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FEATURES OF THE AUTONOMIC NERVOUS SYSTEM IN ATHLETES DOING COMPLEX-COORDINATION SPORTS

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ABSTRACT
The article presents the results of a study of the functional state of the autonomic nervous system of athletes involved in sports gymnastics. At the same time, the results of the study showed the relationship between qualifications and growth in the activity of adaptation mechanisms and the activity of the parasympathetic link of regulation.

KEYWORDS: *autonomic nervous system, athletes, sports gymnastics, Kerdo index, Hildebrant coefficient*

Adequate assessment of the functional state of the autonomic nervous system and its adaptive capabilities during the training process requires improvement of methods of medical and pedagogical control over athletes [Минко О. В., Марков К. К.].

The importance of current examinations is increasing with the aim of early detection of transitional functional states of the body of young athletes in the training process, as well as prevention of the initial phenomena of fatigue, overtraining, reducing the level of reactivity of the central nervous system, immunodeficiency and reducing resistance [Saclova L. et al.. Green J. H. Баратова С]. A typical psychophysiological state in sports is high tension and, as its variety, sports stress, which contributes to the development of autonomic dysfunctions [Булгаков М. С., Маринич В. В., Эбзеева Е. Ю.].

Currently, the study of the autonomic nervous system in athletes is becoming more relevant due to the increasing loads in the training, pre-race and competitive periods, which also lead to overstrain of the functional capabilities of the autonomic nervous system, leading to a decrease in sports results and the development of pathological conditions [Маринич Saclova L. et al. l, , Turmel J. et a,].

THE PURPOSE OF THE RESEARCH is to study the functional state of the autonomic nervous system in athletes involved in sports gymnastics.

MATERIALS AND METHODS

The study was conducted in Sports school specialized in athletics and sports in 2023-2024. 60 male athletes aged 17-24 years involved in sports gymnastics were examined (average age 21.43±1.69 years). All athletes are divided into two groups depending on their qualifications: the 1st group consisted of 22 (36.7%) athletes who qualified as candidates for master of sports and master of sports; in the 2nd group - 38 (63.3%) athletes of the 1st and 2nd categories. The control group consisted of 25 healthy guys matched by age.

To complete the assigned tasks, the Kerdo index and the ratio of heart rate to RR (Hildebrant coefficient) were calculated, the duration and color of dermographism were determined.

The Kerdo index (IC) is an indicator used to assess the activity of the autonomic nervous system. It shows the ratio of excitability of its sympathetic and parasympathetic departments. The Kerdo index is calculated using the formula:

$$IR = 100 * (1 - DBP / HR)$$

When the value of this index is greater than zero (sympathicotonia), they speak of the predominance of stimulating influences in the activity of the autonomic nervous system; less than zero (vagotonia) - about the predominance of inhibitory reactions; if equal to zero (eutony) - about functional equilibrium. The Kerdo index will be over than zero if the pulse is over than diastolic pressure, equal to zero if they are equal, and less than zero if DBP exceeds the pulse [Азимок О. П].

The Hildebrant coefficient is the ratio of heart rate to respiration rate per minute. Normally, this coefficient is 2.8 – 4.9 [Фудин Н. А.].

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When studying the color of the stripes, white dermographism indicates increased excitability of the vasoconstrictors of the skin and the sympathetic part of the autonomic nervous system; diffuse red dermographism - about increased excitability of the parasympathetic department.
All obtained results were subjected to statistical processing.

RESEARCH RESULTS

When studying the ratio of excitability of the sympathetic and parasympathetic parts of the autonomic nervous system, it was found that 62.6% of group I athletes had eutonia, 7.7% of athletes had sympathicotonia, 29.7% had vagotonia. While in group II, eutonia was detected in 77.5% of cases, vagotonia - in 19.2% of cases, sympathicotonia - 3.3%. In the control group, 80.8% had eutonia, 8.2% had sympathicotonia, and 11% had vagotonia (Fig. 1).

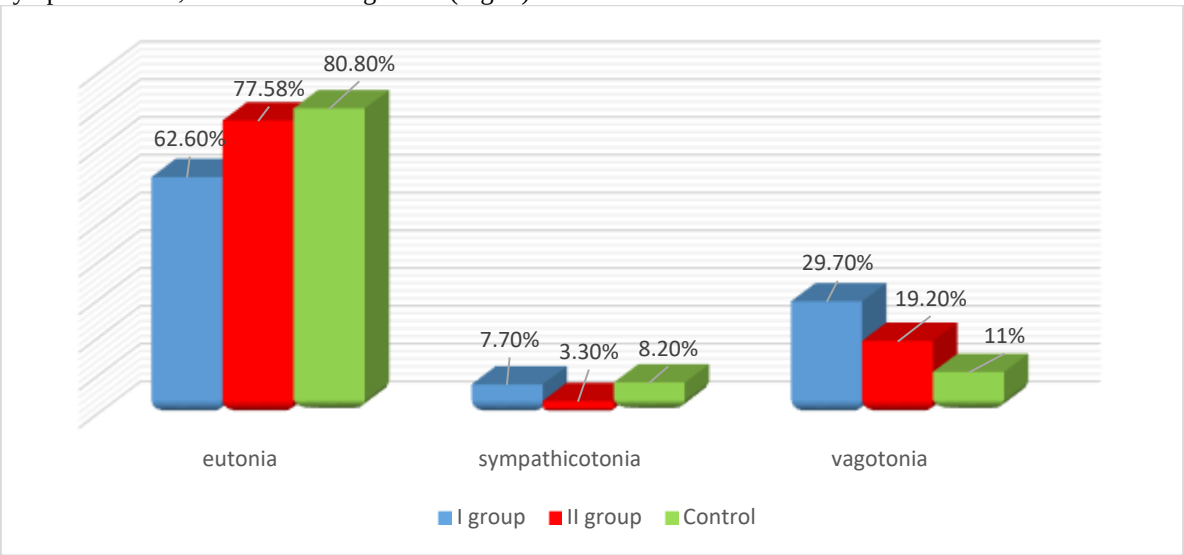

Fig. 1. Comparative analysis of the results of calculating the Kerdo index (%)

When calculating the Hildebrant coefficient, the results of 55.7% of group I gymnasts were within the normal range. 17.1% of athletes had sympathicotonia, and 27.1% had vagotonia. In group II, this coefficient was within normal limits in 68.1% of cases; 6.4% had sympathicotonia, 25.5% had vagotonia. In the control group, 77.2% of athletes were within normal limits, 5.7% had sympathicotonia, and 17.1% had vagotonia (Fig. 2).

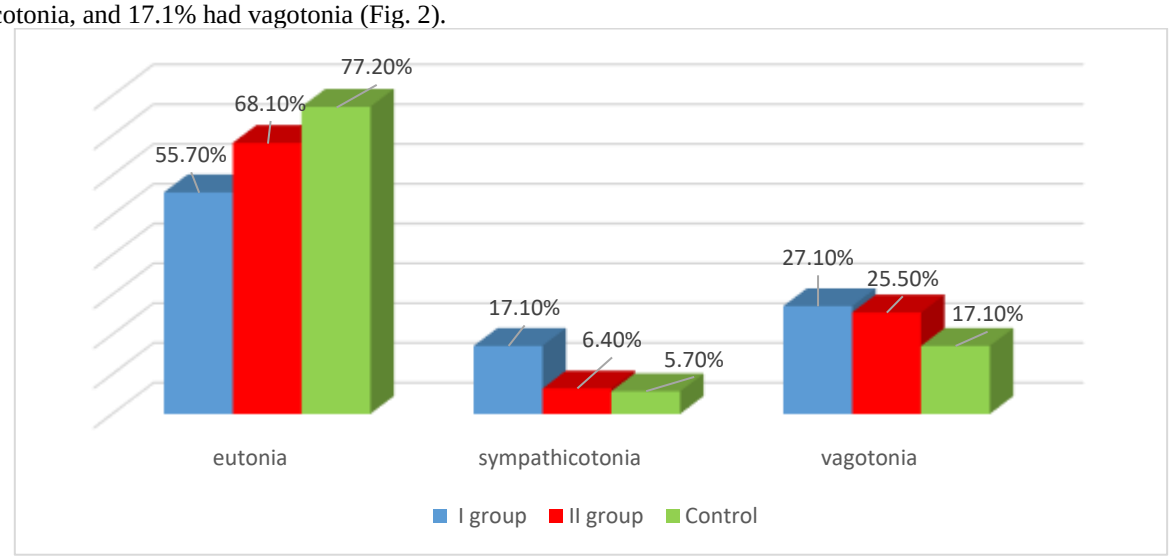

Fig. 2. Comparative analysis of the results of calculating the Hildebrant coefficient (%)

Due to the fact, that in the majority of those examined, eutonia was determined, reflecting the balance of autonomic regulatory mechanisms, in a certain part of athletes the parasympathetic department performs its function more intensively than the sympathetic department, which is apparently due to the specifics of training and competitive loads.

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At a further stage of the examination, a study of dermographism was carried out by color and duration. When conducting a comparative analysis, it was found that in athletes of group I, dermographism, normal in time, was observed in 74.3% of cases, in 9.1% it disappeared quickly, and in 16.6% it disappeared slowly. While in group II, time-normal dermographism was detected in 68.4% of gymnasts and a larger percentage of athletes with inert dermographism - 22.7%. Rapidly disappearing dermographism was observed in 8.9% of athletes (Figure 3).

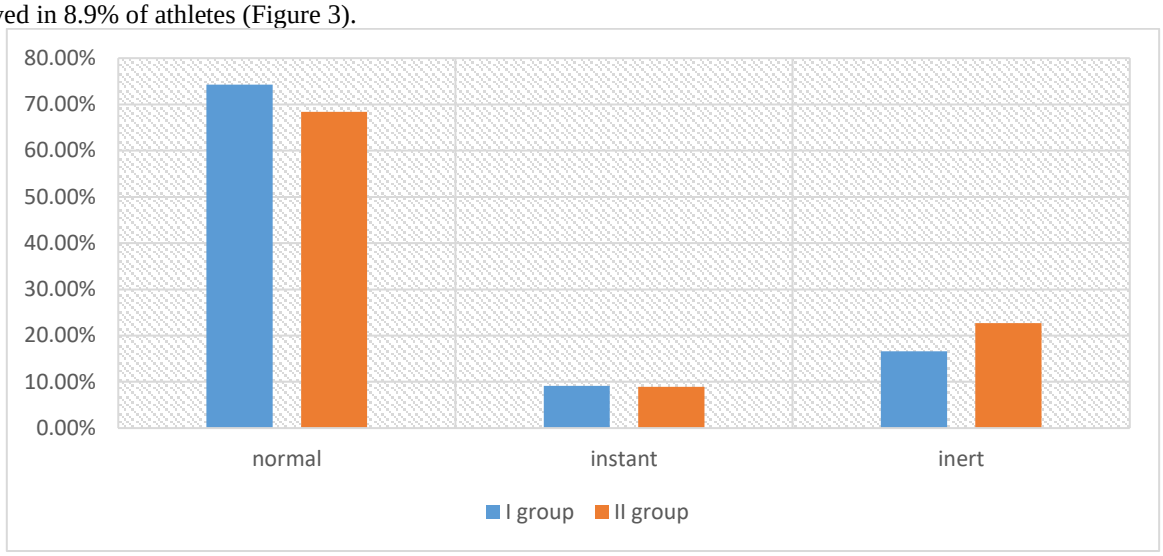

Fig.3. Comparative analysis of the duration of dermographism (%)

When studying the color of dermographism, 8.3% of group I athletes had white dermographism, 75.0% had a transitional shade between pink and red, and 16.7% had diffuse red dermographism. In group II, white dermographism was observed in 10.6% of athletes, color from pink to red - in 63.8%, diffuse red dermographism - in 25.5% (Figure 4).

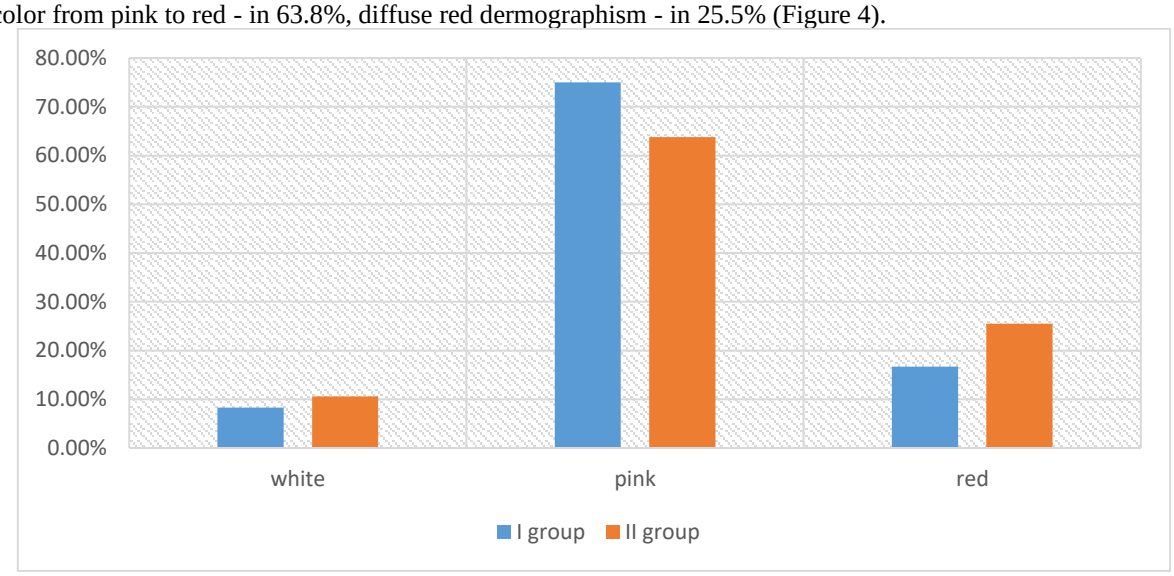

Fig.4. Comparative analysis of dermographism color (%)

Thus, when studying the duration and color of dermographism stripes in athletes involved in sports gymnastics, it was found that in the group of highly qualified athletes, a third of the athletes had a disturbed functional state of the neurovascular system of the skin with a predominance of the parasympathetic component.

CONCLUSION

Thus, a comprehensive study of the functional state of the autonomic nervous system showed that the higher the athlete's qualifications, the higher the increase in the activity of adaptation mechanisms and the activity of the parasympathetic regulation link.

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