later and menstruation disorders of these females increase (L. Fox, R. Bowers, M. Foss, 1998). The age at which menarche began is significantly higher in the American female athletes than in her non-athletic counterpart. High school and college athletes attained menarche significantly later than non-athletes, and various groups of national and Olympic athletes attained menarche significantly latter than the high or school collage athletes. On the other hand, age of menarche for Hungarian athletes has been found to be little affected by athletic competition (L. Fox, R. Bowers, M. Foss, 1998). While average menarche age of Belgium gymnasts have found 15.6±2.1 years, the average menarche age of girls in general population have found 13.2 ±1.2 years (A. Claessens, R. Malina et al., 1992). In different studies the menarche ages were found 15.6 years for gymnasts, 14.5 years for dancers, 13.3 for runners, 13.1 years for swimmers, 13.1 years for volleyball players, 13 years for handball players and 12.8 years in American control group (N.W. Constantini, M.P, Warren, 1994): The mean menarche age was found 12.29 years in non-athletes (L. Fox, R. Bowers, M. Foss, 1998). In our study menarche ages were found in normal values both in athletes and non-athletes, but the athlete's attained menarche later than non-athletes. It has taught that menstrual function disorders were greater in the athletes that trained high intensity in adolescence period.

The vertical jump values were found 25.75±3.93 cm in athletes (7), 43.6±5.6 cm in basketball players (I. Çimen, İ. Cicioğlu, M. Günay, 1997). The vertical jump values of athletes and non-athletes were 41.1±4.26 cm and 29.7±4.26 cm in pre-menstruation period, 41.3±4.0 cm and 29.9±4.09 cm during menstruation and 41.7±4.1 cm and 30.4±3.99 cm in post-menstruation period. The athletes' vertical jump values were found significantly high than non-athletes ($p<0.05$). Therefore our results are similar to the results of Jurkowski et all,1996 study. Vertical jump values were not significantly different between pre, post and during menstruation ($p>0.05$) in both athletes and non-athletes.

The best visual reaction time is between 0.15-0.20 sec and the best auditory reaction time is 0.12-0.27 sec. According to Grasser,1976, the reaction time to voice is between 0.11-0.24 sec; and according to Zaciorskij (1973) the reaction time to light is between 0.1-0.24 sec. The reaction times differ between 0.05-0.35 sec in different reaction forms (O. İmamoğlu, K. Özer, S. Muratlı, G. Hergüner, 1996). In one study, the visual reaction time was found 0.97 sec, the auditory reaction time was found 0.188 sec in female students attending to physical education and sports department (18). In our study athletes' and non-athletes' auditory reaction times were found 14.1±1.13 sec 17.5±2.41 sec in pre menstruation period, 14.05±1.03 sec. and 17.4±2.40 sec during menstruation, 14.02±0.98 sec and 17.4±2.21 sec. in post-menstruation period. Athletes' and non-athletes' visual reaction times were found 14.3±1.30 sec and 17.8±2.40 sec in pre menstruation periods, 14.2±1.18 sec and 17.9±2.45 sec during menstruation, 14.1±1.12 sec and 17.9±2.46 sec in post menstruation period. The reaction times of athletes were significantly better than non-athletes ($p<0.05$). Better reaction times of athletes could be explained with training and sportive condition. Because auditory reaction time could decrease from 0.12-0.27 sec to 0.05-0.17 sec with training (O,İmamoğlu K, Özer S, Muratlı G Hergüner, 1996). The reaction times weren't found significantly different between menstrual cycle periods ($p>0.05$) in both groups.

20 m sprint times were found 3.62±0.84 sec in female national Turkish table tennis players, 3.33±0.66 sec in female volleyball players and 4.10±0.18 sec in different sports branch athletes (20). In our study 20 m sprint times of athletes and non-athletes were 4.12±0.18 sec and 4.66±0.65 sec in pre-menstruation period, 4.11±0.17 sec and 4.74±0.67 sec in menstruation period, 4.10±0.16 sec and 4.58±0.59 sec in post menstruation period. 20 m sprint values were significantly different between athletes and non-athletes ($p<0.05$); athletes' sprint values were better. Between menstrual cycle periods, 20 m sprint values were not found significantly different ($p>0.05$) in both groups.

In our study, the hand grip strength values of athletes were similar with literature (F. Ergül, M. Günay. Elit 1997, A. Rodzijevskij, S. Kurup, L. Schachlina, I.S. Beresterkaja, 1994) Athletes' hand grip strength values were higher than non-athletes ($p<0.05$). Between menstrual cycle periods the strength values didn't significantly differ ($p>0.05$). The anaerobic power values of athletes were higher than non-athletes but this difference was not significant ($p>0.05$). The anaerobic power values weren't significantly different between menstrual cycle periods ($p>0.05$).

Higgs and Robertson (1981) supports that the menstruation phases don't effect the sportive performance. Brain et all (1991) determined that sportive performance was higher during menstruation. A questionnaire that applied to females in 1964 Tokyo Olympiad games showed that 37% of the athletes thought their performance were not negatively affected from menstruation. Jurkowski (1986) found that by the effect of oestrogen and progesterone hormone athletes got tired lately during menstruation. Menstrual cycle didn't effect speed and physical capacity (R, Özdemir, S. Küçükoğlu., Özdemir et. al., 1993) searched the effect of ovulation on power; they found similar strength values in the 8 and 21 day of cycle (16). Sarwar and et all (1996) found strength didn't change between menstrual phases (1.-7.; 7.-12.; 12.-18. day) in women who use oral contraceptive. Dibrezzo and et all (1991) didn't find differences in power between three phases of menstrual cycle. Higgs and Robertson (1981) didn't find differences in hand grip muscle strength and knee extensor muscle strength among two menstrual cycle. Rodzijevskij and et all (1994) determined that menstrual cycle phases didn't effect swimming performance. Lebrun et. all (1995) examined the effects of menstrual cycle phase on four selected indices of athletic performance; aerobic capacity, anaerobic capacity, isokinetic strength and high intensity endurance. They found the cycle phase didn't impact significantly on the majority of the performance tests and cardio-respiratory variables (C. Lebrun, J. Prior Taunton, 1995). Female athletes reporting poorer performance during menstruation, a large percentage were endurance athletes (e.g. tennis players and rowers). Performances for volleyball and basketball players and swimmers and gymnasts were better than for the endurance athletes (L. Fox, R. Bowers, M. Foss, 1998). In our study motor performance parameters were not significantly different between three menstrual cycle periods (p>0.05). Results of our study were similar with the literature that consist speed and strength.

Exercise and regular training can decrease resting heart rate. In our study resting heart rates of athletes and non-athletes were found significantly different (p<0.05). Systolic and diastolic blood pressures were not found significantly different (p>0.05). From a physiological standpoint, metabolic and cardiovascular responses at rest and during maximal exercise are not systematically affected during different phases of menstrual cycle (L. Fox, R. Bowers, M. Foss, 1998). In our study resting heart rate, systolic and diastolic blood pressures weren't different between menstrual cycle periods (p>0.05). Reason of the low heart rate in athletes can be explained by adaptation that occurs by sports and regular training.

It's concluded from this study that athletes attained menarche later than non-athletes. Menstrual cycle periods didn't significantly affect sportive motor performance of basketball, volleyball players, judokas and non-athletes.

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