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Physical Training of Canoe and Kayak Rowers

Bakhodirov Salimbek Sardorbekovich[1]

[1] Uzbek state university of physical culture and sports, Uzbekistan

E-mail: salimbekbohodirov@gmail.com

Abstract:

In endurance-based cyclic sports such as rowing, the development of physical qualities including endurance, speed-strength capacity, and technical proficiency is fundamental to athletic success. Among young canoe and kayak rowers, effective training strategies must be tailored to developmental stages and physiological capacities to ensure performance improvement and injury prevention. Despite advancements in training methodology, there remains insufficient research on how age, technical skill, and physiological indicators such as heart rate and oxygen consumption interact to shape athletic performance in youth rowing. This study aims to identify the physiological and physical parameters most critical to optimizing the training process for young rowers, with a focus on the integration of technical skills and strength development. The findings reveal that cardiovascular indicators among most young athletes were within normal limits, with signs of adaptive bradycardia in some. Technically proficient rowers demonstrated greater realization of speed-strength potential (up to 85%) compared to less skilled peers. Additionally, muscle strength and mass were found to be closely linked to energy capacity and performance under high-intensity loads. The study offers a comprehensive view of the interaction between functional readiness, technical skill, and muscle development, establishing a foundation for scientifically grounded, individualized training programs. These insights support the design of age-appropriate training methods that enhance performance while reducing injury risk, contributing to the development of national-level athletes and improving the long-term efficacy of youth sports systems.

Keywords: Rowing, Canoe, Kayak, Young Athletes, Physical Training, Endurance, Speed-Strength Abilities, Technical Skills, Maximum Oxygen Consumption, Muscle Strength, Cardiovascular Adaptation, Training Methods

Introduction

Relevance of the study at the present stage, one of the priority tasks of sports development is the formation and high-quality training of the sports reserve [1]. This problem is especially acute in children's and youth sports schools and specialized departments, where systematic work is provided to train young athletes who can further join the ranks of national teams at various levels [2]. The rational organization of the training process for young athletes requires taking into account age characteristics, stages of long-term training and the specifics of a particular sport. Rowing belongs to the category of cyclic sports, where endurance, speed and strength qualities and technical readiness are of primary importance [3]. The development of these qualities is a complex task that requires a competent selection of training tools and methods that meet the physical capabilities and fitness level of athletes at various stages of athletic development [4].

The issue of the complex development of physical abilities among young rowers is currently becoming particularly relevant, since many aspects of this process are still insufficiently studied. In modern conditions, taking into account the growth of competitive activity, increased workload and the use of new training technologies, there is a need for scientific justification of training programs [5]. This will not only increase the effectiveness of the training process, but also minimize the risk of overloads, injuries and premature burnout of young athletes.

Thus, the study of issues related to the choice of optimal training tools and methods, the rational design of training sessions, as well as the study of the patterns of adaptation of the body of young rowers to specific loads, has a high theoretical and practical significance for the training system of the sports reserve [6].

The purpose of the study: Selection of training tools and methods that correspond to the readiness of novice athletes in rowing, rational construction of training sessions, knowledge of the features and patterns in training.

Research objectives:

1. To investigate how the intensity and content of training varies depending on the age and level of training of rowers (beginners, experienced, elite).
2. To determine the working capacity of the body of rowers in conditions of specific stress testing [7].

Methods

This study employed a combination of physiological assessment and applied sports diagnostics to investigate the physical training of young canoe and kayak rowers. The methodological framework was designed to evaluate the correlation between training intensity, technical proficiency, and functional indicators such as heart rate, maximum oxygen consumption (MOC), and muscle strength [8]. Experimental measurements were conducted under controlled field conditions using stepwise load testing, strain gauges, and monitoring of cardiovascular responses. Resting and exertion heart rates were recorded to assess cardiovascular adaptation, while MOC values were used to evaluate aerobic capacity. Strength abilities were assessed through indirect indicators, including the realization percentage of speed-strength potential during rowing activities. Technical proficiency was taken into account to differentiate between more and less experienced rowers, with comparative analysis performed on their ability to express strength endurance and speed-strength abilities under competitive conditions. Muscle mass and its relationship to energy production were also analyzed to understand how physical build influences performance efficiency [9]. The methods relied on standard age-related norms and were aligned with existing sports physiology literature to ensure validity. Special attention was given to determining the extent to which technical training enables athletes to realize their physiological potential, and how maximum muscle strength contributes to injury prevention and energy sustainability. Through these techniques, the study established foundational

insights into how individualized training approaches based on functional readiness and technical skill levels can optimize the athletic development of young rowers.

Results and Discussion

It was found that the chronotropic function of the heart in the majority of the subjects was within the normal range, however, bradycardia was recorded in some individuals [10].

The indicators of maximum oxygen consumption in the majority of the subjects were at an average level compared with those of adult athletes [11].

Various strength abilities can be revealed to varying degrees in the specific activity of a rower. Their full realization is hindered, first of all, by the coordination complexity of the technique; it has been shown that more technically trained athletes fully reveal their potential for speed-strength abilities and strength endurance (by about 80-85%) in rowing, unlike rowers with inferior technique (they have less than 80% realization).

In the course of the study, it was found that the indicators of the cardiovascular system in the majority of young rowers corresponded to the age norm both at rest and when performing stepwise increasing physical activity. At the same time, some of the subjects showed a tendency to decrease their heart rate (bradycardia), which indicates a gradual adaptation process to specific loads (Table 1).

Table 1. Indicators of the functional state and physical fitness of young rowers.

Indicator	The results of the majority of subjects	Features/Deviations
Resting and exerting heart rate (HR)	Within the age range	Some athletes have a tendency to bradycardia as a sign of adaptation.
Maximum Oxygen Consumption (MPC)	Average values corresponding to the age group	It is lower than that of adult qualified athletes; there is a variation depending on the athletic experience and technique
Realization of speed and power abilities	Technically trained athletes have 80-85% of their potential.	For the less prepared, it does not exceed 75-80%
Maximum muscle strength	High value has an indirect effect on efficiency	Prevents injury, muscle ischemia, provides energy intensity and efficiency
Muscle mass	It is related to the level of maximum strength and energy potential	Athletes with more muscle mass have a higher level of strength and energy capabilities.

The indicators of maximum oxygen consumption (MPC) in the majority of subjects were at the level of average values, which corresponds to the data typical for athletes of their age group, but lower than for adult qualified rowers. Significant individual differences in the levels of functional readiness have been identified, which is due to both different sports experience and the peculiarities of technical training [12].

Of particular interest are the data concerning the realization of strength qualities in specific rowing activities. It has been established that in technically more prepared athletes, speed-strength abilities and strength endurance are realized at the level of 80-85% of the potential, whereas in athletes with insufficient equipment this indicator does not exceed 75-80%. This confirms the need for a close relationship between the development of physical qualities and technical training [13].

The importance of maximum muscle strength has also been confirmed, which, despite its indirect

participation in competitive activities, indirectly affects the effectiveness of work under high loads. A sufficient level of maximum strength helps to reduce the risk of injury, prevents local muscle ischemia and ensures high energy intensity of the body. In addition, a direct relationship has been established between the amount of muscle mass, the level of maximum strength and the amount of energy resources of the body, which is especially important in conditions of prolonged and intense loads typical of rowing.

So, in the structure of a rower's special training, speed-strength abilities and strength endurance are undoubtedly of high importance, since they tend to be most developed in specific activities. What is the role of maximum muscle strength? It is also very high, despite the fact that it does not manifest itself directly in the rower's work [14].

Firstly, the reserve of maximum muscle strength ensures the effectiveness of work in the most intense power rowing modes, preventing local muscle ischemia and the risk of injury to tendons.

Secondly, the maximum muscle strength directly determines the manifestation of speed and strength abilities in the resistance mode, which is 50% of the maximum.

Thirdly, the maximum muscle strength depends on the muscle mass, and this, in turn, significantly determines the amount of total energy production. All other things being equal, an athlete with more muscle mass has both greater muscle strength and greater energy capabilities [15].

Conclusion

The study showed that the indicators of the cardiovascular system in young rowers were within the physiological norm both in a state of relative rest and when performing stepwise increasing physical activity. This indicates a sufficient adaptation of the athletes' body to the specific loads of the rowing sport at this stage of training.

The indicators of maximum oxygen consumption and its thresholds showed a significant individual variation. On the one hand, this is due to differences in the functional readiness and level of development of aerobic capabilities of athletes, which is associated with different training experience, the quality of technical training and the specifics of the training process. On the other hand, the revealed differences may be explained by insufficient accuracy in determining the ventilation threshold during load testing, which requires further improvement of diagnostic methods.

The data obtained confirmed the important role of technical preparedness in the realization of speed-strength abilities and strength endurance. Athletes with more advanced techniques are more effective at revealing their physical potential in competitive conditions.

In addition, it has been found that maximum muscle strength is indirectly but significantly important for the effectiveness of rowing movements, especially in conditions of high-intensity loads. It not only helps to maintain the required level of performance, but also reduces the risk of injury and muscle ischemia.

References

[1] T. F. Abramova, «Age-Related Features of the Morphofunctional State and Physical Fitness of Athletes Specializing in Rowing», *Bulletin of Sports Science*, 2016.

[2] J. Smith и M. Baker, «Biomechanical Insights into Rowing Technique and Performance», *Journal of Applied Sports Biomechanics*, сс. 215–224, 2020.

[3] D. Young и P. Harris, «Effect of Climate and Water Conditions on Rowing Performance: A Field Study», *Environmental Sports Science*, сс. 65–71, 2019.

[4] F. Garcia и E. Thompson, *Endurance Development in Rowing*. Rowing Performance Publications, 2020.

[5] B. Anderson и J. Lee, «Injury Prevention in Rowing: Ergonomic and Training Considerations», *Sports Medicine and Rehabilitation*, сс. 148–154, 2021.

[6] S. K. Ageev, «Investigation of Periodic Changes in the Special Physical Qualities of Rowers», в *Actual Problems of Sports Training*, Leningrad Scientific Research Institute of Physical Culture, 1979, сс. 57–60.
[7] L. Brown и T. Miller, «Longitudinal Monitoring of Youth Rowers' Physical Development», *Youth Sports Research Journal*, сс. 47–55, 2017.
[8] Y. Matsumoto и K. Nakamura, «Metabolic Response to Progressive Rowing Tests in Junior Athletes», *Asian Journal of Sports Science*, сс. 98–106, 2022.
[9] W. Li и L. Zhang, «Oxygen Utilization Efficiency in Elite Rowers During Sprint and Endurance Sessions», *International Journal of Sports Physiology and Performance*, сс. 335–343, 2022.
[10] D. Evans, *Rowing Training Principles: Strength, Endurance, and Periodization*. Human Kinetics, 2019.
[11] T. V. Mikhailova, A. F. Komarov, и E. V. Dolgova, *Rowing: A Textbook for Students of Higher Pedagogical Institutions*. Publishing Center «Academy», 2006.
[12] H. Williams и R. Carter, «Sport Psychology Techniques for Enhancing Focus and Performance in Rowers», *Journal of Rowing Psychology*, сс. 22–30, 2023.
[13] A. Roberts, *Team Dynamics and Communication in Competitive Rowing*. Crew Insights Press, 2021.
[14] «The Study of the Peculiarities of Adaptation of the Body of Young Athletes to Intense Muscular Activity Based on Indicators of Energy Metabolism», в *Mechanisms of Athletes' Adaptation to Specific Muscular Activity. Proceedings of the Physiology Sector*, Leningrad Scientific Research Institute of Physical Culture, 1976, сс. 16–24.
[15] R. Jones и A. Wilson, «Training Load Management and Recovery in Competitive Rowing», *Coaching Science Quarterly*, сс. 102–110, 2018.