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Physiological Ergogenic Medicines: Modern Trends Of Application In The Training Of Athletes

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Abstract: There are various approaches to the classification of ergogenic agents used to improve the physical capabilities of athletes. Mainly, ergogenic agents of five different classes are considered: food, physiological, psychological, pharmacological, mechanical. This article analyzes the results of recent scientific publications concerning the use of physiological ergogenic agents by highly qualified athletes. The study showed that the use of a hyperoxic gas mixture has a directed effect on the functional capabilities of the cardiorespiratory system, optimizing vegetative support. The use of oxygen support before maximum exercise helps to increase the performance of the oxygen transport system, the overall performance of the heart, as well as reduce the limiting capabilities of the respiratory system. Breathing a hyperoxic gas mixture for 20 minutes after maximum exercise accelerates the processes of urgent recovery of the cardiovascular and respiratory systems.

Key words: training process, biomedical support, sports physiology, extra-training means, ergogenic means, recovery, working capacity, functional systems of the body, adaptation.

1. INTRODUCTION

At the present stage, the intensity of stress in elite sports is critical. In the course of active sports activity, certain changes in the functional state of the body occur, associated with adaptation to physical and psycho-emotional stress, and, consequently, with the degree of tension of regulatory mechanisms. Along with the constant improvement of the pedagogical component of the training process, it becomes necessary to develop new, modern technologies for optimizing sports training, which will expand the range of adaptive capabilities of the human body. In this regard, the analysis and systematization of information about ergogenic means, as well as the effectiveness of their use in order to restore and improve special performance in various sports, are of great interest for the theory and practice of sports.

The aim of the study is to analyze and systematize research on the development and application of existing physiological ergogenic agents in sports.

2. RESEARCH METHODOLOGY AND ORGANIZATION

Search, collection and analysis of information sources (articles, conference materials, abstracts, magazines) were performed.

3. RESEARCH RESULTS AND THEIR DISCUSSION

According to modern concepts, ergogenic means are means that can improve exercise performance and / or increase adaptation to training loads. Scientists believe that ergogenic products should meet the following requirements: not be included in the WADA list of prohibited substances; be physiologically and metabolically effective; do not create inconvenience and do not lead to extreme situations; not cause immediate and delayed negative consequences for the athlete's health; not cause excessive and long-term decrease in fitness; not to have negative reviews in print media [17]. There are various approaches to the classification of ergogenic aids used to enhance the physical performance of athletes. Mainly, ergogenic agents of five different classes are considered: food, physiological, psychological, pharmacological, mechanical. This article analyzes the results of the latest scientific publications concerning the use of physiological ergogenic agents in highly qualified athletes. A special role is played by means of preliminary (and post-work) stimulation of athletes' working capacity, which accelerates recovery processes, including in conditions of competitive activity [2]. In this direction, scientists from different countries are actively conducting research work to identify the effects of hyperoxia. A group of scientists from Canadian universities is studying the effect of hyperoxia on the content of lactate and pyruvate and on the partial tension of respiratory gases in muscles [17]. They found that hyperoxia (60% O2 content) compared to normal air during high-power exercise affects a decrease in muscle glycogenolysis, a decrease in the accumulation of lactate and its utilization, and reduces the concentration of blood adrenaline by ~ 44%. Researchers from the University of Prague D. Sachi et al. Tried the use of concentrated oxygen inhalation when performing the Wingate test again [18]. Inhalation of 99.5% oxygen during the recovery period following the Wingate test significantly accelerates short-term recovery processes. There was a significantly less decrease in the effectiveness of the second Wingate test after inhalation of 99.5% oxygen compared to air. A study similar to the above was conducted by New Zealand scientists [15]. They used a randomized randomized test to assess respiration 21; 60 and 100% oxygen during 4 minutes of rest after 30 seconds of maximal exercise on repeat exercise. Breathing with 100% oxygen during rest after maximum exercise improves the productivity of the subsequent exercise, however, fatigue indicators are also increased and the transient ergogenic effect is therefore short-lived - perhaps 1–2 s. Our research has shown that the use of a hyperoxic gas mixture has a targeted effect on the functional capabilities of the cardiorespiratory system, optimizing vegetative support. The use of oxygen support before maximum exercise helps to increase the performance of the oxygen transport system, the overall performance of the heart, as well as reduce the limiting capabilities of the respiratory system. Breathing a hyperoxic gas mixture for 20 minutes after maximum exercise accelerates the processes of urgent recovery of the cardiovascular and respiratory systems [7].

One of the directions of using physiological means directly in the training process or in parallel to it is feedback on changes in physiological processes and results of activity. Feedback is useful in increasing the performance of athletes, as well as in the process of motor training and rehabilitation [12,16]. However, attitudes and feedback paths vary considerably. This not only can be attributed to conditions and feedback, but also depends on the differences of the subjects. In addition, the internal processes that facilitate training and

rehabilitation performance are poorly understood. Feedback reaction time training is an integral part of the psychological training of the Canadian Speed Skating Mind Room program [14]. Researchers from the Universities of San Francisco (USA) and Toronto (Canada) presented the new system in the form of re-starts. The protocol for measuring pedal activation of the device by the foot has been designed so that the response is recorded when the pedal is released rather than depressed. This allows athletes to react by simulating their actual start on the ice. The results can be communicated to each athlete as feedback and then a start signal sounds for the athlete 2 seconds later to release the pedal. Scientists assign an important role in improving the results of athletes to the use and accounting of biological rhythms. V. Pugacheva with scientists from the universities of Slovakia and the Czech Republic analyzed the relationship between biorhythms and physical performance of biathletes [19]. The authors determined the optimal time for the development of speed abilities to be 6 pm, for strength abilities - 9 am and for practice shooting - in the afternoon and evening. The most active research in sports chronobiology is carried out by scientists at the University of Liverpool. They compared responses to continuous morning and evening exercise in a hot environment (35 ° C) [11]. The following indicators were investigated: body temperature, aerobic capacity, power output and operating time in a step test on a bicycle ergometer. The studies were conducted at 08:00 and 17:00. The authors found that in the evening compared to the morning, the average power output was 9 watts more and the operating time increased by 2.8%. Researchers from the Exercise Physiology Laboratory of the University of São Paulo [9] found that late exercise, although it leads to more stress on the cardiovascular system, is not accompanied by a decrease in aerobic performance and is not perceived as heavier. Scientists from the Department of Obstetrics and Gynecology, Department of Reproductive Endocrinology, University of Patras (Greece) [13] found that elite athletes involved in rhythmic gymnastics had a smoothed circadian rhythm of salivary cortisol, possibly due to intense training and competition. Gymnasts have higher levels of salivary cortisol in the morning and psychological stress compared to salivary cortisol levels in untrained men and women. Currently, in chronobiological research, there is a shift in emphasis from studying the dynamics of body functions and performance at different times of the day to research related to the search for rhythms of body systems as indicators of the functional state and adaptation processes. Various researchers have shown the role of physical activity as a pacemaker, synchronizing and desynchronizing human circadian rhythms.

Scientists from the Department of Psychobiology at the Federal University of San Paulo (Brazil) and the John Moore University of Liverpool Sports Research Institute conducted the first study to determine the circadian rhythm at all speeds of movement and muscle groups under a standardized protocol [10].

This study showed a pronounced 24-hour rhythm in slow and fast movements of the knee extensors and flexors. In our studies of the rhythmic organization of psychophysiological indicators of athletes of various specializations [3], it was also established that the daily dynamics of psychophysiological processes in athletes has a predominantly 24-hour rhythmic structure. In addition to daily rhythms, 14- and 30-hour rhythms were identified, which is associated with the nature of sports activity: ultradian 14-hour rhythms were established in athletes of cyclic dynamic types, infradian 30-hour rhythms were established in athletes of situational types, and ultradian 14-hour rhythms were found in athletes of strength types. hourly and infrared 30-hour components. In our other work [4] rhythm was analyzed and chronobiological features of the main systems limiting the performance of skiers were determined. It is shown that the rhythmic organization of the respiratory system of athletes is represented by 14-, 16-ultradian, daily 24-hour, infrared 30-hour rhythms. Circadian rhythm of the cardiovascular system of skiers is represented by daily 24-hour and ultradian 14-hour

rhythms of indicators of central hemodynamics and daily 24-hour rhythms of indicators of peripheral hemodynamics. Methods of chronocorrection and optimization of the functional state of a person are being developed. Scientists from the Institute of Biomedical Research VSC RAS and the North Ossetian Medical Academy have proposed and successfully tested new methods of chronocorrection of the state of athletes [8]. In their studies, ergogenic means, such as low-intensity magnetic laser exposure in the biofeedback mode in combination with the intake of adaptogens, ensure successful correction of pathological desynchronosis, increase the level of health, general physical performance, and exercise tolerance. Another, in our opinion, a promising method for urgent post-training and post-competition restorative effects is transcranial electrical stimulation with a pulsed current (TPP). This method non-invasively, selectively and strictly dosed activates the work of structures producing endogenous opioid peptides [6]. There are few data on the use of TPP in sports practice. In a number of studies, scientists have used EFT to correct the psychophysiological status of athletes. Our studies have shown that TPP after a competitive load helps to accelerate the processes of restoration of autonomic regulation of the cardiovascular system of athletes. The cumulative effect of the course of TES procedures was manifested in the optimization of the EEG rhythms of the athletes' brain.

4. CONCLUSION

Consequently, TES is a promising method of physiological influence for optimizing the functional state of athletes in the process of their adaptation to training and competitive loads, as well as in the process of recovery after them [5]. Output. This review analyzes the data on the results of studies by foreign and Uzbek scientists in the field of the use of physiological ergogenic agents, which are mostly used simultaneously for both urgent and cumulative effects. The strategic direction is the complex application of physiological stimulation means simultaneously with training means in training cycles. These combinations of means and the rationale for their use in various sports will ensure the achievement of a higher cumulative training effect, an increase in the adaptive potential of the athlete's body and the effectiveness of competitive activity.

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