DYNAMICS OF DEVELOPMENT OF PHYSICAL QUALITIES FOR OMC IN FEMALE ATHLETES

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Аннотация

В статье представлены особенности динамики субъективной оценки функционального состояния и проявления двигательных способностей на протяжении ОМЦ у спортсменок, специализирующихся в беге на короткие дистанции. Показано, что на протяжении специфического биологического цикла уровень проявления двигательных возможностей спортсменок изменяется в соответствии с фазами цикла, каждая из которых характеризуется тем или иным состоянием менструальной функции и организма в целом. Учет данного положения при построении тренировочного процесса может повысить его эффективность без увеличения объема и интенсивности применяемых нагрузок.

Ключевые слова: спортсменки, овариально-менструальный цикл, фазы, двигательные способности, индивидуальные особенности.

Анотація

У статті представлені особливості динаміки суб'єктивної оцінки функціонального стану і прояву рухових здібностей протягом ОМЦ у спортсменок-бігунів на короткі дистанції. Показано, що протягом специфічного біологічного циклу рівень прояву рухових можливостей спортсменок змінюється у відповідності з фазами циклу, кожна з яких характеризується тим чи іншим станом менструальної функції і організму в цілому. Облік даного положення при побудові тренувального процесу може підвищити його ефективність без збільшення обсягу та інтенсивності застосовуваних навантажень.

Ключові слова: спортсменки, оваріально-менструальний цикл, фази, рухові здібності, індивідуальні особливості.

Statement of the problem and its connection with important scientific and practical tasks (The problem formulation). In recent years the emancipation of women in sports activities leads to increasing demands on the level of training of women athletes. The most urgent problem is the problem of the rationalization of sports training, the main purpose of which is to ensure on time achievement of the planned level of condition and fitness.

At the same time, the most important factor in the evaluation of the latter is the structure of competition activity, which suggests the possibility not only to quantify the value of the required components to demonstrate higher athletic performance, but also to establish the subordinate relationship of the various components of the structure and preparedness of specific athletes. The methodology provides a structured mix of training and competitive activities of athletes is the theoretical prerequisite for its use as a basis when modeling the extent and nature of training effects [2, 4, 9, 10, 21].

It should be emphasized that the parameters characterizing these or those components of competitive activities, is often poorly linked and form is not always strictly differentiated assessment. Only by defining the level of perfection of its indi-

vidual components, it is possible to objectively assess the strengths and weaknesses in the structure of the competitive activities of the specific athletes, to develop the best individual model and outline the way to achieve it [1, 10, 17]. The realization of this goal involves the analysis of practical experience of building exercises and the study of the dynamics of state athletes from the scope and focus of the performed training load.

Thus, a critical aspect of effective planning of training process of sportswomen advocates an individual approach, which, primarily, should include biorhythmic peculiarities of a female organism, characterized by a number of morphological, physiological, and psychological changes. Information about the training methods of women, including athletes, are described in the scientific and methodological literature, is ambiguous, however, can identify individual opinions of experts, and in this regard, two approaches to the subject under discussion [1, 5]. Some scientists and practitioners insist that when you build mesocycles of training to take into account the phase of the OMC. Others believe that to build a training process should be regardless of gender of the athlete, i.e. on the basis of the general laws of the workout.

At the same time, did not question the fact that individual changes in athletic performance, motor skills, functional and mental state of the mother throughout the childbearing period, in large measure, depend on the cyclical functions of her reproductive system. The latter suggests that knowledge and use in training activities information about the features of the biorhythmic patterns of functioning of the organism specific athletes is essential not only to enhance sports performance and maintain reproductive health.

Analysis of recent research and publications. It should be noted that in most previous studies [5, 7, 8, 11, 16, 18] the authors‘ attention was focused on training athletes given the ovarian-menstrual cycle (OMC). For example, at the end of the last century extensive research work in this direction is conducted «school» of Professor A. R. Radzievskiy [6, 12, 13]. In recent years, in Ukraine the development of features of adaptation of the female body to tense sports activities actively involved in L. Y.-G. Sahlina [20].

When studying the literature discovered a lot of work, which examines the impact of OMC on the operation of the data systems of the body women in different phases [1, 3, 6, 7, 8, 11, 14, 20]. In particular, are indisputable experimental information about the change of hormonal background [15, 16], pictures of blood, the excitability of the Central nervous system and mental state of women within the OMC. Therefore, it is logical to assume that the functioning of the major body systems of women under the influence of the OMC (during) causes changes in the level of different physical qualities.

A number of researchers noted that intensive exercise fraught women overtraining to a much greater extent than men [15, 16]. Moreover, their influence affects the hormonal system, which in turn, leads to violations of autonomic functions [7]. This fact objectivesare the need to prevent overtraining by regulation loads that are adequate to the peculiarities of the female body.

It should be recognized that the system of training, serving and currently, has been developed and refined over the men, women, adapting to it, not had the opportunity to fully realize themselves. In addition, since most studies on the impact of sport on the body, justification of the mode and methods of trainings were also held for athletes-men, their results are often mechanically transported and taken into account in the training process of women, which is contrary to modern scientific knowledge about the peculiarities of the female body and its individual functioning as the result of a variety of processes sporting activities.

A priority for the development of individually targeted training programs, choice of means and methods of development of motor abilities, technical-tactical and psychological preparation as in multi-year planning and construction of various structural units of the annual cycle, according to some researchers [1, 6, 8, 11, 14, 18, 19, 20], is to focus on the stages of biological maturation, of health at different phases of the menstrual cycle, the functionality of the main systems of the body, and regenerative functions. In addition, to optimize strategic approaches in the preparation of athletes for major competitions of the season will allow the monitoring of individual dynamics of physiological characteristics of human body.

In turn, the ambiguity of the results obtained in different studies on the dynamics of physical qualities in various phases of OMC [7, 8, 17, 22], perhaps due to the fact that in each of them to assess the level of manifestation of a quality to use non-specific for a particular sport tests, indirectly characterizing data quality (for example, the manifestation of strength abilities in different types of athletics determined by the results in five times the long jump, the results of the bench press, the results of jumping up by pushing the legs).

The purpose of the research was to determine peculiarities of the dynamics of subjective assessment of the functional state (SAFS) and manifestations of physical qualities for the OMC at the sportswomen of specialized in the sprint.

Organization of the research and methods. The study involved 16 athletes, runners for short distances, with the qualification of the first category – CMS. For the full OMC at each test measured the levels of basal temperature (to determine the individual phase boundaries of the OMC) and were tested

Table 1

The degree of influence of OMC (%) on the dynamics of different motor abilities (results of dispersion analysis)

Motor abilities	Degree of influence	The accuracy of the impact
The quickness of motor reaction	18,6	p≤ 0,01
Coordination ability	8,5	p≥ 0,05
Maximum random force - muscle PH - muscles PSS	 28,9 12,9	 p≤ 0,01 p≤ 0,05
Explosive strength (isometric mode) - muscle PH - muscle ПSS	 17,9 22,7	 p≤ 0,01 p≤ 0,01
The explosive force of lower limb muscles (dynamic mode)	23,6	p≤ 0,01

according to the method of being, activity and mood. The use of the latter allowed by the results obtained for each scale of the sums to reveal the subjective assessment of functional status of athletes in each phase of MC.

To determine the level of physical abilities 3-4 times a week (at least 3 times in each phase of the OMC) before the main training session was carried out testing, which included a specific set of control exercises. So, for the instrumental control over power and speed-power capabilities of different muscle groups of athletes were used the method of computer testimory, namely, the recording and analysis of the curve of development of muscle force in time [1, 17]. This instrumental technique allows to assess the level of special strength preparedness of sportswomen on the basis of the set of specific data characterizing the ability of the individual to the manifestation of «explosive» efforts that are not directly measurable using traditional means.

Were recorded and processed testinmony demonstration of the power of muscle groups that carry most of the load in the structure of the sprint racing of the muscles extensors of foot (EF) in the knee joint and plantar flexors of the foot (PFF). In the isometric mode was given a setting to show maximum random force in the explosive isometric mode to quickly achieve maximal force in the shortest period of time. According to the obtained mesodynamics curves determined maximal isometric muscle strength (Fmax) shown in the described movement, the time during which was achieved the maximum force (tmax).

Also calculated differential value (gradient) force (J) characterizing the rate of rise of force at a maximum and equal to $J=F_{max}/t_{max}$. Since the phase repulsion in the run lasts between 0,10 and of 1,13 with [2], it was determined the value of the force developed by athletes for 0,1 s ($F_{0,1}$).

Speed-strength abilities (in dynamic mode) was estimated according to the results jump up Abalakov with hands. For evaluation of fastness was determined the latent time of simple motor reaction and coordination abilities - as the difference in the jump up Abalakov with and without hands.

The research results were processed using mathematical statistics methods.

Results and discussion.

The study of the dynamics of subjective assessment of the functional state of the athletes during the OMC has shown that its value in postmenstrually (II) and postovulatory (IV) phases was significantly higher (p≤0,05) than in the menstrual (I), ovulatory (III), and premenstrual (V) phases and also above the average for the entire period of specific biological cycle. It should be noted that between the level of the SOFS in the II and IV phases, and between the values of «critical» phases (I, III and V), significant differences were not detected (p≥0,5).

The result of variance analysis was determined by the degree of influence of OMC as a factor of change, SOFS, which was 22,4 % and it is significantly significant (p≤0,05).

In the course of the studies, a unidirectional wave-like nature of the dynamics of physical qualities from phase to phase of the OMC in female athletes. It was found that a higher level of the investigated parameters have on II and IV phase and their reduction to I (low), III and V phases. These dynamics are manifestations of motor abilities (strength, speed, speed-power and coordination abilities) discovered in numerous studies of other authors carried out in different sports [6, 8, 11, 13, 14, 18, 20, 22].

In the present study were the features of the dynamics of certain physical qualities for OMC, which are determined by the differences in the average level of manifestation of motor abilities over the full cycle, relative to the maximum in the phase IV (100 %); variation index over a complete cycle; the ratio of the level of abilities between favorable and critical phases; as well as the degree of influence of the OMC on the dynamics of each indicator in the specific phase of the cycle (table 1).

The coordination ability for OMC varied within the limits of 17,6 %. The average level of the manifestation of these abilities over a complete cycle is 86,8±9 percent. The values shown in phase II was significantly lower than in IV (p≤0,05), and during and before menstruation lower than during ovulation. The degree of influence of OMC on the dynamics

Table 2

Indicators of jump height (in cm) up with sway and without sway hands on phases OMC have runners over short distances

Phase OMC	Jump with sway hands, cm						Jump without sway hands, cm					
	before training		p	after training		p	before training		p	after training		p
	X	S		X	S		X	S		X	S	
I	49,8	2,3	-	46,6	2,4	-	39,6	1,8	-	38,9	2,0	-
II	53,6	1,2	<0,05	52,8	1,3	<0,05	43,2	1,3	<0,05	42,9	1,7	<0,05
III	51,3	1,4	>0,05	50,3	1,9	>0,05	40,6	1,7	<0,05	38,3	1,8	<0,05
IV	54,3	1,3	<0,05	53,9	1,8	<0,05	45,2	1,6	<0,05	45,0	1,8	<0,05
V	50,9	2,1	<0,05	47,2	2,2	<0,05	40,9	1,9	<0,05	39,6	2,0	<0,05

of manifestation of the coordination abilities was 8,5 % and was not reliable, possibly due to the high vnutricinovialnoe and interindividual variability of this indicator in the individual phases of a OMC.

Maximum random force of muscles of extensors of the feet (EF) for OMC ranged from 9,7 %. The average level of the manifestation of these abilities over the full cycle was 92,5± 4 %. The values shown in phase II was significantly lower than in IV ($p \leq 0,05$), and results in a "critical" phase – below average, but did not differ significantly among themselves ($p \geq 0,05$) . The degree of influence of OMC on the dynamics of this indicator has made 28,9 % and was accurate.

Maximum random force of muscles of the plantar flexors of the foot (PFF) for OMC was changed in the range of 9,9 %. The average level of the manifestation of these abilities over a complete cycle amounted to 94,3±4 percent. The values shown in II and IV phase had no significant differences, as there was discovered them and between the values of "critical" phases ($p \geq 0,05$). The degree of influence of OMC on the dynamics of this indicator was 12,9 % and is statistically significant (see table.1).

It should be noted that the main difference between the level of display of power capabilities of muscle PH and PSS is less pronounced decrease in the results of the maximum random muscle strength of PSS in phase II.

The explosive force of muscle PH during isometric mode of operation for OMC varied within the limits of 13,8 %. The average level of manifestation of these features over a complete cycle, 91,7±7 per cent. The values shown in phase II was significantly lower than in IV ($p \leq 0,05$) and before and during menstruation – lower than during ovulation. The degree of influence of OMC on the dynamics of this index was 17,9 % and is accurate.

In turn, the explosive power of the muscles of PSS in an isometric mode of operation for OMC varied within the limits of 9,8 %. The average level of the manifestation of these abilities over a complete cycle amounted to 94,7± 5,0 %. The values shown in II and IV phase had no significant differences between them ($p \geq 0,05$) and the values shown during and before menstruation, was significantly lower than during ovulation ($p \leq 0,05$). The degree of influence of OMC on the dynamics of this indicator was equal to 22,7 % and was statistically significant (see table.1).

The main difference in the manifestation of the starting strength between muscle groups and the PH of PSS similar to the differences in the dynamics of the maximum of arbitrary power, was a more significant decline in muscle PH in phase II relative to IV. Thus, the explosive force of lower limb muscles during dynamic operation mode according to the results jump up Abalakov for OMC was changed in the range of 7,9 %. The average level of manifestation of these features over a complete cycle amounted to 96,8±5 %. The values shown in phase II was significantly lower than in IV ($p \leq 0,05$), and the results of the "critical" phases of below average, however, was not significantly different among themselves ($p \geq 0,1$). The degree of influence of OMC on the dynamics of this indicator amounted to 23,6 % and was accurate.

Interesting data were obtained when analyzing the score jump up with sway and without sway hands, which were performed daily before and after exercise. In evaluating the results of jumps into account not only the phase of the OMC, but the amount and orientation of the training effects.

Identified (table 2) that the height of the jump up with a wave of the hand before training varies on different days of the cycle from of 49,8 to 54,3 cm, after training from a 46,6 to 53,9 cm In both cases, the highest results are shown in postovulatory phase (IV), and the lowest in the menstrual (I). The greatest difference was recorded in jumps performed after training. And if in II, III, and IV phase differences before and after exercise were statistically insignificant ($p > 0,05$), in postmenstrually and especially in the menstrual phase difference reaches 5% level of significance.

Thus, training load stronger effect on speed-strength potential of athletes during the most unfavorable

for the organism phase of the OMC. As for the ovulatory phase, the differences in the way the vertical jump before and after exercise not significant and did not differ ($p>0,05$) from that of in the II and III phases of a OMC.

The results of the jumps without stroke (see table. 2) showed approximately the same pattern: the highest values recorded in the second and fourth phases of the cycle, while low in I and III. But if in jumping strokes differences in the rate in the last phase was significant, in this method, the jump they are minimal, the greatest differences are typical for the ovulatory phase.

This fact can be explained by the fact that the way to jump up without strokes was for athletes less familiar and require a certain coordination skill, and, as already noted in the ovulatory phase may disrupt orientation in space and disparity in motor actions. When performing jumps with sway and without sway hands the greatest variability is observed in the menstrual phase.

With the most significant variation recorded after a workout, which is due to both the different scope and focus of the performed training load and the individual reaction of an organism of the sportswoman at her.

Thus, the data obtained indicate the presence for OMC phase changes of indicators of motor abilities of athletes. It was also established that the dynamics of each of them has its own characteristics, specific to a particular phase of the menstrual cycle. These characteristics we associate with changes in the functional state of organs and systems which depend on the level of different motor abilities of athletes.

The change of state of the Central nervous system for the OMC, apparently, largely determines the level of manifestation:

a) the quickness of motor reaction in connection with the change of the interaction between excitatory and inhibitory influences, and threshold of excitation of neurons;

b) coordination capacity by controlling the internal structure of the movement, i.e. changes in the composition involved in the motor act of muscles, decreasing the number of motor units in these muscles, the sequence of involvement of individual muscles;

c) explosive power of the muscles, causing the frequency of pulsation, the degree of synchronization of excitatory influences on the motoneurons, the number of recruited motor units and the coordination of activity involved in the contraction of muscle groups.

Probably, such objective reasons common to the whole group of sportswomen who participated in the study, the trend in the individual indicators of motor abilities for OMC.

In turn, high values of variability indices in I, III and V phases suggest that the level of manifestation of physical qualities in the "critical" phase, the OMC has a significant individual characteristics.

Conclusions. Thus, in examining the general trends in subjective assessment of functional status and manifestation of physical qualities in athletes for OMC were confirmed by data obtained in studies by other authors, about the unidirectional wavelike nature of dynamics of indicators from phase to phase of the cycle. The highest values of the studied parameters were observed in postmenstrually and postovulatory phases (maximum – postovulatory period), and a decrease in menstrual, ovulatory and premenstrual phases (low during menstruation).

Also discovered significant differences in the dynamics of the manifestation of individual motor abilities in female athletes for the OMC:

– the average level of display and the range of variation in indicators over a complete cycle;

– the correlation between the level of development of physical qualities in a supportive and critical periods of the cycle;

– the degree of influence of the menstrual function to change the results of the individual test exercises for OMC.

It should be added that the high values of variability of all studied parameters in the menstrual, ovulatory and premenstrual phases of the OMC suggests that the level of manifestation of motor abilities in "critical" phases of the cycle has significant individual characteristics.

From the foregoing it follows that during the OMC the level of manifestation of motor abilities of athletes varies in accordance with the phases of the cycle, each characterized by a particular condition of the menstrual function and the organism as a whole. Taking into account this position during the training process, in our opinion, can increase its efficiency, from the point of view of growth of motor abilities of athletes, without increasing the volume and intensity of applied loads.

Prospects for further research. It is planned to develop programming algorithm of individualization of training of athletes, specializing in speed-power kinds of track and field athletics, on the basis of promising technological decisions.

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