DYNAMICS OF PSYCHOPHYSIOLOGICAL STATE OF THE BOXERS INFLUENCED BY THE STANDARD OF SPECIALIZED DEMANDS OF SPECIALIZED BASIC TRAINING

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Annotation. Examined the psychophysiological state of boxers with 9 types of reactions to the anticipation stage of the specialized basic training. In the experiment involved 18 male boxers aged 18-20 years. We investigated the dynamics of the reactions of anticipation in boxers under the influence of standard specialized loads. In the main part of the session boxers improved individual series 4-5 shock the boxing bag with the installation of the most strongly and quickly strike (loading dose - 9 rounds of 3 minutes each with an interval of 1 minute rest). Upon completion of the boxers performed strength training with weightlifting neck and stuffed ball. The regularities of the occurrence of each type of response in this group of athletes, provides a way of their use as criteria for assessing the psycho-physiological state of boxers.

Keywords: boxing, dynamics, reaction, anticipation, psychophysiological, loads.

Introduction

Achieving a high athletic performance depends on how effectively realized the potential inherent in the genes, boxer's individual features in the process of sports improvement [3, 8, 13].

Scientists believe that the indicator of the human central nervous system may be indicators of the visual analyzer [4]. It is shown that the performance of physical work is accompanied by the excitation of the cerebral cortex to changes in arousal threshold visual analyzer [5, 6].

Availability instrumental psychophysiological techniques that allow us to investigate the central nervous system by monitoring changes in performance of the visual analyzer, justifying the feasibility of their use in combat sports [10]. In addition, using the methods of estimation of physiological parameters, we can evaluate the performance impact of specialized exercises to develop and improve the speed of movement of vehicles [3, 8]. That is, to apply those techniques as a means of pedagogical control [4, 11].

In addition, the methods of measuring sensorimotor reactions are effective for the study of human central nervous system [1, 3, 4]. It is believed that the diagnosis of the human condition only by one method is inadequate [6]. Scientists emphasized informative hand-eye coordination in determining the excitation and inhibition of neural processes that occur in the body of athletes [3, 4, 5, 9, 15].

Absolute numbers of sensorimotor reactions are psychological manifestations of strength and balance nerve processes of athletes [4, 7, 15, 16]. However, a more informative for boxers of different skills, as research is difficult sensorimotor reaction [3, 4, 9, 12, 14]. In the highest state of readiness of qualified boxers reach these thresholds speed complex sensorimotor reactions that are close to those of simple reaction [14].

Sensorimotor reaction is one of the methods for determining the strength of the nervous system of athletes [15] and objective criteria for assessing their level of fitness [3, 4, 10].

Along with the use of methods for measuring sensorimotor reactions for the study of neural processes in terms of the visual analyzer, broad introduction to the sport also received psychophysiological methods of measuring the critical frequency scintillation light (CFSL). This method was used in studies liability of nervous processes [4], the fatigue of the body [1, 8, 15], mental tension and performance [6], the influence of stress on the body [2, 4], and the study of individual characteristics of athletes [12] .

Thus, psycho-physiological research methods of sensorimotor reactions and CFSL are effectively used as diagnostic tools of the body, as well as for teaching control for timely correction and optimization of training athletes [10, 11].

However, in the scientific and methodological literature on boxing insufficient attention is paid to the study of individual indicators of competitive boxers. Sensor motor response anticipation is not enough used to study the dynamics of psycho-physiological state of boxers at the stage of specialized base preparation, and individual characteristics of psychophysiological field of each athlete individually.

Studies were conducted in accordance with the theme 2.9. "Personalization training process of skilled combat" Consolidated Plan research in the field of physical culture and sports in 2011-2015.

Purpose, objectives, material and methods.

Purpose of research - to study the dynamics of psychophysiological state of boxers under the influence of standard specialized load stage of specialized base preparation.

Research objectives:

1. Determine the performance dynamics of reactions in anticipation of boxers in different parts of training sessions under the influence of a specialized standard load.

2. Identify criteria for evaluating psychophysiological state of a boxer using anticipation reactions.

Methods of research: theoretical analysis and synthesis; neurochronometry, methods of mathematical statistics.

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The organization and methods of research. In study involved 18 male boxers aged 18-20 years, who train at the stage of basic specialist training (first-level sport - 7 candidates for Master of Sports - 9 masters of sport - 2). The study was conducted at the end of the preparatory period.

Indicators of anticipation reactions in training session measured in each boxer three times: the first measure took place before the preparatory part, the second - in the middle of the main part of the lesson, the third - at the end of the final session. The main workout of boxers improved individual striking 4-5 series on punching ball with the stance as hard and fast strike (loading dose - 9 rounds of 3 minutes with an interval of 1 minute rest, which is a specialized workload standard for the boxer training for one) . Upon completion of special work on the equipment boxers perform strength exercises with lifter stamped and stuffed ball. The final part of the session included gymnastic exercises to develop flexibility and muscle relaxation.

We determined the 9 types of reactions anticipation [10], conventionally divided into three blocks: the first block - a slow direct (SD), slow sine wave (SSW), slow diagonal (SDL), the second block - rapid direct (RD), rapid sine wave (RSW), rapid diagonal (RDL), the third unit - a complex direct (CD), a complex sine wave (CSW), a complex diagonal (CDL). Accordingly, each successive unit reaction is more complicated from the previous one. For convenience in the processing and analysis, measuring of each reaction in different parts of the training sessions had its labeling. For example, measuring a slow direct reaction (SD) to the beginning of preparation has marking SD-a, in the main - SD-b, at the end of the session - SD-c, etc.

The data were processed by methods of mathematical statistics, namely, using a standard computer program "Statistics 7" of StatSoft. We analyzed the following groups of parameters: the arithmetic average, minimum and maximum values of variation, the range of variation, standard deviation of the arithmetic average, correlation analysis by Brave Pearson, t-test for dependent samples by Student.

Results of research.

An analysis of the medium group values of the first block of anticipation responses (Table 1) is defined relative stability in their performance under the influence of standard specialized loads - differences between measures in different parts of the training are unreliable. Thus, in terms of a slow direct reaction (SD) measures between SD-a and SD-b t = - 0,717 (P > 0,05) between the measures of SD-b and SD-c t = 0,003 (P > 0,05). The difference between measures of SD-a and SD-c is also not significant (t = - 0,974, P < 0,05). This fact, in our opinion, indicates that the standard specialized load at the end of the preparatory period did not significantly affect the physiological state of the studied boxers in the diagnosis of this type of anticipation reaction - probably it is for athletes at this stage of long-term preparation is quite simple, and therefore influenced by familiar for them fatigue of their body, boxers demonstrate a relatively stable performance.

Table 1

Dynamics of anticipation reactions a slow direct, a slow sine wave, a slow diagonal under the influence of standard specialized load in boxers (n = 18) during specialized basic training.

Type of anticipation reaction	Measure	Arithmetic average	Minimum value	Maximum value	The range of variation	The standard deviation
Slow Direct	to the beginning of preparation part of training session (SD-a)	8,44	3	14	11	+_3,601
	in the main part of training session (SD-b)	9,22	3	16	13	+_4,332
	at the end of training session (SD-c)	9,22	2	13	11	+_3,687
Slow sine wave	to the beginning of preparation part of training session (SSW-a)	7,67	3	14	11	+_4,058
	in the main part of training session (SSW-b)	9,89	1	25	24	+_7,506
	at the end of training session (SSW-c)	8,89	4	16	12	+_4,042
Slow diagonal	to the beginning of preparation part of training session (SDL-a)	11,11	1	20	19	+_5,769
	in the main part of training session (SDL-b)	9,56	3	19	16	+_4,605
	at the end of training session (SDL-c)	9,44	3	16	13	+_4,630

The same is observed in the analysis of performance anticipation reaction a slow sine wave (SSW) (Table 1) - differences between performance measures of unreliable SSW-a and SSW-b (t = - 1,194, P < 0,05), SSW-b and SSW-c

(t = 0,654, P <0,05), SSW-a and SSW-c (t = - 0,840, P <0,05). Thus there is a slight (no significant) increase the performance of a slow sine wave in boxers in the middle of the main part of the training session. Analysis of the anticipation reaction a slow diagonal (SDL) (Table 1) shows a similar pattern - differences between them in different parts of the of training session as false: between performance measures of SDL-a and SDL-b (t = 1,466, P < 0,05), SDL-b and SDL-c (t = 0,079, P < 0,05) between performance measures of SDL-a and SDL-c (t = 1,314, P <0,05). In the group of boxers there is only a slight tendency to decrease a slow diagonal under the influence of load (Table 1). We can assume that this is due to natural mobilization of mental athletes.

Thus, we can conclude that this unit of anticipation reactions is relatively easy for boxers, so even under the influence of fatigue due to specialized standard load values are not significantly changed.

In the study of first block anticipation reactions simultaneously performed correlation analysis of each anticipation reactions separately, resulting in a proved reliable correlation relationships between indicators of measures SD-a and SD-c (r = 0,568; P < 0,05), SD-b and SD-c (r = 0,851; P < 0,001), SSW-b and SSW-c (r = 0,504; P < 0,05), SDL-a and SDL-b (r = 0,644; P <0,01), SDL-a and SDL-c (r = 0,483; P < 0,05), confirming the above statement about the stability indices anticipation reactions a slow direct, a slow sine wave, a slow diagonal in boxers regardless of psychophysiological state of their body.

The analysis of the data of the second block of anticipation reactions (Table 2) revealed instability in their terms. Yes, there is a significant decrease a rapid direct reaction (RD) in a group of boxers between measures RD-a and RD-b (t = 3,366, P < 0,01). We can assume that in the middle of training session under the influence of stress was mobilized psychophysiological state of boxing, and that this type of anticipation reaction is strongly reflected. At the end of training session parameters unreliable increased between measures RD-b and RD-c (t = 1,158, P < 0.05). There is no difference between the first and third parameters of measure - between RD-a and RD-c (t = 1,318, P < 0,05). That is, the level of psychophysiological state of boxers at the end of the training session returns to the source. Thus, we can assume that this type of anticipation reaction reflects the level of CNS excitation of a boxer.

When analyzing the performance anticipation reaction a rapid sine wave (RSW) (Table 2) observed a significant increase in the group of boxers in the middle of the main part of workout - between measures RSW-a and RSW-b (t = -2,396, p < 0,05). That is, under the influence of the effects of stress boxers do not have time to deal with the complexity of this type of reaction - it can be assumed that they have lost visual perception under the influence of fatigue. At the end of training session performance of this type of anticipation reaction returned to the original level: differences between measures RSW-b and RSW-c (t = 1,465, P <0.05) and a RSW-a and RSW-c (t = -0,001, P > 0, 05) are unreliable. Thus, we can assume that this type of anticipation reaction can be a criterion of psychophysiological assessment of fatigue boxer at the time of measure.

Table 2

Dynamics of anticipation reactions a rapid direct, a rapid sine wave, a rapid diagonal under the influence of standard specialized load in boxers (n = 18) during specialized basic training.

Type of anticipation reaction	Measure	Arithmetic average	Minimum value	Maximum value	The range of variation	The standard deviation
Rapid Direct	to the beginning of preparation part of training session (RD-a)	14,22	4	24	20	+_7,224
	in the main part of training session (SD-b)	10,22	4	20	16	+_4,697
	at the end of training session (SD-c)	12,22	2	24	22	+_7,908
Rapid sine wave	to the beginning of preparation part of training session (RSW-a)	12,22	8	16	8	+_2,981
	in the main part of training session (RSW-b)	15,55	10	26	16	+_5,883
	at the end of training session (RSW-c)	12,22	6	22	16	+_5,776
Rapid diagonal	to the beginning of preparation part of training session (RDL-a)	15,11	4	24	20	+_6,516
	in the main part of training session (RDL-b)	16,22	6	32	26	+_7,417

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at the end of training session (RDL-c)	14,89	4	24	20	+_6,659

When analyzing the performance anticipation reaction a rapid diagonal (RDL) (Table 2) there is unreliable tendency to increase in the middle of the main part of workout (between measures RDL-a and RDL-b (t = -0,597, P < 0.05)) and returns to the original level at the end of the training session (between measures RDL-b and RDL-c (t = 0,502, P < 0.05) and RDL-a and RDL-c (t = 0,124, P < 0.05).

That is, the performance anticipation reaction a rapid diagonal can complement the performance anticipation reaction a rapid sine wave.

Simultaneously reactions in this block performed correlation analysis separately between parameters measuring of each rapid reaction in different parts of the workout. Established reliable statistical relationship between performance measure and RD-a and RD-b (r = 0,719; P < 0,001), and RD-a and RD-c (r = 0,642; P < 0,01), indicating that the proportional changes in the dynamics of these indicators in boxers under the influence of standard specialized load. This fact confirms the foregoing statement that all boxers in the middle of training sessions were involved in significant mobilization of psychophysiological state exactly in terms of performance anticipation reaction a rapid direct (RD). There are no reliable relationships separately between indicators of measure RSW-a, RSW-b, RSW-c and RDL-a, RDL-b, RDL-c, indicating that the instability of these indicators of boxers. Thus, this fact confirms the foregoing statement that these types of anticipation reactions as a rapid sine wave (RSW) and a rapid diagonal (RDL) are psychophysiological assessment criteria of fatigue of boxers just during loading.

The analysis of indicators anticipation reactions of the third block (Table 3) found significant differences in their dynamics. Analysis of the dynamics of reaction a complex direct (CD) indicates a significant increasing of them in the second part of the training session (the difference t = -3,436, p <0.01) between performance measure CD-b and CD-c and at the end of training session (difference t = -3.419, P <0.01) between indicators of measure CD-a and CD-c). The difference between CD-a and CD-b is not significant (t = -0,797, p < 0,05). That is, the facts indicate accumulation in the boxers influenced by psychophysiological fatigue loads are specialized standard in the main body, and more - at the end of workout. This suggests that this type of anticipation reaction can be criterion for evaluating the fatigue of the body of a boxer under the influence of special loads. Simultaneously correlation analysis revealed a reliable correlation coefficient between performance measure CD-b and CD-c (r = 0,818; P < 0,001), confirming the proportional increase in the direct performance of reaction a complex direct in a group of boxers exactly at the end of workout.

In analyzing the performance a complex sine wave (CSW) (Table 3), however, identified a significant decrease in their end of the session compared to its beginning. So, the current significant difference between indicators of measure CSW-b and CSW-c (t = 3,282, P < 0.01) between indicators of CSW-a and CSW-c (t = 5,529, P <0.001). However, no significant difference between indicators of measure CSW-a and CSW-b (t = 0,252, p < 0.05), in the first part of workout. Simultaneously correlation analysis revealed no significant correlation relationships between indicators of all measures reaction complex sine wave (CSW), indicating that the instability of group performance. However, a significant decrease in group performance exactly CSW at the end of training session indicates the presence of positive changes in the psychophysiological state of boxing, despite objective fatigue. This suggests that this kind of reaction reflects the individual internal mobilization (adaptation) of psychophysiological state a boxer to load.

Table 3

Dynamics of anticipation reactions a complex direct, a complex sine wave, a complex diagonal under the influence of standard specialized load in boxers (n = 18) during specialized basic training.

Type of anticipation reaction	Measure	Arithmetic average	Minimum value	Maximum value	The range of variation	The standard deviation
Complex Direct	to the beginning of preparation part of training session (CD-a)	12,09	6,4	16,0	9,6	+_3,393
	in the main part of training session (CD-b)	13,33	8,0	24,0	16,0	+_5,488
	at the end of training session (CD-c)	16,00	12,8	24,0	11,2	+_3,557
Complex sine wave	to the beginning of preparation part of training session (CSW-a)	14,13	9,6	17,6	8,0	+_2,689
	in the main part of training session (CSW-b)	13,17	10,4	22,4	12,0	+_3,915
	at the end of training session (CSW-c)	9,24	5,6	16,8	11,2	+_3,643
Complex diagonal	to the beginning of preparation part of training session (CDL-a)	18,62	10,0	25,2	15,2	+_5,763

in the main part of training session (CDL-b)	15,33	10,8	24,0	13,2	+_3,876
at the end of training session (CDL-c)	10,71	6,4	13,6	7,2	+_2,572

In analyzing the performance a complex diagonal (CDL) observed a similar to a complex sine wave (CSW) pattern. There is a significant decrease in its performance at the end of the training session: between performance measures CDL-b and CDL-c (t = 5,085, P <0.001) between indicators of CDL-a and CDL-c (t = 5,773, P <0.001). Unreliable only difference between indicators of measures CDL-a and CDL-b (t = 1,751, P> 0.05) - in the first part of workout. . Simultaneously correlation analysis shows no significant relationship between all indexes measures reaction a complex diagonal (CDL). In other words, this type of anticipation reaction duplicates characteristics of a complex sine wave (CSW).

The study additionally conducted correlation analysis between indicators of all anticipation reactions. The results complement the above patterns.

So determined, in the third block there is a dialectical opposition between performance reaction a complex direct (CD) and reaction a complex sine wave (CSW), indicators of reactions a complex direct (CD) and a complex diagonal CDL): established inverse relationship between indicators of CD and CSW (r = -0,633; P < 0,01), between indicators of CD and CDL (r = -0,642; P < 0,01). That is, these reactions reflect different aspects of psychophysiological state of boxers.

A rapid diagonal (RDL) has a high correlation of own reliable performance with indicators of a complex direct (CD): r = 0,702; P <0,001. Both types of reactions reflect increase performances in the boxers influenced by fatigue (standard specialized load).

The first block of anticipation reactions (a slow direct, a slow sine wave, a slow diagonal) has a tight correlation of indicators between themselves, SD and SSW (r = 0,797; P < 0,001), SD and SDL (r = 0,766; P < 0,001), SSW and SDL (r = 0,741; P < 0,001). It shows their uniformity. These reactions have low information content for these troop boxers at the stage of basic specialist training.

Some related reactions have among themselves trusted relationship. Thus, the indicators of reaction a slow direct associated with indicators of reaction a rapid direct (r = 0,882; P <0,001), indicators of reaction a slow sine wave associated with indicators of reaction a rapid sine wave (r = 0,687; P < 0,01).

Indicators of reaction a slow sine wave have a high reliable correlation of indicators of reaction a complex direct (r = 0,733; P < 0,001), and a complex diagonal (r = 0,707; P < 0,001).

Conclusions.

1. In the study of dynamics of the indicators of anticipation reactions under the influence of specialized standard load in boxers' training session (n = 18) during basic specialized training were identified such patterns:

- Found stability in the indicators of anticipation reactions a slow direct, a slow sine wave, a slow diagonal - the differences between the indicators of measures such reactions in different parts of the training sessions are not reliable (t = 0,003 - 1,466, p < 0,05).

- Found a significant decrease of anticipation reactions of a rapid direct in a group of boxers in the middle of the training session (t = 3,366, p < 0,01). The level of psychophysiological state of boxers at the end of the session according to this reaction returns to the original.

- The analysis of indicators of anticipation reaction a rapid sine wave observed a significant increase in the group of boxers in the middle of the main part of the training session (t = -2,396, p < 0,05). At the end of training session indicators of this type of reactions returned to the original level: the differences between the indicators at the beginning and the end of the session are inaccurate (t = -0,001, p < 0,05).

- The analysis of the indicators of reaction a rapid diagonal observed inaccurate tendency to increase in the middle of the main part of the training session (t = -0,597, p < 0.05), they return to the original level at the end of training session (t = 0,502, P > 0.05), the equality of indicators between the beginning and the end of training (t = 0,124, p < 0,05).

- Analysis of indicators of the dynamics of anticipation reaction a complex direct testifies their significant increase in the second part (t = -3,436, p < 0.01) and at the end of the training session (t = -3,419, p < 0,01). The difference in performance between the beginning and the middle training session is not significant (t = -0,797, p < 0,05).

- Determined a significant decrease of indicators of reaction a complex sine wave at the end of training session (t = 3,282, p < 0.01) and compared to its beginning (t = 5,529, P <0.001). The difference between indicators in the first part of training session is not significant (t = 0,252, p < 0,05).

- Determined a significant decrease of indicators of reaction a complex rapid diagonal at the end of the training session is not significant (t = 5,085, P <0.001) and compared to its beginning (t = 5,773, P < 0.001). The difference between indicators that received in the first part of training session is not significant (t = 1,751, p < 0,05).

2. Identified the following criteria for evaluating of indicators of psychophysiological state of boxers using anticipation reactions:

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- anticipation reactions a slow direct, a slow sine wave, a slow rapid diagonal have little information for boxers at the stage of specialized base preparation, as under the influence of fatigue loading indicators of standard specialized in boxers have no significantly changes;

- anticipation reaction a rapid direct characterizes the level of CNS arousal of a boxer and can be used as a criterion of evaluation of its mobilization;

- Anticipation reaction a rapid sine wave may be psychophysiological assessment criteria of fatigue a boxer at the time of measuring (or during exercise). Indicators of reaction a rapid diagonal can complement indicators of a rapid sine wave;

- Anticipation reaction a complex direct may be a criterion of evaluation of overall fatigue body of a boxer (including under the influence of special loads);

- Anticipation reaction a complex sine wave and a complex diagonal may make criterion of individual internal mobilization (adaptation) of psychophysiological state of a boxer to stress.

Prospects for further research in this direction.

In further studies on the basis of the above provides definition specific features of the dynamics of psychophysiological state of a boxer on the stage of specialized base preparation, taking into account his individual style of competitive activity.

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