TECHNICAL AND TACTICAL ACTIONS IN THE CONTEXT OF PSYCHOPHYSIOLOGICAL INDICATORS OF JUNIOR TAEKWONDOKAS

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Introduction. Thanks to its staginess, taekwondo attracts a large number of young people. And when you consider that the level of aerobic capacity of taekwondokas is almost as good as of the representatives of aerobic sports, we can imagine a strong recreational potential of this sport [1, 2]. Hence, the peculiarities of technical and tactical actions of young taekwondokas are of particular interest, as well as their relationship with psychophysiological indicators of athletes, which were the subject of this study.

Materials and methods. 20 taekwondokas aged 15-18 years were involved in the research. The sparrings were carried out in three 2-min rounds with a 1-min rest interval in between. Before the bout, all participants did standard warm-up exercises typical for this sport.

Heart rate was registered using the "Polar" heart rate monitor without intervals throughout the bout. The psychophysiological indicators were estimated using the hardware and software complex "Activatiometer". Technical and tactical actions (TTA) were evaluated based on the video recording data. We measured: the number of TTA by minutes in each round; the number of points scored in each round; the coefficient of efficiency (CE) of each round as the ratio of the number of scored points and the number of TTA; the level of special endurance as the ratio of TTA in the first and third rounds, and the ratio of CE in the first and third rounds. Effective actions were registered using the electronic monitoring system.

Results and discussion. The analysis of the findings shows that, although TTA tend to decrease in the number by the third round, significant differences are not observed owing to multidirectionality of individual indicators.

The number of TTA in the first round is negatively correlated with the recovery pulse in the first ($r = -0.473$, $p < 0.05$) and in the third ($r = -0.431$, $p < 0.05$) rounds and is positively correlated with the number of TTA in the second ($r = 0.798$, $p < 0.01$) and in the third ($r = 0.579$, $p < 0.01$) rounds. The number of points scored in the first round, is also positively correlated with that of points scored in the second ($r = 0.612$, $p < 0.01$) and in the third ($r = 0.444$, $p < 0.05$) rounds and the level of special endurance by CE ($r = 0.752$, $p < 0.01$). The coefficient of efficiency of the

first round is even more correlated with special endurance: with CE of the second round - ($r = 0.503$, $p < 0.05$), and with CE1/CE3 - ($r = 0.820$, $p < 0.01$). Consequently, athletes with better special endurance use more technical and tactical actions from the very beginning of the bout.

The number of TTA in the second round is highly correlated with the number of TTA in the first ($r = 0.798$, $p < 0.01$) and in the third ($r = 0.657$, $p < 0.01$) rounds. The number of points scored in the second round is positively correlated with heart rate in the second round ($r = 0.469$, $p < 0.05$), in the second ($r = 0.463$, $p < 0.05$) and in the third ($r = 0.420$, $p < 0.05$) recovery periods, number of scored points in the first ($r = 0.612$, $p < 0.01$) and in the third ($r = 0.587$, $p < 0.01$) rounds and CE of the first round ($r = 0.503$, $p < 0.05$). CE of the second round is positively correlated with HR in the second ($r = 0.479$, $p < 0.05$) and in the third ($r = 0.468$, $p < 0.05$) recovery periods and CE of the first round ($r = 0.505$, $p < 0.05$). Thus, athletes, who achieve better results in the second round, have a higher pulse rate during this round.

The number of TTA in the third round is negatively correlated with HR in the first recovery period ($r = -0.526$, $p < 0.05$) by the level of special endurance ($r = -0.567$, $p < 0.01$) and positively – with the number of TTA in the first ($r = 0.579$, $p < 0.01$) and in the second ($r = 0.657$, $p < 0.01$) rounds. Therefore, athletes with poor special endurance, who have started the first round with a higher pulse rate, are unable to perform a larger number of technical and tactical actions in the third round.

The number of scored points in the third round is positively correlated with HR in the second round ($r = 0.454$, $p < 0.05$) and in the third ($r = 0.420$, $p < 0.05$) recovery period, the number of TTA in the second round ($r = 0.421$, $p < 0.05$) and the number of scored points in the first ($r = 0.444$, $p < 0.05$) and, especially, in the second ($r = 0.587$, $p < 0.01$) rounds. CE of the third period is positively correlated with HR in the first ($r = 0.584$, $p < 0.01$) and in the second ($r = 0.455$, $p < 0.05$) rounds and in the first ($r = 0.429$, $p < 0.05$), second ($r = 0.441$, $p < 0.05$) and third ($r = 0.540$, $p < 0.01$) recovery periods. Consequently, the effectiveness of actions of taekwondokas in the third round is determined to a large extent by their functional state.

The level of special endurance as the ratio of TTA1/TTA3 is negatively correlated with the number of TTA in the first ($r = -0.475$, $p < 0.05$) and second ($r = -0.550$, $p < 0.01$) minutes of the third round and the total of TTA in the third round ($r = -0.567$, $p < 0.01$). Therefore, the level of special endurance with regard to this coefficient is mostly determined by the number of TTA in the third round.

The level of special endurance, defined as the ratio of CE1/CE3 is positively correlated only with the number of scored points ($r = 0.751$, $p < 0.01$) and CE ($r = 0.819$, $p < 0.01$) in the first round.

Individualization of training process largely depends on psychophysiological characteristics of trainees. Those features of the nervous system that make up such dynamic side of mental life as

speed, tempo, working capacity, concentration, attention switch, perceptual speed, etc., are of special importance. These neurodynamic characteristics influence the style of sports activity considerably.

Attention switch is the most important psychophysiological characteristic for a taekwondoka. It stands to reason that in our studies it is the only indicator used to detect a significant relationship both with a sports category ($r = 0.560$, $p < 0.01$) and the rating of sports achievements ($r = 0.444$, $p < 0.05$). Higher predisposition to delay ($r = 0.579$, $p < 0.01$) promotes worse attention switch.

One of the most available and informative methods of evaluation of the functional state of the central nervous system is a statistical analysis of the latency periods of a simple sensorimotor reaction, which shows the integral characteristics of the human CNS, since in the process of its realization the most significant systems are involved - vision and kinesthetic, enabling to perform complex motor-identification actions. Average response time of the left hand equaled 214±24 msec, of the right one - 218±20 msec, which is described as a very agile nervous system. Time of motor response of the left hand is significantly correlated with athletes' sports category ($r = -0.458$, $p < 0.05$), rating ($r = 0.610$, $p < 0.01$) and coefficient of efficiency in the second round ($r = 0.508$, $p < 0.05$). Time of motor response of the right hand is correlated with multiple aspects, but for the most part with vegetative indicators (for example, with incomplete HR recovery after the third round ($r = 0.501$, $p < 0.05$).

Functional hemispheric asymmetry is a significant aspect of personality. Each hemisphere has its specific functions that influence sports activity. Various types of activity are provided by either "sinistrocerebral" or "dextrocerebral" thinking. A significant asymmetry, contradicting the nature of activity, often testifies to non-optimal thinking when solving a specific task. In our study the functional asymmetry was estimated by the degree of activation of brain hemispheres. The indicator of activation of a particular hemisphere depends on the number of activated neurons and the degree of their excitation. As seen from the hemispheric asymmetry analysis, it is people with interhemispheric balance who predominate (dextrocerebral - 25%, sinistrocerebral – 20%, ambidexters – 55%) in the sampling. However, we did not observe any relationship between the functional asymmetry with technical and tactical actions and the level of sports achievements. As for the vegetative indicators, the degree of asymmetry correlates, for instance, with HR after three minutes of recovery upon the final round ($r = -0.550$, $p < 0.01$).

The reactions to a moving object (RMO) reveal the features of the integrative function of the brain activity in the time and space perception. In this case physiological mechanisms get involved in the process, thus providing higher accuracy by means of coordination of most subsystems (visual, auditory, motor analyzer) united for the purpose of problem solving. In the

given group, the accuracy rate amounted to 27.63±7.33 c.u., which corresponds to a good level. Accuracy in the RMO test is associated with the tendency to prediction ($r = -0.604$, $p < 0.01$). The variation range of the RMO test is also good (72±31 c.u.) and associated with the tendency to prediction ($r = -0.795$, $p < 0.01$).

The level of psychoemotional stress in the examined group, estimated by total activity of brain hemispheres, was equal to 149.8±81.6 c.u., which is described as excessively high.

Conclusion. Hence, individuals doing taekwondo usually have sky-high indicators of the psychophysiological sphere. Such parameters as attention switch and motor response time are of particular importance and are significantly correlated with sports results and rating of sports achievements. The extremely high level of psychoemotional stress that we observed indicates the not so perfect mechanisms of psychophysiological self-regulation.

The findings can be used to improve the quality of management of the training and sports qualification processes in taekwondo.

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Abstract

The features of technical and tactical actions and psychophysiological indicators of 15-18-year-old taekwondokas were studied. Those athletes who have better special endurance were proved to use more technical and tactical actions from the very beginning of the fight. The effectiveness of actions of taekwondokas in the third round is determined to a large extent by their functional status. Persons engaged in taekwondo tend to have very high psychophysiological characteristics. Such parameters as attention switch and time of motor response are of particular importance and are significantly correlated with sports results and rating of sports achievements. The extremely high level of psychoemotional stress that we observed indicates the not so perfect mechanisms of psychophysiological self-regulation.