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# THE STUDY OF THE FUNCTIONAL STATE OF THE CENTRAL NERVOUS SYSTEM OF YOUNG BOXERS IN THE BACKGROUND OF THE USE OF AUDIOVISUAL STIMULATION

## ИССЛЕДОВАНИЕ ФУНКЦИОНАЛЬНОГО СОСТОЯНИЯ ЦЕНТРАЛЬНОЙ НЕРВНОЙ СИСТЕМЫ ЮНЫХ БОКСЕРОВ НА ФОНЕ ПРИМЕНЕНИЯ АУДИОВИЗУАЛЬНОЙ СТИМУЛЯЦИИ

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***Keywords:*** *functional state of the central nervous system, specially-preparatory stage, young boxers, audiovisual stimulation.*

***Abstract.*** ***The article presents the results of a study of indicators of the health of the nervous system of young boxers in the background of the use of audiovisual stimulation.***

***Ключевые слова:*** *функциональное состояние центральной нервной системы, специально-подготовительный этап, юные боксеры, аудиовизуальная стимуляция.*

***Аннотация.*** ***В статье излагаются результаты исследования показателей работоспособности нервной системы юных боксеров на фоне применения аудиовизуальной стимуляции.***

**Introduction.** Training loads of special-prepared, precompetitive and competitive periods lead to a tension of compensatory-adaptive mechanisms with the development of reversible and irreversible disadaptation phenomena [10]. Proceeding from this, timely recognition and correction of developing dysfunctions of the body systems of young athletes, monitoring of their health is necessary.

In the framework of these measures, an important place belongs to the use of highly effective modern methods and methods of psycho-physiological support of the training process. The methodological arsenal of prevention and correction means of disadaptive conditions requires constant improvement and the search for new methods. Taking into accoun the difficult economic conditions, priority should be given to the application of the most effective, short-term and accessible methods of correction and rehabilitation. In this sense, activities with the application of rhythm imposition methods based on the bioresonance principle, in particular, audiovisual stimulation, are promising.

The available literature data testify to the effectiveness of the use of these methods for optimizing the adaptation process, increasing emotional resistance to stress, treating borderline neuropsychic disorders, and increasing mental performance [3-9]. This allowed us to put forward a working hypothesis about the possibility of using the method of audiovisual stimulation to correct the functional state of the body in persons experiencing difficulties in the training and competition period. Audio-visual stimulation (ABC) is a rhythmological effect on the body through the visual and auditory analyzers involving the cortical, limbic structures and the reticular formation of the brain [7]. Thus, influence on neurohumoral regulation of a person is carried out. However, the mechanisms of action and effectiveness of audiovisual psychophysiological impact on the psychoemotional state, efficiency, functional reserves of the central nervous system of athletes remain to this day little studied.

The purpose of the research is the psychophysiological substantiation and the identification of the effectiveness of the use of audiovisual stimulation sessions to enhance the functional state of the central nervous system of young boxers.

Materials and Methods. The study was conducted on the basis of the laboratory of psychophysiology and experimental psychology of the Bashkir State Pedagogical University. M. Akmullah, the sports complex of the Bashkir State University and at the stadium «Dynamo» in Ufa

Researches were conducted in a special preparatory period. This stage was chosen in connection with diverse, high physical loads, which should lead to significant functional reorganization in the body of athletes. At the beginning and at the end of the study, the athletes underwent an in-depth examination at the Republican Medical and Sports Dispensary and were found healthy.

In the conditions of the training process, 72 athletes aged 13-14 years were examined, who made up the control group (CG) and the experimental group (EG). The control and experimental groups were homogeneous by age, years of boxing and level of preparedness. The admission of young athletes to a physiological examination was carried out on the basis of the written consent of one of the parents and the administration of the sports school.

To assess the functional state of the central nervous system (CNS) of young boxers, the chronoreflexometric technique of T.D. Loskutova was used. [1] in the modification of M.P. Moroz [2]. The method allows to evaluate the current functional state of the subjects according to the parameters of the visual-motor response to the presentation of a light stimulus. The technique was carried out with the help of the psychophysiological testing device «Psychophysiologist» (Ltd. Medikom MTD, Taganrog).

The mathematical-statistical processing of the experimental material was carried out using the Microsoft Excel spreadsheet editor and Statistica 6.0 software package. To determine the differences in the physiological indicators of boxers 13-14 years old, the method of comparing the groups by the t-test of the Student was used at a significance level $p < 0.05$, $p < 0.001$.

Results. The analysis of scientific publications on boxing and practice of sports training determined the importance of studying the level of efficiency of the central nervous system of boxers in a special preparatory period [10]. Therefore, we conducted an analysis of the effect of stimuli of various modalities (light, sound) on the frequency of brain biorhythms, which affect the biological activity of the brain and the functional state of individual body systems, in particular, the functional state of the central nervous system. As corrective measures, audio-visual stimulation sessions were performed on the portable software-hardware complex «PhotoSonix», which is released serially and is permitted for medical use. The complex includes hardware, general and special software.

The hardware complex includes the following devices:

**Table 1 – Functional state of the central nervous system and the efficiency of young boxers with and without the use of audiovisual stimulation (n = 72), % ratio**

| Performance level | Groups of subjects | Before experiment | | After experiment | |
|---|---|---|---|---|---|
| | | Quantity | % | Quantity | % |
| Limited | CG | – | – | – | – |
| | EG | – | – | – | – |
| Normal | CG | 10 | 28 | 5 | 13,9 |
| | EG | 5 | 13,8 | 10 | 27,8 |
| Slightly lowered | CG | 8 | 22 | 15 | 41,7 |
| | EG | 12 | 33,4 | 22 | 61,1 |
| Reduced | CG | 18 | 50 | 16 | 44,4 |
| | EG | 19 | 52,8 | 4 | 11,1 |
| Significantly reduced | CG | – | – | – | – |
| | EG | | | | |

– a program control unit that provides generation of auditory and visual stimuli for the purpose of correcting the functional the state of the central nervous system. It includes various versions of programs for psychophysiological rehabilitation, as well as restoration and preservation of working capacity, normalization of sleep, provides the possibility of individualizing the impact; – additional devices: special glasses with LEDs, headphones.

For the psychophysiological impact, natural stimuli were used: light and sound for changing the psychoemotional state. The complex is practical and easy to use. The sportsman wore headphones, glasses with LEDs, closed his eyes, and then ran the chosen program. The device supplied specially selected light and sound signals, which affect the central nervous system. This provided psychophysiological correction of the functional state of the central nervous system, normalization of the processes of excitation and inhibition, removal of excessive tension, inducing sleep, restoring efficiency, reducing overwork and psychosomatic disorders.

The sessions of audiovisual stimulation were conducted every day during the training process of sportsmen, except Sunday, as the training process includes one day to restore the body. Three «PhotoSonix» devices were used, each assuming work with two subjects. In total, 10 sessions of audiovisual stimulation were conducted with the athletes of the experimental group under program No. 13 Alpha / Theta relaxation, which helped to learn how to move from one state to another. The duration of the Alpha / Theta relaxation program was 24 minutes at a frequency of 8-28 Hz. The experiment was conducted under the control and direct participation of trainers and assistant coaches. Simultaneously, 6 people were invited to audiovisual stimulation sessions, along with the assistant coach, the instruction was explained and the program was launched. So, for one training was conducted work with 36 boxers.

Table 1 presents the results of a study of the functional state of the central nervous system of young boxers against the background of the use of audiovisual stimulation.

**Discussion.** It is noteworthy that in the course of the forming experiment in the study groups «limited» and «significantly reduced» levels of the functional state of the nervous system of young boxers were not recorded.

Resurches showed that in the special preparatory period, the «normal» level of the CNS performance decreased by 14.1% in the CG and, accordingly, the «slightly lowered» level of the level of the CNS efficiency increased. The «reduced» level remained practically unchanged. We are inclined to associate such a redistribution of the levels of the working capacity of the central nervous system with the peculiarity of the structure of the special preparatory stage and the tasks facing it. It is known that this stage includes three microcycles (Mc): at the 1 st Mc of the preparatory period, the organism «draws» into the work of high intensity by using a variety of training aids in accordance with the tasks of the stage, the 2nd Mc is the «shock» – training the loads reach their maximum, in the 3rd Mc the loads are significantly

reduced to detect the cumulative effect of the use of training aids [10].

Redistribution of the levels of the functional state of the central nervous system, found in the athletes of the experimental group in the special preparatory period, in our opinion, is a sign of the optimal neuropsychic stress associated with the adaptation of the body of boxers to training and psychoemotional loads against the background of the use of ABC. This is evidenced by an increase of 14% in the number of young athletes with a «normal» level of functioning of the central nervous system. Reducing the number of young boxers with a «lowered» level of the CNS efficiency by 41.7% is, in our view, a reflection of the redistribution of the relationships between the processes of excitation and inhibition in the cerebral cortex of athletes as a result of the use of ABC.

Conclusion. The sessions of audiovisual stimulation can be recommended for use in the training process as an effective tool in a complex of means and methods that enhance the functional state of the central nervous system of young boxers.

Under the influence of audiovisual stimulation a redistribution of the levels of the functional state of the central nervous system occurred in the athletes of the experimental group. The experimental group noted an increase in the number of young athletes with a «normal» level of functioning of the central nervous system by 14%, in the control group their number decreased by 14.1%. In the experimental group there was a decrease in the number of young boxers with a «lowered» level of the CNS efficiency by 41.7%, in the control group – by 5.6%.

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