Evaluation of biochemical factors influencing endurance performance in weightlifters

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ABSTRACT

In this analytical article, we considered the possibility of assessing the functional state and adaptive capabilities of combat athletes by measuring the dynamics of the difference in infraslow potentials of the brain (omega potentials). The presented method indirectly characterizes changes in the level of psychological tension and physical activity, which is relevant in martial arts, where the athlete is under high mental stress with a lack of space and time.

Keywords: infraslow potentials of the brain, omega potentials, adaptive capabilities, functional state

Relevance. Today, in order to achieve high results in elite sports, it is not enough to rely only on pedagogical methods for assessing the functional state of an athlete. In modern sports, where any physical activity requires the highest functionality, there are increased demands on the resources of the body. To prevent overtraining and achieve the greatest performance of an athlete, as well as adequate adaptation to training and competitive loads, it is necessary to take into account the morphofunctional and psychophysiological characteristics of the body.

Movements in martial arts differ from cyclic sports in their sensory, cognitive and motor complexity, high emotional stress. In this regard, the issue of assessing the state of the nervous system and the neuromuscular apparatus becomes relevant. It is known that infraslow brain activity is associated with metabolic processes in the central nervous system, then it may reflect changes associated with the regulation of the functional state of athletes in conditions of physical and psychological stress. Due to the high information content of this method, it is possible to regulate the training and competitive activities of an athlete. The presented work shows the features of the application of this method on single combat athletes by analyzing the scientific literature.

Purpose of the study. To analyze the effectiveness of using the data of the dynamics of omega-potentials in martial arts to assess the functional state of an athlete.

Results of the study and their discussion. There are quick more complex methods for assessing the general functional state of an athlete, which determine the state of the cardiovascular, immune and other systems.But

due to the fact that in martial arts great demands are placed on the speed of decision-making, based on the reflex response from information entering the brain during combat fights, it is necessary to assess the dynamics of the functioning of the nervous system and the neuromuscular apparatus, and thus determine the level of adaptive capabilities , allowing to postpone the moment of fatigue, and achieve high results.

In the 80s of the twentieth century, in the course of numerous studies in the field of neurophysiology and psychophysiology, it was revealed that the dynamics of the amplitude-time parameters of infraslow biopotentials of the brain (energy characteristic of the interaction of charges of brain regions) plays a fundamental role in the adaptation of the organism. In his scientific and practical works, A.N. Sychev showed that the method of assessing the stable potential of the millivolt range in the vertex-trainer lead (an active electrode is placed on the crown of the head - electrode with zero potential on the hands), it is possible to assess the functional state of the athlete and regulate his training activity in accordance with the obtained indicators. In 1983 A.M. Ten conducted a study on fencers to measure the quasi-stability, that is, the relative stability, of the potential difference (omega potentials). They were based on the work of A.G. Sychev, and defined the method of registration of omega-potential as an instant assessment of the functional state of an athlete during training. They identified three ranges of omega-potential characterizing the levels of relatively stable functioning of the brain: low adaptive capabilities (from -1 to 20 mV), optimal values (from -20 up to -40 mV), high voltage of regulation systems (from -40 mV and above), and proved the optimal response of the body to various loads. They conducted their study on 32 fencers in October (at the stage of pre-season training) and in July (before the main start of the season), using the "Multimeter" VR-11. The indicators were measured in the morning and in the competition model. The results of the study revealed that in 90% of the morning results corresponded to the average level of omega-potential regarding stable functioning of the brain, but with long-term measurements during this period, this method established the recovery of athletes and their adaptive capabilities. In July, indicators were measured before important competitions, which showed relatively stable results in leading athletes (± 20-25% of baseline) and unstable results in those whose entry into the team was not decided (it was increased from -45 to -50 mV or on the contrary, reduced from -18 to -20 mV), and after the solution of the command configuration, these indicators stabilized, in contrast to those who had an unstable functional state.

To assess the functional state of the fencer in competitive conditions, they took measurements from two of them during combat practice (training model of the competition). They revealed signs of mobilization of the adaptive systems of the body during combat practice in both athletes (in the first from the beginning of work from -31 to -42 mV to the end of work from -35 to -37 mV, in the second from -30 to -41 mV to from -32 to -42 mV, the difference in indicators is also associated with the gains of the first and the losses of the second). They also suggested that the omega-potential in the morning and during training a state of high emotional stress. Based on the analysis of the work of A.M. Ten, it can be assumed that the measurement of omega-potentials provides a relative assessment of the results of the functional state of athletes, which requires taking into account all the factors influencing the state of the athlete. Measurement of omega potentials in the morning allows you to regulate the training process and load, as it shows more objective indicators of the state of the body, and in competitive activity it is more difficult to evaluate this, as the level of tension increases. In 2009 A.Kh. Kalmetiev, E.Sh. Shayakhmetova, R.M. Muftakhina a study was conducted on boxers of various age groups using the same method of measuring omega potentials. They examined 78 boxers of three age groups (15-16 years old - "boys", 17-18 years old - "juniors", 18 and older - "men") before and after training sessions. In the course of the study, it was

found that after training sessions, the "boys" had a negative shift in the indicators of optimal values by 6.15±19 mV (from -32.27±0.43 to -26.12±0.24), juniors" by 5.51 ± 0.34 mV (from -33.72 ± 0.38 to - 28.21 ± 0.34), for "men" by 5.2 ± 0.11 mV (from 33.60 ±0.40 to -28.40±0.29). Also, it was found that the training load of boxers of all age groups increases the percentage of a decrease in the adaptive capabilities of an athlete, but with age, this indicator decreases, due to the adaptation of the body to physical stress. To determine the data on the amplitude-time characteristics of the omega potential in boxers, they conducted a statistical analysis to determine the average value of the amplitude of omega potentials and found the greatest difference in omega potentials in "boys" and "men" with a difference of 20.446 mV, which indicates the need individual regulation of the distribution of physical activity in accordance with individual indicators of the adaptation of the body, with the speed of age-related changes, etc.

In 2015 M.V. Tregubova, A.V. Beloedov, E.V. Eliseev conducted a study by the same method of measuring the omega-potentials of the brain of aikidoists. 120 Tenshinkai aikidoists of three sports categories (1st category (18 and older), 2nd category (16 years and older), 3rd category (16-17 years old)) were examined before and after training sessions and competitions. According to their research, aikidoists of the 2nd and 3rd category at the age of 16-17 years have a significant decrease in the optimal values of omega-potentials after training sessions - by 13.5 and 11.6%, after competitions - by 8% and 2.1% . In the older age group of the 2nd category (18-20 years old), the optimal values (from -20 to -40 mV) after training sessions decrease significantly less - by 0.9%, after the competition by 3.9%. In the same age group of the 1st category, the optimal values significantly decrease (from -1 to -19 mV) after training sessions - by 18.3% and after competitions by 0.5%. At the same time, in all categories, the adaptive capabilities are significantly reduced after the competition, and the tension of the body's regulatory systems is significantly increased. Therefore, this study suggests that it is necessary to regulate training activities in accordance with the individual performance of the athlete, and also notes that adaptive capabilities work more effectively in competition conditions.

Conclusion. Based on the analysis of scientific literature, we assume that the assessment of infraslow potentials of the brain (omega-potentials) allows us to determine the functional state of martial artists, for whom the regulation of adaptive processes under conditions of physical and mental stress is of great importance in competitive activity. But for more accurate information content of this method, it is necessary to take into account all the factors that affect the functional state of the athlete. According to the study of fencers by this method, it turned out that in the morning hours and during training activities, athletes reflect the functional state of the body, and in competitive activity, its mental state, since the state adapts during the competition. A similar result was obtained from aikidoists, where adaptive capabilities after competitive activity showed a better result than after training activity. In boxers, the difference in omega potentials after training of young men and men was correlated, which amounted to about 20 mV, which made it clear that it was necessary to regulate the training process in accordance with the obtained indicators in each age category. By conducting such studies on combatants, it is possible to determine the average data that will be used to select for the appropriate stages of training, as well as to individualize the training process, in accordance with the condition of the athlete.

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