Biological bases of optimization of training loads of athletes

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Abstract

Objective of the study was to study the main approaches of coaches in Belarus and China to taking into account the biorhythmic characteristics of the body of athletes when planning their training process and to determine the dynamics of the manifestation of speed-strength abilities during OMC in female athletes specializing in various sports.

Methods and structure of the study. A questionnaire was developed and a survey was conducted of coaches (n=16) involved in training female athletes in the Republic of Belarus and specialists (n=12) who train female hockey players in China. Also, to determine well-being, changes in mental state, performance, tolerance of training and competitive loads in various phases of the body's biorhythmics, a survey and testing of 18 qualified Belarusian female runners at various distances and 23 Chinese female hockey athletes was conducted.

Results and conclusions. Analyzing the data from a survey of coaches, it can be stated that most specialists, when planning the training process, do not take into account the phase nature of the ovarian-menstrual cycle of female athletes, which negatively affects the tolerance of the proposed loads, the functional state and well-being of girls. The results of the survey and the results of testing of female athletes indicate the presence of significant phase changes in the indicators of motor abilities of female runners and hockey players in each of the phases of the ovarian-menstrual cycle.

Keywords: *female athletes, training, questioning, characteristics of the female body, OMC.*

Introduction. It is known that adaptation processes and the activity of functional systems in the body of women differ from those in men, which is due to the main biological feature of the female body - the presence of reproductive function, which is quite complex in its neurohumoral regulation [4, 5]. Studies by many authors have shown that the cyclical nature of the processes corresponds to the phases of the biological rhythm and affects not only the general condition of the woman's body, but also its individual organs and systems, which largely determines the performance and magnitude of the manifestation of motor qualities in female athletes [2, 3, 6, 7]. Thus, it is obvious that in practical activities, coaches need to take into account the biorhythmic characteristics of the body of a particular athlete, which significantly influence sports performance.

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athletes involved in hockey were conducted. The age of the subjects is 16-20 years, and their sports experience is 3-9 years.

Results of the study and discussion. Analysis of the questionnaires of coaches from Belarus and China allowed us to obtain the following data. Thus, 68.8% of surveyed Belarusian and 58.3% of Chinese specialists, when planning their work, do not take into account the phases of female athletes' OMC. Accordingly, 12.5 and 16.7 percent take into account, and 18.8 and 25.0% use information about the cycle partially, depending on the characteristics of its course. It is characteristic that 75.0% of respondents from the Republic of Belarus and 83.3% of the People's Republic of China are convinced of the mandatory conduct of training sessions during the menstrual phase, the rest do not see the need for this or approach this issue individually, depending on the well-being of the athlete.

The respondents spoke about the optimal amount of load during the menstrual phase of the OMC as follows. Thus, 43.8% of Belarusian and 41.7% of Chinese trainers believe that training influences during this period should be reduced by half, respectively, 25.0 and 16.7% reduce the load volume by 20-30 percent of the maximum, the remaining respondents of two countries do not change the planned volume depending on the psychophysiological and physical condition of the athletes.

It was revealed that 56.3% of Belarusian and 58.3% of Chinese trainers consider the use of technical simulation exercises, more aimed at developing flexibility, to be effective in the menstrual phase. At the same time, 18.8% of coaches of runners and 25.0% of hockey players believe that general physical training is more productive in this phase.

Without exception, all Belarusian and Chinese experts state the presence of psychophysiological changes occurring in the body of female athletes in the menstrual and, especially, premenstrual phase. Most often (as indicated by 81.3% of Belarusian coaches and 66.7% of Chinese coaches), this manifests itself in the fact that their players become irritable and psychologically unbalanced. A number of female athletes (18.8 and 16.7%, respectively) develop some lethargy, apathy towards the training process, lack of confidence in their abilities, and sometimes fear and reluctance to participate in competitions.

Many coaches (56.3% Belarusian and 66.7% Chinese) have personal experience working with female athletes in whom OMC has virtually no effect on the effectiveness of the training process. The remaining specialists from the two countries claim that absolutely all of their players are largely susceptible to the influence of the body's biorhythms on sports activities. The fact that an athlete with somatic and psychological properties characteristic of men can achieve success in sports was confidently stated by 75.0% of surveyed specialists from the Republic of Belarus and 83.3% from the People's Republic of China.

Thus, the coaches of the two countries do not have a common conceptual opinion in the approach to planning the educational and training process of female athletes in terms of the biorhythmic characteristics of the body and determining the optimal state in which the necessary training influences can be set.

To study the course of menstrual function and its relationship with the psychophysiological state of girls in various phases of the body's biorhythms, a survey was conducted among female athletes from two countries. During the experiment, they daily recorded the state of the body in self-monitoring diaries, and we kept a log of the biological cycle of the subjects.

Analysis of personal data shows that runners from the Republic of Belarus began to play sports at 10.3 years old, hockey players from the People's Republic of China at 9.5 years old, and the OMC stabilized in the majority of girls in the two countries by the age of 14-15 years. The duration of OMC in 55.6% of female runners and 56.5% of female hockey players is 27-29 days. Accordingly, 22.2% and 30.4% have 23-26 days, 16.7% and 8.7% have 21-22 days, and 5.6% and 4.3% have more than 30 days.

It should be emphasized that a shortened OMC (21-22 days) in itself is difficult for planning the training process, and the presence of any violations of the specific biological cycle of an athlete aggravates these difficulties.

The duration of menstruation in 68.3% of all female athletes surveyed is five days, 14.6% - four days, 9.8% - three days, 7.3% - six to seven days. At the same time, 85.4% of female athletes feel a deterioration in their health before and during menstruation, pain in the pelvis, and headaches. A decrease in performance accompanies the premenstrual phase in 65.9 percent and the menstrual phase in 87.8 percent of respondents. All athletes participate in competitions regardless of the phase of the cycle, however, 85.4% of girls

Indicators of upward jump height (cm) in different phases of OMC among female athletes

Phases of OMC	Before training		After training	
	Runners	Hockey players	Runners	Hockey players
	$\bar{X}$±S	$\bar{X}$±S	$\bar{X}$±S	$\bar{X}$±S
I	39,7±2,8	38,2±2,5	36,5±2,7	35,8±2,9
II	43,4±1,1	42,2±1,6	42,8±1,0	41,9±1,8
III	41,1±1,3	40,1±1,7	39,3±1,5	38,7±1,9
IV	45,0±1,2	44,2±1,6	43,9±1,4	43,1±1,6
V	40,3±2,0	40,6±2,1	37,2±2,3	38,3±2,1

note that during menstruation this causes faster and deeper fatigue, and the recovery process takes longer than usual.

Analysis of data on psycho-emotional state showed the following. 26.8% of respondents complain of increased fatigue, imbalance and unreasonable irritability in phase I (menstrual), in phase II (postmenstrual) - 4.9%, in phase III (ovulatory) - 12.2%, in phase IV (postovulatory) - 7 .3% and in V (premenstrual) – 48.8% of female athletes.

According to the subjective sensations of hockey players, during the ovulatory, premenstrual and menstrual phases of the cycle, their physical and emotional state worsens, against the background of which precise spatial orientation decreases, muscle sensations worsen, the time when athletes play slowly increases, and, consequently, the performance of individual players decreases and the team as a whole.

As for female runners, according to their perception, the best manifestation of special motor qualities is expressed in the II and, especially, IV phases of the cycle, while in the I, III and V phases there is a decrease in the realization of dominant abilities. It is characteristic that, according to research data [1, 3, 7], it is the postmenstrual (II) and postovulatory (IV) phases of the cycle that are characterized by a high level of hormone concentration.

Interesting data were obtained when analyzing the results of the Abalakov jump, which the athletes performed daily before and after training (see table). Not only the OMC phase in which the jump test was carried out was taken into account, but also the volume and direction of training influences during this period.

It was revealed that the height of the upward jump before training fluctuates on different days of the cycle among athletes of the two countries from 38.2 to 45.0 cm, after training - from 35.8 to 43.9 cm. In both cases, the lowest results are shown in the menstrual period (I), and the highest – in the postovulatory phase (IV). It is significant that the greatest difference was recorded in the jumps that were performed after training, and the greatest variability in performance was observed during the menstrual phase. Moreover, the most significant variation was recorded after training, which is associated both with the implementation of training influences that differ in volume and direction, and with the individual reaction of the athlete's body to them.

Thus, the data of the study indicate the presence of phase changes in the indicators of the motor abilities of female athletes during the OMC, and the strongest influence of training loads on their motor potential is observed during the period of unfavorable phases of the body's biorhythmics.

Conclusions. It can be stated that in their work with the female contingent, coaches do not focus on OMC, which negatively affects the functional state of female athletes and, as a consequence, their sports performance. At the same time, the training process, organized taking into account the biorhythmic characteristics of the female body, will not only ensure higher overall performance, the proper level of special preparedness of female athletes, but will also preserve their reproductive health. At the same time, monitoring the individual dynamics of the functional indicators of a particular athlete in various phases of the biological cycle and, in connection with this, the individualized focus of the applied training influences, largely optimize strategic approaches in preparing for the main competitions of the season.

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