FUNCTIONAL STATE OF THE HEART OF FOOTBALL PLAYERS DURING DIFFERENT PERIODS OF TRAINING

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Annotation. *The goal of the work was to improve medical monitoring of professional football players by developing and implementing a method for assessing the functional state of football players using the SE-3 electrocardiograph device. An analysis of the functional state of football players throughout the football season was carried out. It was revealed that in the basic period of training there is an increase in adaptation potential; in the competitive period of training, violations of the functional state were often observed.*

Key words: *functional state, variational pulsometry, electrocardiograph, football, integral assessment, medical supervision.*

Rational construction of the training process requires deep knowledge about the effect of physical activity on the body of athletes. One of the indicators of the functional state of the body is the value of its physical performance [2, 6].

One of the necessary prerequisites for optimal management of the training process, in particular, for regulating the volume and intensity of loads both during one lesson and throughout individual training cycles, is information about the morphofunctional state of the body systems that provide muscle activity. Taking this into account, we examined the physical performance of football players by determining the frequency and rhythm of heart contractions.

It has been established that a person's physical performance largely depends on the state of the cardiovascular system. It is also known that a decrease in heart

rate at rest increases the potential capabilities of the heart during physical activity [2, 4, 5].

Based on the fact that bradycardia and sinus arrhythmia reflect the functional capabilities of the heart, we used these indicators to assess the physical performance of football players during year-round training. For this purpose, the method of variation pulsometry was used, which makes it possible to quantitatively assess the functional state of the heart. This method is not labor-intensive and not burdensome for athletes, which allows it to be used many times in the educational and training process and in competitions. When processing seismic cardiograms (PSC), the arithmetic mean duration of the cardiac cycle, its variability, mode, mode amplitude and other indicators are calculated. R.M. Baevsky [1] proposed the calculation of the myocardial tension index (MI), the value of which indicates the degree of cardiac tension, reflecting the functional state of the organism as a whole. This indicator is calculated by the formula where AMo is the amplitude of the mode, %; ΔX is the difference between the maximum and minimum durations of the cardiac cycle, s; Mo - fashion, p.

In an effort to increase the speed of calculations, V.V. Trunin, working with athletes, proposed using simplified methods. In this case, the indicator of the functional state of the heart (IFSH) is calculated using the formula: IFSH =M x Δx - 100, where M is the average duration of the cardiac cycle; Δx is the difference between the maximum and minimum durations of the cardiac cycle.

The research was carried out in the field. When recording the duration of the cardiac cycle, we used a seismic sensor, which was installed in the fifth intercostal space along the midclavicular line. Heart rhythm was recorded using an SE-3 Electrocardiograph. SCG was recorded in a sitting position (at least 100 cardiac cycles). When processing SCG, the average duration of the cardiac cycle and the variability of this value were calculated.

To quantitatively characterize the functional state of the heart, we used an evaluation table developed by us, based on the average duration of cardiac cycles and the amplitude of its fluctuations (Table 1).

20 football players were examined. All athletes were constantly under medical supervision and were practically healthy.

The studies were carried out before training (game) and 15-16 hours after its completion. In total, 18 examinations were carried out, 360 elongated seismic cardiograms were recorded and tested.

Table 1.

Indicator of the functional state of the heart football players, conditional units

IFSH	**Grade**
26 and higher	Great
19-25	Fine
12-18	Satisfactorily

Based on the research, it was found that the level of PFOS in football players increased as their training developed (Table 2).

Individual data indicate that training loads of the same volume and intensity are tolerated differently by football players. These differences are also reflected in the time of recovery processes. As a rule, in football players with higher PFOS levels, training led to a smaller decrease in them. In football players with lower levels of PFOS, training had stronger, and in many cases unfavorable, effects.

Table 2.

Average values of PFSS of athletes in the preparatory period of training, arb. units

Indicators	January	February	March	April
Average value	13,9±1,8	17,1±2,8	22,6±1,7	20,5±1,9
Individual fluctuations	7,0-27,6	12,7-29,6	14,7-23,1	22,0-33,1

Based on the duration of PFOS recovery in athletes, it was possible to determine the amount of work done and the degree of their fatigue. Our data shows that in many cases the load planned by the coach was not adequate to prepare the team as a whole. Some players were overloaded, while others, on the contrary, trained with insufficient physical stress. A similar situation was clearly observed in January and February. The value of PFSS at this time for some football players was more than 3 times greater than for others. During this period, it was advisable to conduct the training process with clear consideration of the individual capabilities of each player.

During the competitive training period, the average value of PFSS among football players increased and averaged 24.1–27.0 units. units (Table 3).

Table 3.

Average values of PFSS of athletes in the preparatory period of training, arb. units

Indicators	May	June	August	September
Average value	24,2±0,8	25,0±0,7	25,8±0,8	27,0±0,6
Individual fluctuations	17,9-29,1	23,4-30,2	18,7-32,7	24,1-33,0

In August and September, the value of PFSS among football players continued to increase and, on average, reached its highest value. Compared to the preparatory period, it increased by an average of 30%.

When observing gaming activity, it was noticed that players with increased PFSS could more easily tolerate competitive loads in all periods of preparation. Throughout the competitive period, they played matches with almost no substitutions. After training and competitive loads, their recovery took place no later than 15-16 hours.

Thus, with the development of training, the functional capabilities of the heart, determined by the value of PFOS, increase, which indicates an increase in the physical performance of football players.

At the end of the preparatory and during the competitive periods, individual differences in PFSS values among football players are noticeably smoothed out. This indicates that the study group is becoming homogeneous and more trained.

Football players with an increased PFSS index tolerated training and competitive loads better. According to variation pulsometry data, their recovery from previous loads was much faster than that of football players with low PFSS values.

The results of the conducted studies allow us to confirm the possibility of monitoring the functional state of football players through the use of variation pulsometry. Having data on the values of PFSS for each player and for the team as a whole, the coach has the opportunity to plan the load for each player individually, taking into account his training and recovery time.

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