PSYCHOPHYSIOLOGICAL CHARACTERISTICS AS INDICATORS OF SELECTION IN MARTIAL ARTS

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Summary

Abstract. In recent years, due to the active processes of commercialization in martial arts, the number of competitions involving qualified athletes has increased significantly. As a result, the intensity of competitive activities has increased and the requirements for the training of athletes have increased. Coaches and scientists have begun to look for new ways to increase the effectiveness of competitive activities of athletes, as well as new approaches to the selection of talented athletes. Competitive activity in sports and, in particular, in martial arts is characterized by the external manifestation of the processes of higher nervous activity, which provide speed of reactions and information processing, speed of mastering the technique of movements, the ability to switch from attacking to defensive and vice versa.

The aim of the research: to determine the psychophysiological criteria of talent in martial arts. Research methods are theoretical analysis and generalization, documentary method, survey (questionnaire), measurement, methods of mathematical statistics.

During the first stage of research, we analyzed the features of selection and criteria for talent in sports. At the second stage of research, we conducted a survey of fencing, karate and boxing coaches, and identified criteria for talent in martial arts. After that, we hold the measurement of psychophysiological characteristics of fencers, boxers and karate fighters at the stage of maximum realization of individual capabilities and at the stage of specialized basic training. The characteristics we measured were simple visual-motor reaction, distinction reaction, choice reaction, resistance to obstacles, reaction to a moving object and strength endurance. In conclusion, we have defined informative psychophysiological criteria of giftedness in martial arts, supplemented scientific data on psychophysiological characteristics in martial arts.

Introduction. The evolution of competitive activity in martial arts (fencing, boxing, karate, wrestling, etc.) determines changes in the system of training athletes in these sports. In recent years, due to the active processes of commercialization in sports, the number of competitions in which qualified athletes participate has significantly increased. As a result, the intensity of competitive activity has increased and the requirements for the training of athletes have increased [4,5]. Coaches and scientists have begun to look for new ways to increase the effectiveness of competitive activities of athletes; in particular, we can highlight the study of psychophysiological characteristics and consider them when building the training of athletes in martial arts [3,4,8].

Competitive activity in sports and, in particular, in martial arts is characterized by the external manifestation of higher nervous activity, which provide speed of reactions and information processing, speed of mastering the technique of movements, the ability to switch from attacking to defensive and vice versa. The effectiveness of competitive activities in martial arts provide the following psychophysiological characteristics: strength, mobility and balance of nervous processes [8,7].

Carrying out sports selection, it is necessary to understand that it is process of search of the most talented people who possess a complex of qualities necessary for successful sports activity, namely: high level of innate inclinations, development of abilities and inclination to this kind of sport.

As noted in basic research, the selection in sports should focus on indicators that are stable in ontogenesis [3,4]. In addition, the main nervous processes of man, including psychophysiological characteristics, are genetically determined [1,2,8]. The issues of taking into account psychophysiological characteristics in the process of selection of athletes in martial arts in the scientific and methodological literature are not studied. Thus, the study of psychophysiological characteristics of athletes as informative indicators of sports talent in martial arts becomes relevant.

The aim of the study. To determine the psychophysiological indicators of selection in martial arts.

Objectives of the study:

1. To analyze the criteria of selection in different sports.

2. Identify the main indicators of selection in martial arts.

3. Determine the psychophysiological characteristics of martial arts athletes at the stage of maximum realization of individual capabilities (for example, fencing, boxing and karate).

4. To determine the psychophysiological characteristics of martial arts athletes at the stage of specialized basic training (for example, fencing, boxing and karate).

5. To compare the psychophysiological characteristics of martial arts athletes at different stages of long-term training.

Object of research: Selection in sports.

Subject of research: Psychophysiological characteristics of martial arts athletes.

Research methods:

1.   Theoretical analysis and generalization.
2.   Documentary method.
3.   Survey (questionnaire).
4.   Measurement.
5.   Methods of mathematical statistics.

Results of research. As part of the solution of the task of our research, we conducted a survey of coaches on the specifics of the selection of martial arts athletes. In total, we interviewed 50 respondents, of whom 18% (9 people) are boxing coaches, 22% (11 people) are fencing coaches and 60% (30 people) are karate coaches. 10% of the specialists we interviewed are honored coaches of Ukraine.

One third (33%) of the boxing, fencing and karate trainers we surveyed believe that at the initial stage of selection special attention should be paid to motivation and desire to go in for sports, and 28% of professionals focus on such indicators as speed of thinking, information processing and decision making. 18% of coaches think that an important indicator of selection is the speed of motor reactions. 11% of experts are convinced that it is worth focusing on anthropometric data, 9% - on the level of physical fitness of children at the beginning of classes. 1% of coaches added that in the initial selection the general coordination, agility and stress resistance of the athlete are important.
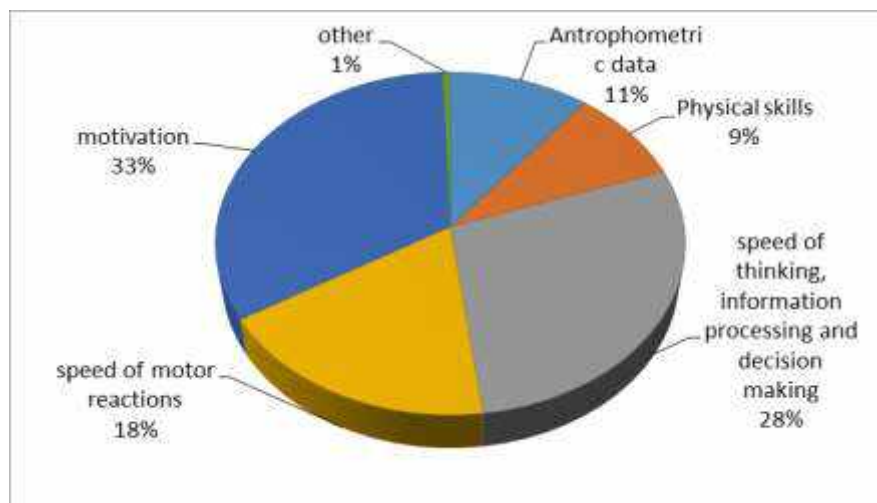
Fig.1. The opinion of trainers on the criteria of talent, which should be paid attention to in the initial stages of many years of training.

Thus, because of the survey we found that one of the main criteria for gifted athletes in the initial stages of long-term training, in addition to motivation to play a particular sport; coaches highlight the speed of thinking and information processing and motor reactions of the athlete. These qualities, in our opinion, are closely related to the psychophysiological characteristics of athletes and the peculiarities of the nervous processes in the central nervous system. At the same time, coaches do not consider physical fitness at the beginning of classes as an informative criterion of talent, which can be used in the implementation of the initial selection in martial arts.

Based on the results of the analysis of literature sources on the criteria of talent in sports and martial arts in particular, as well as on the data obtained during the survey of martial arts coaches, on the criteria of talent we measured the psychophysiological characteristics of martial arts athletes specializing in boxing. fencing and karate. In particular, the contingent of our study were qualified swordsmen, qualified boxers and qualified karate fighters, as well as winners of all-Ukrainian children's competitions in fencing, boxing and karate, which are at the stage of specialized basic training.

The research was conducted using the complex for psychophysiological testing "Neurosoft-psychotest".

As a result of the analysis of literature sources on psychophysiological characteristics in martial arts, as well as based on the results of the survey, we identified indicators of psychophysiological characteristics, which are most common in scientific and methodological literature and are informative in the opinion of coaches. Measurements were also performed according to the following methods: simple visual-motor reaction, choice reaction, distinction reaction, resistance to obstacles, reaction to a moving object and measurement of power endurance of the brush.

Thus, in skilled boxers, the rate of simple visual-motor reaction is 241.1 ms, and in athletes at the stage of preliminary basic training, this figure is 257.3 ms, which in both cases corresponds to a high level of this reaction. Athletes are also characterized by a low number of errors in the implementation of this type of reaction and is 3.9 on average in skilled and 3 in children. The accuracy of a simple visual-motor reaction indicates the stability of the attention of boxers, which in turn is due to the balance of nervous processes.

Among qualified karate athletes, the rate of simple visual-motor reaction is at the level of 224.8 ms, and in karate at the stage of preliminary basic training, it is 250.8 ms, which is an indicator of a high level of this reaction. For athletes specializing in karate is characterized by a low number of errors in the implementation of this type of reaction and is 2 errors on average in skilled and 1.4 in young athletes. The indicator of the accuracy of a simple visual-motor reaction indicates the stability of the attention of karate, which in turn is due to the balance of nervous processes.

Measuring a simple visual-motor reaction in skilled fencers and fencers at the stage of preliminary basic training, we obtained results that are numerically equivalent to 203.4 ms and 218.6 ms, respectively, and correspond to a high level of this reaction. In addition, these athletes have a low number of errors in the implementation of this type of reaction, and is 2.7 on average in skilled and 2.2 in athletes at the stage of preliminary basic training. According to the results of measurements of this type of reaction, it can be argued about the stability of the attention of fencers, which, accordingly, is determined by the balance of nervous processes.
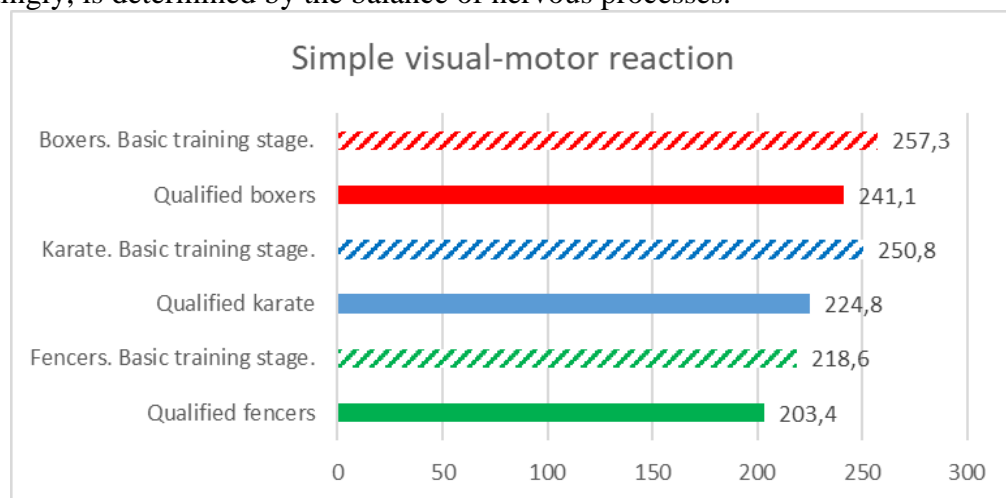

Fig.2. Indicators of simple visual-motor reaction in martial arts athletes at different stages of long-term training (MS).

The average response rate of the choice of qualified boxers is 365.7 ms, and in young athletes at the stage of preliminary basic training, this result is 381.1 ms, which is within normal limits and indicates an intermediate type between inert and mobile type of higher nervous activity. The standard deviation of ± 82.3 ms in skilled and ± 80 ms in athletes at the stage of preliminary basic training is an indicator of the balance of nervous processes of boxers, and high accuracy of the choice indicates the strength of nervous processes and high concentration.

Qualified karate athletes, having passed the measurement method "Reaction of choice", showed a result of 334.1 ms, and athletes at the stage of preliminary basic training of the same sport received a figure of 454.5 ms, which is within normal limits and indicates an intermediate type between inert and a mobile type of higher nervous activity. The standard deviation of ± 84.2 ms in skilled and ± 102.8 ms in children is an indicator of the balance of neural processes of karate, and the high accuracy of the choice reaction indicates the strength of neural processes and high concentration.

In qualified athletes specializing in fencing, the response rate is 323.2 ms, and in fencers at the stage of preliminary basic training, this figure is 359.9 ms, which is within normal limits and indicates an intermediate type between inert and mobile type of higher nervous activity. The standard deviation of ± 69.7 ms in skilled fencers and ± 80.6 ms in athletes at the stage of preliminary basic training is an indicator of the

balance of nervous processes in boxers, which also indicates the strength of nervous processes and high concentration.

Fig.3. Indicators of the reaction of choice in martial arts athletes at different stages of long-term training (MS).

Evaluating the results of boxers who were measured by the "Response Response" method, we obtained the following indicators: qualified athletes respond at a speed of 337 ms, and boxers at the stage of preliminary basic training at a speed of 348 ms. these results are within the norm and correspond to the average value of this indicator. An intermediate type, between inert and mobile type of higher nervous activity, also characterizes them.

The average rate of response in qualified karate athletes is 297.8 ms, and in athletes at the stage of preliminary basic training - 386.2 ms, which is within the norm and corresponds to the average value of this indicator. These indicators correspond to the intermediate type, between the inert and mobile type of higher nervous activity.

In skilled fencers, the resolution of the distinction is 307 ms, athletes at the stage of preliminary basic training, it is equal to 318.3 ms. The indicators measured by us are within the norm and correspond to the average value of this indicator. They are also characteristic of the intermediate type, between the inert and mobile type of higher nervous activity.
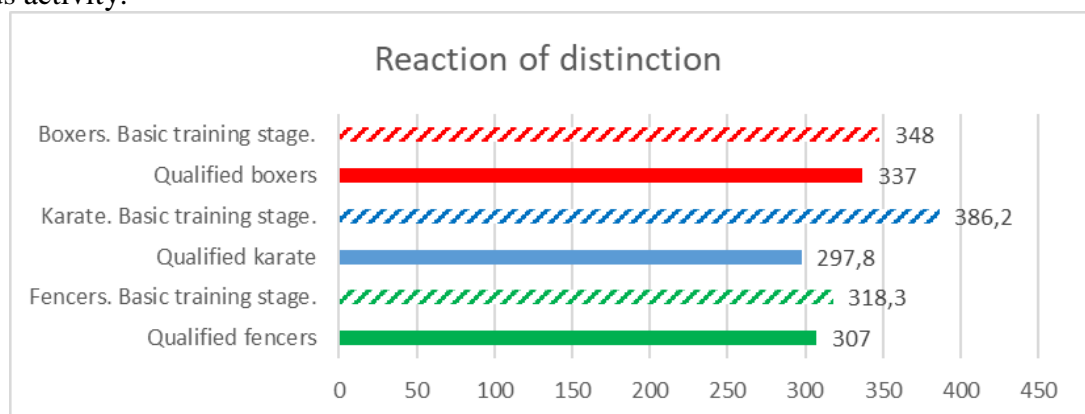

Fig.4. Indicators of the reaction of distinction in martial arts athletes at different stages of long-term training (MS).

We evaluated the resistance of boxers to interference, which consisted of comparing the results of the assessment of attention to a previously known stimulus, and the results of the reaction to the same stimulus with obstacles, the occurrence of which is unknown in advance. Thus, in qualified athletes, there is a high resistance

to interference, with a reaction at the level of 50.5 ms, in athletes at the stage of preliminary basic training there is almost the same result - 49.7 ms. The low number of errors indicates a balance of nervous processes and high concentration.

Among skilled karate athletes, the resistance to obstacles is 55.5 ms, and among young athletes, it is significantly different and is 80.5 ms. In the implementation of this type of reaction there is a small number of errors in karate athletes, which indicates a high concentration of attention and balance of nervous processes.

Qualified fencers have a high level of resistance to obstacles and is 82.3 ms, and athletes at the stage of preliminary basic training, this figure is 119.3 ms. The low number of errors in skilled fencers indicates a high concentration of attention and balance of nervous processes. At the same time, athletes at the stage of preliminary basic training have a greater number of errors, which indicates a relatively lower concentration.

The next indicator we measured in athletes was hand strength endurance. This figure is 91% for qualified boxers, and only 76% for athletes at the stage of preliminary basic training. This difference in the results indicates that in the process of sports improvement there is an impact on this quality and with age and growth of sportsmanship, it improves.

In athletes specializing in karate, the strength endurance of the hand is 95% in skilled and 60% in athletes at the stage of preliminary basic training. A much higher rate of strength endurance of the hand in qualified karate allows us to say about the development of this quality in the process of sports improvement.

Qualified fencers determined their hand endurance index of 88%, and athletes at the stage of preliminary basic training showed a result of 73%. The difference in the values of indicators in athletes of different qualifications indicates the possibility of training this indicator.
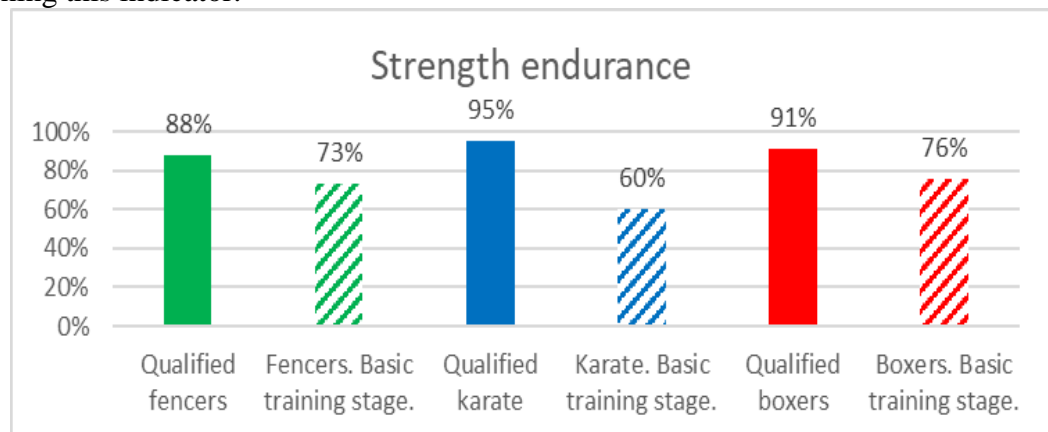

Fig.5. Indicators of strength endurance of the hand in martial arts athletes at different stages of long-term training (%).

In order to determine the balance of nervous processes of athletes, the indicators of reaction to a moving object were determined. In particular, skilled boxers are characterized by an average accuracy of reaction to a moving object, which is 43%. In addition, the number of advances is 38% and the number of delays is 19%. Given these indicators, it can be argued that the predominance of excitation over the processes of inhibition. Boxers at the stage of preliminary basic training have an average accuracy of reaction (46%), the number of advances is 38%, and delays - 16%. Given these indicators, it can be argued that the predominance of excitation over the processes of inhibition.
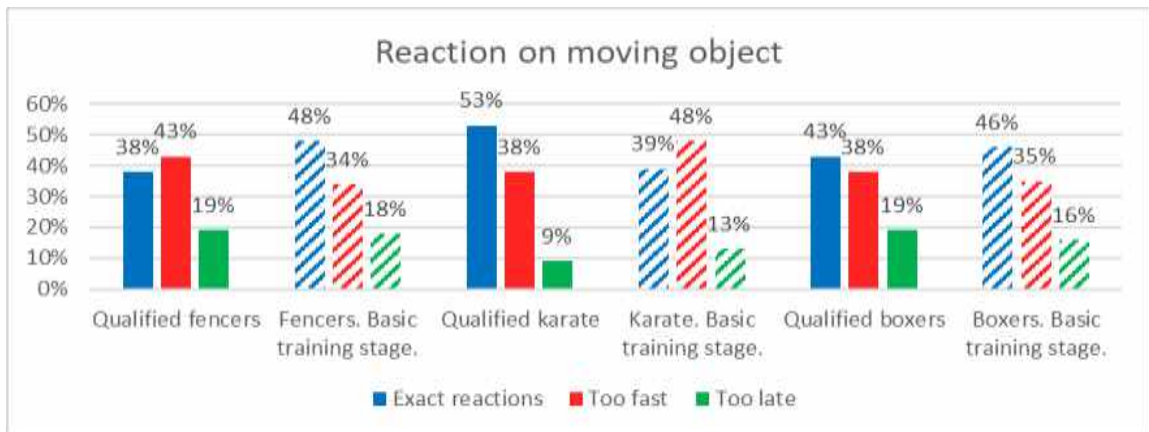
Fig.6. Indicators of reaction to a moving object in martial arts athletes at different stages of long-term training (MS).

Measuring the indicators of reaction to a moving object in qualified karate, we came to the following conclusions: the number of accurate reactions is 53%, advances - 38%, and delays - 9%. Summarizing these results, we can say about the balance of nervous processes with the predominance of excitation over the processes of inhibition. Athletes at the stage of preliminary basic training have a number of accurate reactions of 39%, the number of advances is 48%, and delays - 13%. Such data allow us to assert the significant predominance of excitation over inhibition processes.

In fencers, the results of measurements by the method of "Reaction to a moving object" are: 38% accurate in qualified and 48% in athletes at the stage of preliminary basic training, the number of advances 43% and 34%, respectively, and the number of delays in qualified fencers is 19% , and young athletes - 18%. These indicators indicate a significant predominance of excitation over the processes of inhibition in skilled fencers.

Table 1.

Psychophysiological characteristics of swordsmen at the stage of maximum realization of individual capabilities and at the stage of specialized basic training.

№	Indicator	Stage of maximum realization of individual opportunities (qualified athletes)	Stage specialized basic training	p
1	Simple visual-motor reaction (ms)	203.4 (± 40.3)	218.6 (± 47.4)	> 0.05
	Number of errors	2.7	2.2	> 0.05
2	Choice reaction	323.2 (± 69.7)	359.9 (± 80.8)	> 0.05
	Number of errors	3	4.5	> 0.05
3	Resolution reaction (ms)	307.0 (± 65.0)	318.3 (± 86.8)	> 0.05
	Number of errors	4.5	4.9	> 0.05
4	Resistance to interference (ms)	82.3	119.4	<0.05
	Number of advances	2.1	3.2	<0.05
	Number of delays	0.2	0.06	<0.05
5	Reaction to a moving object (ms)	-2.2 (± 16.8)	1.3 (± 24.6)	> 0.05
	Number of exact reactions	38%	48%	> 0.05
	Number of advances (ms)	43%	34%	> 0.05
	Number of delays (ms)	19%	18%	> 0.05
6	Strength endurance of the brush	88% (± 5%)	73%	<0.05

Table 2.

Psychophysiological characteristics of karate fighters at the stage of maximum realization of individual capabilities and at the stage of specialized basic training.

№	Indicator	Stage of maximum realization of individual opportunities (qualified athletes)	Stage specialized basic training	P
1	Simple visual-motor reaction (ms)	224.8 (± 35)	250.8 (± 46)	> 0.05
	Number of errors	2	1.4	> 0.05
2	Choice reaction	334.1 (± 84.2)	454.5 (± 102.8)	> 0.05
	Number of errors	1.8	1	> 0.05
3	Resolution reaction (ms)	297.8 (± 70.5)	386.2 (± 97.7)	> 0.05
	Number of errors	2.8	2.6	> 0.05
4	Resistance to interference (ms)	55.5	49.7	<0.05
	Number of advances	1.1	0	<0.05
	Number of delays	0	0	<0.05
5	Reaction to a moving object (ms)	-6.2 (± 25.5)	1.5 (± 24.6)	> 0.05
	Number of exact reactions	53%	39%	> 0.05
	Number of advances (ms)	38%	48%	> 0.05
	Number of delays (ms)	9%	13%	> 0.05
6	Strength endurance of the brush	95% (± 7%)	60% (± 18%)	<0.05

Table 3.

Psychophysiological characteristics of boxers at the stage of maximum realization of individual capabilities and at the stage of specialized basic training.

№	Indicator	Stage of maximum realization of individual opportunities (qualified athletes)	Stage specialized basic training	p
1	Simple visual-motor reaction (ms)	241.1 (± 52.7)	257.3 (± 53.2)	> 0.05
	Number of errors	3.9	3	> 0.05
2	Choice reaction	365.7 (± 82.3)	381.1 (± 79.9)	> 0.05
	Number of errors	4.5	5	> 0.05
3	Resolution reaction (ms)	337.4 (± 84)	348 (± 84.5)	> 0.05
	Number of errors	4.9	5.3	> 0.05
4	Resistance to interference (ms)	50.5	49.7	<0.05
	Number of advances	4	4.6	<0.05
	Number of delays	0	0.5	<0.05
5	Reaction to a moving object (ms)	-0.6 (± 24.9)	-4.1 (± 25.5)	> 0.05
	Number of exact reactions	43%	46%	> 0.05
	Number of advances (ms)	38%	35%	> 0.05
	Number of delays (ms)	19%	16%	> 0.05
6	Strength endurance of the brush	91% (± 10%)	76% (± 8%)	<0.05

Conclusions.

As a result of the survey we found that one of the main criteria for the talent of athletes in the initial stages of long-term training, in addition to motivation to play a particular sport, coaches highlight the speed of thinking and information processing and motor reactions of the athlete. At the same time, coaches do not consider physical fitness at the beginning of classes as an informative criterion of talent, which can be used in the implementation of the initial selection in martial arts.

According to the analysis of scientific and methodological literature, as well as based on the results of a survey of coaches, we have identified indicators of psychophysiological characteristics, which are most common in the literature and are informative in the opinion of coaches. These include: indicators of simple visual-motor reaction, distinction reaction, choice reaction, reaction to a moving object, resistance to obstacles and strength endurance of the hand.

We determined that martial arts athletes have a high level of simple visual-motor reaction, which is 241.1 ms for qualified boxers, 257.3 ms for boxers at the stage of specialized basic training, and 224.8 ms for qualified karate athletes. For young karate fighters 250.8 ms, for qualified fencers 203.4 ms and for fencers at the stage of specialized basic training 218.6 ms. High scores of choice and distinction reactions, which in numerical equivalent are 365.7 ms and 337 ms for qualified boxers, respectively, for boxers at the stage of specialized basic training 381.1 ms and 348 ms, for qualified karate athletes, characterize martial arts athletes. These the figures are 334.1 ms and 297.8 ms, and in karate athletes at the stage of specialized basic training they are 454.5 ms and 386.2 ms, in qualified fencers the reaction of choice is at the level of 323.2 ms, and the reaction of distinction - 307 ms, for fencers at the stage of specialized basic training 359.9 ms and 318.3 ms, respectively. They are also characterized by the predominance of excitation processes over inhibition, the strength of the nervous system and high concentration. At the same time, martial arts athletes have a high level of resistance to obstacles (278.9 ms), which allows them to perform work regardless of changing environmental conditions.

Because of our research, it were found that martial arts athletes have a high level of simple visual-motor reaction, choice reaction, distinction reaction and have a high accuracy of reaction to a moving object with a predominance of advances over delays. Such trends traced at different stages of long-term training, which in our opinion indicates that these psychophysiological characteristics are stable indicators in the process of sports improvement of the athlete and can be criteria for talent in martial arts.

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