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THE LEVEL OF SPECIFIC MOTOR PROPERTIES IN THE INDIVIDUAL PHASES OF THE MENSTRUAL CYCLE AMONG YOUNG SPORTSWOMEN PRACTICING SPRINTS

Introduction

Among the many monthly rhythms of various traits and phenomena of the human organism, the best known is women's menstrual cycle, dependent on the function of the reproductive glands and related to the physiological rhythm of the whole organism. This rhythm coincides on average with the lunar month lasting 29.5 days (rotation of the Moon around the Earth).

The menstrual cycle is the time between periods. The length of normal cycles shows significant variability from 25 to 35 days, most often it lasts 28 days. This cycle is of endogenous origin and, due to its duration, is divided into four phases (Szmigielski 1974; Sylwanowicz et al. 1980):

Phase I, bleeding – called menstrual, lasting about 3-5 days. Phase II, growth – called follicular, lasting about 9 days. Phase III, secretory – called ovulation, lasting about 14 days. Phase IV, ischemia – called luteal, lasting about 2-3 days.

In each menstrual cycle, one ovarian follicle (Graffa) usually grows and breaks. This process is called ovulation. Ovulation occurs essentially in the middle of the cycle (intermenstrual), usually between days 13 and 16 of the menstrual cycle. In periods of abnormally long or short fluctuations, the preovulatory period fluctuates, while the period between ovulation and the day of menstrual bleeding is usually constant and is usually 14 ± 1 days.

The female monthly rhythm manifests itself in a group of changes occurring regularly in the body of a woman, which is reflected not only in the

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functions of individual organs, but also efficiency and fitness of the body and even in the psyche (Szmigielski 1974).

For a long time, much attention has been paid to assessing the physical performance of women in relation to cyclical changes occurring in the reproductive organs. This issue is of particular interest due to the dynamic development of women's sport. However, the complexity of this issue has finally not allowed explaining how a woman's body reacts to effort during the one-month cycle.

The literature suggests that researchers' opinions on this problem diverge. Queraux (1963) reports that the efficiency of women during menstruation is significantly reduced. The same view is presented by Weinert and Droszcz (1966), who emphasize the decline in psycho-physical fitness and athletic performance before and during menstruation. Regarding the influence of the menstrual cycle on a woman's system, Wiśniewska-Roszkowska (1958) claims that during and immediately after the menstrual period a woman's vital force is lowest. This view is shared by Cseffalvay (1966) and Tatarczuk (1999), whose research showed that a woman achieves the highest physical fitness after menstruation. Żownowataja (1962) confirms the reduced ability of women to exercise before and during menstruation.

Rougier and Liuquette (1962), Burkhard et al. (1970) report that as many as 55% of women achieve worse training results in the premenstrual period. Sykut (1973) asserts that the physical fitness of women increases in the progesterone phase of the sexual cycle, this also occurs in students who do not compete in sport. He also notes, along with others (Sykut 1970, Hildebrant 1970, Runge 1929), that the reduction in physical fitness during the menstrual period is much lower than might be expected; in any case, less frequent than in the premenstrual period. According to Kwilecka's research (1970), regardless of the duration of the menstrual cycle, its third quarter is characterized by greater than average physical fitness. Others claimed explicitly that the increase in athletic performance during menstruation is unquestionable (Runge 1929, Schoppe 1929). Jones (1960) reported that at the Melbourne Olympic Games six women won medals while in their menstrual period.

Generally, most researchers found that menstruation affects results unfavorably more frequently than favorably (Ingmen 1953, Bale and Davies 1983; Tatarczuk 2000).

Despite numerous attempts to explain the problem, i.e. whether and what influence the menstrual rhythm has on women's performance, there is still no incontrovertible view.

In the context of the above remarks, this article aims to determine the

level of selected motor properties in the four phases of the menstrual cycle in young sportswomen in the final phases of adolescence, on the verge of transitioning from an anabolic to a balanced catabolic process.

Materials and methods

The material used in this study was collected during the gathering of the Belarus national team in 2016. It involved women practicing short runs: 58 female athletes, aged 18 to 25, who regularly trained sprints, 5-6 times a week, 2 hours a day. They all had the master or first sports class. The average internship period was 7 years.

The measurements of three selected trials determining motor performance were carried out at the athletics stadium (long jump and running on the track, and vertical jump in the sports hall) during the grouping of the Belarusian team.

The following motor features were measured:

- *power measurement: vertical jump* – Execution: mark the board with chalk covered fingertips. Move away from the wall to a distance ensuring a free swing. Squat while swinging the arms back – take a jump from both feet upwards while pulling your arms up – touch the graduation with your fingers as high as possible. Evaluation: the best jump out of the three measured ones. The result is determined in centimeters, based on the difference of the highest reach in the jump and reach in standing. Motor fitness test (Wolański and Parižkova 1976);
- *speed measurement: 30 m run from a flying start* – Execution: signal the start from the standing position. Evaluation: the test is carried out twice, the best time is taken into consideration, measured with the accuracy of 0.1 s. Fitness test (Denisiuk 1975);
- *measurement of jumping ability: three long jump tries (added jumps)* – Execution: start at the marked line, feet parallel to each other, legs bent in the knees – hand swing backwards – a jump with a strong swing of hands forwards from both feet. Score: measure the distance from the line to the back edge of the heel (footprint) in centimeters. Motor fitness test by L. Denisiuk (1975).

The menstrual cycle was divided into four phases:

- menstrual phase – bleeding, lasting about 3 to 5 days;
- follicular phase – lasting 9 days;

- secretory phase – ovulation, lasting about 14 days;
- ischemic phase – luteal, lasting about 2-3 days.

During the examination of motor skills, each person provided information on the date of their last menstruation; next, on the basis of this and considering the date of the study, it was determined in which phase of the menstrual cycle the examined person was. This is how people were grouped and qualified for the appropriate phase. The basic statistical characteristics (average value \bar{x} , average standard deviation SD , and significance level) were calculated with M. Withney's "U" test for each motor characteristic in each phase of the menstrual cycle.

Results

The differences over the variability of motor traits of the examined women in the various phases of the menstrual cycle helped formulate the following problem statement: how does a woman's body react to the workload in the individual phases of the menstrual cycle, and distinguish between the highest and lowest periods of physical efficiency. The results of the tests are presented in Table 1.

The first attempt (evaluated power, measured in centimeters) of the vertical jump. Large fluctuations in average values can be observed. The highest average power result was obtained by the women in the postovulatory phase, and the lowest in the bleeding phase. The analysis of the significance level of differences shows that between the individual phases of the menstrual cycle the power results reported statistically significant differences in most phases, and only between the follicular phase and the ovulation difference in power values was statistically insignificant (Table 1).

In the jumping test (triple long jump), the average results obtained by the examined women range from 753.6 cm in the bleeding phase to 799.6 cm in the postovulatory phase. Thus, the jumping ability changed in a rather positive direction. Statistically significant differences were recorded between the menstrual phase and follicular and postovulatory phase as well as follicular and postovulatory and luteal phase. There were no statistically significant differences in average jumps between the bleeding phase and luteal phase and between follicular and postovulatory phase.

In the speed test, 30 m flying start sprint, the analysis of arithmetic average suggests that the highest value in this test was achieved in the postovulatory phase (3.08 s) and the lowest in the luteal phase (3.16 s). In this sample, no statistically significant average values were found between the various phases of the sexual cycle (Table 1).

Table 1

Statistical characteristics of selected motor skills in the individual phases of the menstrual cycle

Feature	Bleeding Phase (I) N=8	Follicula Phase (II) N=13	Ovulation Phase (III) N=28	Luteal Phase (IV) N=9	«U» "						
					1-2	1-3	1-4	2-3	2-4	3-4	
Long Jump (vertical jumps) (cm)	$\bar{x} = 44.8$ $SD = 2.3$	$\bar{x} = 53.6$ $SD = 1.2$	$\bar{x} = 54.3$ $SD = 1.3$	$\bar{x} = 50.9$ $SD = 2.1$	6.30	7.26	6.16	1.66	6.49	3.12	
Tripple long jump (added jumps) (cm)	$\bar{x} = 753.6$ $SD = 36.5$	$\bar{x} = 740.8$ $SD = 21.6$	$\bar{x} = 799.6$ $SD = 29.1$	$\bar{x} = 760.9$ $SD = 30.7$	3.72	4.18	0.65	1.03	3.41	3.89	
Running (flying start) – 30m (sec)	$\bar{x} = 3.14$ $SD = 0.03$	$\bar{x} = 3.10$ $SD = 0.02$	$\bar{x} = 3.08$ $SD = 0.01$	$\bar{x} = 3.16$ $SD = 0.03$	0.47	0.85	0.20	0.38	0.13	1.12	

Source: own work.

Summing up the variability of the studied motor features in the various phases of the sexual cycle of young sportswomen, one can state:

- in all the motor traits studied, the highest average values were achieved by the women in the postovulatory phase;
- in the power and jump tests, the lowest average values were recorded in the bleeding phase; and in terms of speed, in the luteal phase.

Discussion

As mentioned earlier, the in-depth and performed for many years studies on the development of physical fitness in connection to the menstrual cycle have not brought comprehensive and unambiguous results. On the basis of earlier measurements by Czapska (1966), it appears that the highest efficiency of a woman's body is achieved in the follicular and luteal phases. Similarly, Jackowski (1951) determined that less sporty girls achieve highest efficiency in the follicular and luteal phases, while girls with high physical fitness in the luteal phase. Burkhard et al. (1970), examining the physical fitness of students of the University of Lodz, found that women obtained the best results in the ovulatory phase. Kwilecka (1973) registered increasing physical fitness of 16-year-old girls between 50 and 79.2% of the duration of the cycle, regardless of its length. The author's research in the same environment of WSP (Higher School of Pedagogy) students in Zielona Góra (Tatarczuk 1993) showed the highest results of motor tests in the follicular phase and slightly lower in the ovulatory phase, while the lowest values were recorded in the menstrual and luteal phases.

The results of recent studies, currently under analysis, also carried out in a group of WSP students, determined that the highest average strength, jumping, agility, speed, and flexibility appear in the follicular phase, while strength and stamina are highest in the ovulatory phase. The lowest average for all the motor skills was recorded during menstruation. (Tatarczuk 2006)

The review of the literature made by Halicze-Ambroziak (1978) also shows that a woman's system is better prepared for endurance efforts in the luteal phase, and for the burdens that require particularly high speed during the menstrual phase. Also, Dobrzański (1989) emphasizes, from the point of view of a sports doctor, that in most women exercise capacity is the lowest just before menstruation, and the highest immediately after menstruation. According to Keul and colleagues (1972), the maximum exercise capacity of women is noticed shortly after the end of menstruation. Ryan (1974) believes that the period of maximum physical fitness of women falls into the 15th day of the cycle.

In most women, physical performance during menstruation falls down, and this mainly applies to endurance efforts (Dobrzański 1989).

Conclusions

1. An increased physical capacity in the full-length menstrual cycle of young sportswomen occurs in the post-ovulatory phase, in which the highest average power, jump, and speed were found.
2. The lowest values were recorded in the examined motor traits in the bleeding phase (power, jump) and in the luteal phase (speed).
3. The system of women practicing sport is better prepared for the jump-speed activities in the postovulatory phase, and the lowest exercise capacity was also noted before and during menstruation.

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INDIVIDUAL PHASES OF THE MENSTRUAL CYCLE AMONG
YOUNG SPORTSWOMEN PRACTICING SPRINTS**

Keywords: motor features, menstrual cycle, sprinter.

The aim of the article is to assess the level of selected motor properties in particular phases of the sexual cycle among sprinters. The material used in this study was collected during the gathering of the Belarus national team in 2016, among women practicing short runs. 58 Female athletes, aged 18 to 25, regularly trained sprints 5-6 times a week, each time for 2 hours a day. They all had the master or first sports class. The average internship period was 7 years.

The following measurements were taken: power, speed, and jumping. Based on a detailed qualitative analysis of the material, the following conclusions were drawn:

- increased physical capacity in the postovulatory phase in all the studied motor features;
- the lowest values in the examined traits were recorded in the bleeding phase (power, jump) and in the luteal phase (speed);
- the system of women practicing sport is better prepared for the jump-speed efforts in the postovulatory phase, and the smallest exercise capacity was recorded before and during menstruation.

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**POZIOM OKREŚLONYCH WŁAŚCIWOŚCI MOTORYCZNYCH
W POSZCZEGÓLNYCH FAZACH CYKLU MENSTRUACYJNEGO
WŚRÓD MŁODYCH SPORTSMENEK UPRAWIAJĄCYCH SPRINTY**

Słowa kluczowe: cechy motoryczne, cykl menstruacyjny, sprinterki.

Celem pracy jest ocena poziomu wybranych właściwości motorycznych w poszczególnych fazach cyklu płciowego wśród sprinterek. Materiał został zgromadzony podczas zgrupowania kadry narodowej Białorusi w roku 2016. Zawodniczki w liczbie 58 osób, w wieku od 18. do 25. roku życia, trenujące systematycznie sprinty 5-6 razy w tygodniu. Wszystkie

zawodniczki posiadały klasę mistrzowską lub pierwszą. Staż zawodniczy wynosił średnio 7 lat. Wykonano pomiary: mocy, skoczności i szybkości. W wyniku szczegółowej analizy jakościowej materiału stwierdzono:

- zwiększoną wydolność fizyczną w fazie poowulacyjnej we wszystkich badanych cechach motorycznych,
- najniższe wartości w badanych cechach motorycznych w fazie krwawienia (moc, skoczność) i w fazie lutealnej (szybkość),
- organizm kobiet uprawiających sport jest lepiej przygotowany do wysiłków skocznościowo-szybkościowych w fazie poowulacyjnej, a najmniejsze zdolności wysiłkowe wykazuje przed i w czasie menstruacji.