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MODEL CHARACTERISTICS OF PSYCHOPHYSIOLOGICAL INDICATORS OF QUALIFIED KICKBOXERS

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Purpose: to determine the model characteristics of psychophysiological indicators of qualified kickboxers.

Material and methods: analysis of scientific and methodological information, Internet sources and generalization of leading practical experience, psychophysiological research methods, methods of mathematical statistics. The study involved 30 qualified kickboxers who train in Kharkiv sports schools and are members of the Kharkiv Regional Kickboxing Federation WPKA. The participants aged 18 to 22 years old. Athletes are qualified as Masters of Sports and Candidates of Master of Sports.

Results: based on the analysis of scientific and methodological information, Internet sources and generalization of best practical experience, it was found that the specifics of competitive activities in martial arts affects the level of psychophysiological reactions that provide high sports results. The evaluation of simple, complex motor reactions and specific perceptions of qualified kickboxers is performed. The results of the study show the homogeneity indicators of simple and complex reactions, as the coefficient of variation is in the range from 5,48 % to 10,07

%, except for the indicator of complex reaction to a moving object that has a high coefficient of variation (26,10 %). Indicators of specific perceptions have a high coefficient of variation (from 14,02 % to 39,01 %). This is due to the fact that specific perceptions reflect, to a greater extent, the individual, genetically determined, characteristic of a particular athlete psychophysiological state. Based on the obtained results, the model characteristics of sensorimotor reactions and specific perceptions of qualified kickboxers are determined.

Conclusions: the analysis and the presented models became the basis for the development of evaluation criteria for sensorimotor reactions and specific perceptions of qualified kickboxers. Model characteristics of psychophysiological indicators of qualified kickboxers are developed and can be the basis for the selection of athletes in the formation of the team.

Keywords: model characteristics, psychophysiological indicators, sensorimotor reactions, specific perceptions, qualified kickboxers.

Introduction

Modern sports training, which aims to achieve maximum results, requires from the athlete the greatest possible, and sometimes excessive intensity of all physiological reserves, including psychophysiological capabilities. However, the current state of affairs shows that the training activities of qualified athletes, aimed at a high result, can no longer be based not only on increasing the amount of load. This is due to the risk of overexertion and overtraining. Therefore, the optimization of the training process should take place primarily on the basis of scientific knowledge, distribution of training loads, considering the characteristics and indicators of individual typological properties of higher nervous activity of athletes [2, 3, 4].

Diagnosis of functional states of the athlete's body is one of the current areas of modern sports science. High sports achievements are closely related to the psychophysiological functions of a human. It is known that full dedication into training and high results in competitions achieved by the athlete, mainly caused by the level of development of psychosensory abilities [6, 8, 11].

A number of authors [7, 9, 13] believe that the psychophysiological functions of a human are the biological foundation of individual-typological features of the higher nervous system, they characterize the process of formation and improvement of special motor skills in training and competitive activities. The adequacy of the reactions of psychophysiological functions to training or competitive loads can be an indicator of both the level of preparedness of the athlete and the development of his processes of fatigue and overexertion.

The main properties of the nervous system determine the functional and psychological fitness of athletes, which affects sports effectiveness, especially in situational sports (various types of martial arts) [1, 7, 14].

The ability to perform a large number of complex technical and tactical actions, anticipating possible actions of the opponent in combat, making non-standard and instant decisions in extreme situations against the background of disturbing factors - all this is a prerequisite for success in competitive activities of kickboxers and reflects their level of psychological preparedness [4, 12].

Training and competitive activities in martial arts contributes to the formation of athletes a whole set of specific reactions and perceptions. They are based on the threshold of perception of stimuli entering various sensory systems. The main role is played by the levels of musculoskeletal, visual, vestibular and auditory sensations. The higher the level of sportsmanship of the athlete, the higher the level of importance of psychophysiological functions to achieve a competitive result [7, 10, 13].

Connection of work with scientific programs, plans and themes. The study was conducted in accordance with the theme of research work of the Kharkiv State Academy of Physical Culture "Psycho-sensory regulation of motor activity of athletes of situational sports" (state registration number 0116U008943).

The purpose of the study: to determine the model characteristics of psychophysiological indicators of qualified kickboxers.

Material and Methods of the research

The following methods were used to solve the research problems: analysis of scientific and methodological information, Internet sources and generalization of best practical experience, psychophysiological research methods, methods of mathematical statistics.

The study involved 30 qualified kickboxers who train in Kharkiv sports schools and are members of the Kharkiv Regional Kickboxing Federation WPKA. The participants aged 18 to 22 years old. Athletes were qualified as Masters of Sports of Ukraine and Candidates of Master of Sports of Ukraine.

Assessment of psychophysiological reactions was performed using a set of tests developed for tablet personal computers [1]. The tests were divided into three groups: evaluation of simple sensorimotor reactions ("Simple motility and resistance to confusing factors", "Simple visual-motor reaction", "Simple auditory-motor reaction"); complex sensorimotor reactions ("Reaction of choice from static objects", "Reaction of distinction", "Reaction to a moving object", "Reaction of choice from dynamic objects"); specific perceptions ("Estimation of sense of tempo", "Estimation of accuracy and speed at reproduction of the set line", "Estimation of perception of changing the size of object").

Results of the research

Based on the analysis of scientific and methodological information, Internet sources and generalization of leading practical experience, it was found that the specifics of competitive activities in martial arts affects the level of development of psychophysiological reactions that provide high sports results [3, 4, 12].

The coefficient of variation was used to determine the homogeneity of the sample observations. It is believed that if the coefficient of variation does not exceed 10%, the sample can be considered as homogeneous [5]. The obtained data show the homogeneity of the indicators of simple and complex reactions of the studied wrestlers (from 5.48% to 10.07%), except for the indicator of the complex reaction to a moving object that has a high coefficient of variation (26.10%). Indicators in tests that reflect the specific perceptions of kickboxers also have a high coefficient of

variation (from 14.02% to 39.01%), this is due to the qualifications of athletes who individually reflect the prediction of the situation (anticipation) (table 1).

Table 1

Coefficient of variation of psychophysiological reactions of qualified kickboxers (n=30)

S No.	Indicators	V, %
Simple reactions		
1	Simple motility (number of touches in 10 s)	7,02
2	Resistance to confusing factors (%)	5,48
3	Simple visual-motor reaction (ms)	7,18
4	Simple auditory-motor response (ms)	6,82
Complex reactions		
5	Selection reaction from static objects (ms)	9,92
6	Reaction to a moving object (ms)	26,10
7	Resolution reaction (ms)	10,07
8	Selection response from dynamic objects (ms)	7,55
Specific perceptions		
9	Estimation of the sense of pace (80 beats / min.$^{-1}$)	39,01
10	Estimation of reproduction of accuracy of the set line (mm)	25,36
11	The playback speed of a given line (mm / s)	30,34
12	Estimation of perception of changing the size of object (s)	14,02

Based on the obtained test results, model characteristics of psychophysiological indicators of qualified kickboxers were developed (table 2).

Table 2

Model characteristics of psychophysiological indicators of qualified kickboxers (n=30)

№	Indicators of sensorimotor reactions and specific perceptions	$\overline{X}$	δ	m
Simple reactions				
1	Simple motility (number of touches in 10 s)	27,43	1,93	0,35
2	Resistance to confusing factors (%)	81,82	4,48	0,82
3	Simple visual-motor reaction (ms)	226,34	16,24	2,97
4	Simple auditory-motor reaction (ms)	212,49	14,50	2,65
Complex reactions				
5	Selection reaction from static objects (ms)	579,74	57,52	10,50
6	Reaction to a moving object (ms)	17,99	4,70	0,86
7	Resolution reaction (ms)	277,63	27,95	5,10
8	Response selection from dynamic objects (ms)	339,60	25,63	4,68
Specific perceptions				
9	Estimation of sense of pace (80 beats / min.-1) (ms)	34,85	13,59	2,48
10	Estimation of reproduction of accuracy of the set line (mm)	0,39	0,10	0,02
11	The playback speed of a given line (mm / s)	72,41	21,97	4,01
12	Estimation of perception of change of the size of object (s)	0,81	0,11	0,02

The given analysis and the presented models became a basis for development of estimation criteria of sensorimotor reactions and specific perceptions of qualified kickboxers (table 3). They allow differentiated assessment of the functional state and management of the training process in martial arts.

Table 3

Evaluation criteria for sensorimotor reactions and specific perceptions of qualified kickboxers

№	Indicators of sensorimotor reactions and specific perceptions	High level	Medium level	Low level
Simple reactions				
1	Simple motility (number of touches in 10 s)	>27,43	27,43-25,50	<25,50
2	Resistance to confusing factors (%)	>81,82	81,82-77,34	<77,34
3	Simple visual-motor reaction (ms)	<226,34	226,34-242,58	>242,58
4	Simple auditory-motor response (ms)	<212,49	212,49-226,99	>226,99
Complex reactions				
5	Selection reaction from static objects (ms)	<579,34	579,34-636,86	>636,86
6	Reaction to a moving object (ms)	<17,99	17,99-22,69	>22,69
7	Resolution reaction (ms)	<277,63	277,63-305,58	>305,58
8	Response selection from dynamic objects (ms)	<339,60	339,60-365,23	>365,23
Specific perceptions				
9	Estimation of sense of pace (80 beats / min.-1) (ms)	<34,85	34,85-48,44	>48,44
10	Estimation of reproduction of accuracy of the set line (mm)	<0,39	0,39-0,49	>0,49
11	The playback speed of a given line (mm / s)	>72,41	72,41-50,44	<50,44
12	Estimation of perception of change of the size of object (s)	<0,81	0,81-0,92	>0,92

It was found that the studied kickboxers have the following levels in psychophysiological parameters: in simple sensorimotor reactions from 3 (10%) to 7 (23%) athletes have a low level, from 6 (20%) to 12 (40%) sportsmen have a medium level and from 15 (50%) to 17 (57%) kickboxers have a high level; in complex sensorimotor reactions from 4 (13%) to 5 (17%) athletes have a low level, from 8 (27%) to 10 (33%) sportsmen have a medium level and from 15 (50%) to 18 (60%) kickboxers have a high level; in specific perceptions from 5 (17%) to 6 (20%)

athletes have a low level, from 8 (27%) to 10 (33%) sportsmen have a medium level and from 15 (50%) to 17 (57%) kickboxers have a high level (Figure 1).

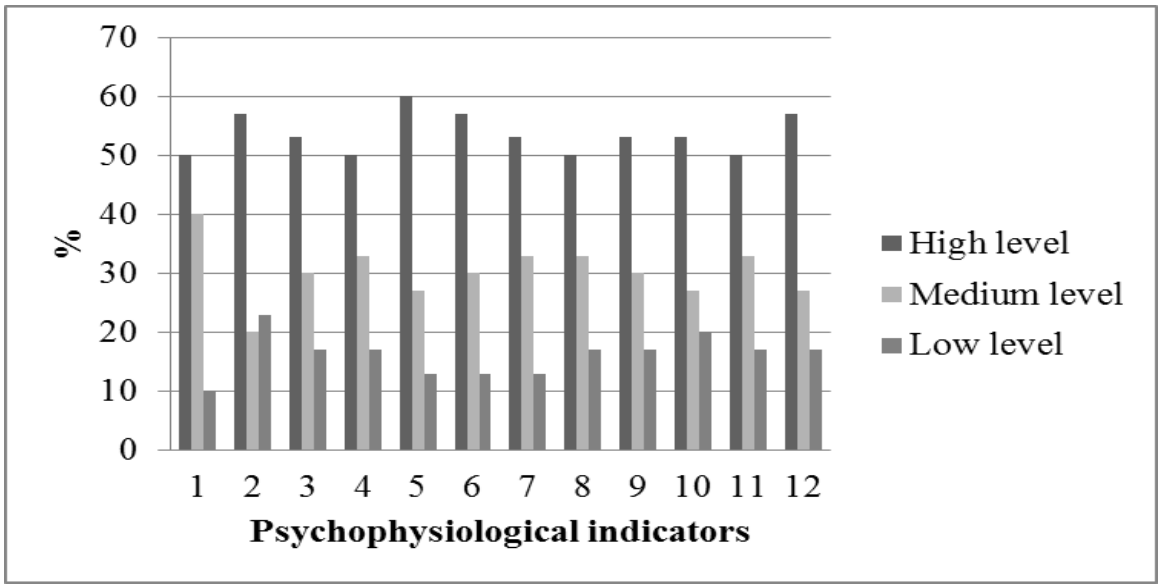

Fig. 1. The level of psychophysiological indicators of the studied kickboxers (n=30)

Note: 1 - simple motility; 2 - resistance to confusing factors; 3 - simple visual-motor reaction; 4 - simple auditory-motor reaction; 5 - selection reaction from static objects; 6 - reaction to a moving object; 7 - resolution reaction; 8 - reaction of choice from dynamic objects; 9 - assessment of the sense of pace; 10 - estimation the speed when playing a given line; 11 - estimate the speed when playing a given line; 12 - assessment of the perception of changing the size of the object.

The obtained data testify to the psychophysiological indicators of athletes as a factor that determines the success in various types of martial arts. This is also confirmed by the results of previous studies, which are presented in scientific papers (Pervachuk, R.V., Tropin, Yu. M., Romanenko, V.V., Chuyev, A. Yu. 2017; Romanenko, V., and et al., 2020; Podrigalo, O., and et al., 2019).

Conclusions / Discussion

The use of modern statistical methods in the analysis of psychophysiological indicators, allows to build mathematical models. They allow you to imagine more clearly the changes taking place in the body of athletes. Rovnyi, A.S., Romanenko, V.V. (2016) studied the model characteristics of sensorimotor reactions and specific perceptions of highly skilled taekwondo practitioners, as a result of which, evaluation

scales were developed. Kozina, Zh. L., Demura, I.M. (2010) used the methods of mathematical modeling to determine the individual tactical manners of the fight in high-class judokas. Zi-Hong, H. (2013) defined the physiological profile of elite Chinese women fighters. The author recommends to compare the data with other wrestlers to help identify individual weaknesses or strengths and develop training programs that will succeed in the fight. Iermakov, S. and et. al. (2016) based on model characteristics identified psychophysiological qualities most important for predicting success in martial arts.

During the study, the following model characteristics of psychophysiological indicators were obtained: simple and complex sensorimotor reactions and specific perceptions. The given analysis and the presented models became a basis for development of estimation criteria of sensorimotor reactions and specific perceptions of qualified kickboxers.

The results of the study indicate the homogeneity of simple and complex reactions, as the coefficient of variation is in the range from 5.48% to 10.07%, in addition to the complex reaction to a moving object that has a high coefficient of variation (26.10 %). Indicators of specific perceptions have a high coefficient of variation (from 14.02% to 39.01%). This is due to the fact that specific perceptions reflect, to a greater extent, the individual, genetically determined, characteristic of a particular athlete psychophysiological state.

It was found that the most studied kickboxers have a high level of manifestation in psychophysiological parameters: in simple sensorimotor reactions from 15 (50%) to 17 (57%) athletes; in complex sensorimotor reactions from 15 (50%) to 18 (60%) sportsmen; in specific perceptions from 15 (50%) to 17 (57%) kickboxers. The average level has: in simple sensorimotor reactions from 6 (20%) to 12 (40%) athletes; in complex sensorimotor reactions from 8 (27%) to 10 (33%) sportsmen; in specific perceptions from 8 (27%) to 10 (33%) kickboxers. Low level has: in simple sensorimotor reactions from 3 (10%) to 7 (23%) athletes; in complex sensorimotor reactions from 4 (13%) to 5 (17%) sportsmen; in specific perceptions from 5 (17%) to 6 (20%) kickboxers.

The developed model characteristics of psychophysiological indicators of qualified kickboxers, in the future, can become the basis for the creation of rapid diagnostics of athletes' readiness for competition.

Prospects for further research will be aimed at determining the correlations between psychophysiological indicators and technical and tactical training of qualified kickboxers.

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