# FEATURES OF PHYSICAL DEVELOPMENT AND ADAPTATION CAPABILITIES OF THE CARDIORESPIRATORY SYSTEM IN CHILDREN AND TEENEGERS ENGAGED IN SWIMMING AND RHYTHMIC GYMNASTICS

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***Abstract.*** *This article examines the impact of regular physical activity, including swimming and rhythmic gymnastics, on the cardiorespiratory system, physical development. The aim of this study is to analyze the physical development and functional state of the cardiorespiratory system in children and adolescents involved in swimming and rhythmic gymnastics. A review of current scientific publications on the impact of systematic physical activity on anthropometric indicators, cardiovascular and respiratory performance, of young athletes is provided. It emphasizes the importance of developing comprehensive programs for assessing the body's functional reserves to prevent noncommunicable diseases and ensure safe sports activities. A literature review revealed ambiguous effects of youth sports compared to physical education in the school curriculum, which requires further research.*

***Key words:*** *physical activity, cardiorespiratory system, children's sports, disease prevention.*

## Relevance

According to recent World Health Organization estimates, approximately 80 % of adolescents worldwide fail to meet recommended levels of physical activity, with girls generally less active than boys. While WHO's global monitoring shows persistently high prevalence of insufficient activity among adolescents aged 11–17 years, efforts remain underway to reduce these levels by at least 10 % by 2025 and 15 % by 2030 compared to baseline figures from 2010. Although long-term trend data up to 2016 indicate high levels of inactivity across regions, recent updates continue to reflect that a substantial majority of young people do not achieve the daily recommended 60 minutes of moderate-to-vigorous physical activity. With the prevalence of noncommunicable diseases increasing among children and adolescents, the development of effective preventive strategies aimed at maintaining health and increasing the body's adaptive reserves is particularly important. Regular physical activity is considered one of the leading factors in harmonious physical development and functional maturity of the body's main systems.

Physical activity improves cardiovascular and respiratory function, and has a positive effect on metabolic processes, bone density, and maintaining a healthy body weight. Regular rhythmic gymnastics and swimming promote balanced physical development and have a beneficial effect on children's psycho-emotional well-being. A dose-dependent effect has been observed: the higher the volume and intensity of physical activity, the greater the positive changes in the cardiorespiratory system. It has been reliably established that moderate and vigorous physical activity, typical of swimming and rhythmic gymnastics, reduces the risk of developing type 2 diabetes, cardiovascular disease, and related mortality . These sports incorporate both aerobic and strength training elements, ensuring comprehensive health improvement.

Children aged 7–16 who actively participate in rhythmic gymnastics or swimming have a lower risk of developing obesity and related diseases. The high level of physical activity associated with these sports ensures optimal physical development, reflecting the influence of the external environment, training characteristics, and lifestyle. Anthropometric parameters—body size, proportions, and somatotype —help identify predisposition to rhythmic gymnastics and swimming, as well as assess the overall physical condition of young athletes. These sports not only promote physical development but also improve autonomic regulation, the body's energy systems, and overall physical performance. Due to the intense training required in these sports, the importance of medical support for young athletes increases. It is essential to consider growth and puberty phases, individual characteristics, and the balance between training, rest, and study. Only a rational distribution of physical activity can ensure harmonious development, improved health, and the creation of a solid foundation for successful athletic achievement. In rhythmic gymnastics and swimming, special attention is paid to the functional state of the cardiorespiratory system, as it determines the level of physical fitness and overall well-being of athletes. Heart rate (HR) is a readily available indicator of adaptation, but when analyzing the impact of physical activity on the cardiovascular system, electrocardiography data is more informative.

In countries with advanced sports medicine, such as Italy, regular ECG screenings reduce the risk of sudden cardiac death in athletes, which has formed the basis of international recommendations. According to the World Health Organization, a significant proportion of children and adolescents worldwide do not achieve recommended levels of physical activity, which is associated with an increased risk of obesity, cardiovascular and metabolic disorders well-being. Against this backdrop, there is growing interest in studying the impact of regular exercise on children. Swimming and rhythmic gymnastics are sports that actively engage the cardiorespiratory system and develop sustainable adaptive responses. At the same time, these sports are characterized by different biomechanical and physiological

characteristics, necessitating a comprehensive assessment of their impact on the physical development and functional status of children and teenagers.

## Materials and methods

The PubMed , Cochrane databases Library , eLIBRARY , and other sources. This review analyzes studies on the impact of regular exercise on anthropometric indicators, cardiovascular and respiratory health of children and teenegers involved in swimming and rhythmic gymnastics. The primary objective of this review was to systematize existing scientific data and assess the body's adaptive capacity under long-term training conditions.

## Results and discussion

An analysis of the literature demonstrates that children and adolescents who regularly participate in swimming and rhythmic gymnastics exhibit higher levels of physical activity and better physical development than their peers who do not participate in sports. Regular training promotes weight management, muscle strength, flexibility, motor coordination, and overall physical performance. The functional state of the cardiorespiratory system in young athletes reflects adaptation to physical activity. Swimming increases respiratory efficiency, improves gas exchange, and reduces cardiac output. Rhythmic gymnastics, in turn, has a significant impact on autonomic regulation, stress tolerance, and neuromuscular coordination. The magnitude of these positive changes depends on the volume and intensity of training, age at initiation, and individual characteristics. At the same time, failure to adhere to the principles of gradualness and adequacy of loads can lead to overstraining of adaptation mechanisms, especially during periods of intensive growth and puberty.

Research into the cardiorespiratory system, physical development, and psychoemotional health of children involved in swimming and rhythmic gymnastics represents an important and promising area of research. This requires the development and implementation of scientifically sound methods for preparing preschoolers for sports and fitness.

A review of the scientific literature confirms that the impact of regular sports training in youth sports on physical development, functional capacity, and emotional well-being remains a subject of active study and comparison with physical education classes within the school curriculum. This underscores the need for further comprehensive research. Anthropometric and somatotypical characteristics play a significant role in athletic orientation and predicting success in swimming and rhythmic gymnastics. Body composition, body proportions, and level of functional fitness determine the effectiveness of motor activity and tolerance to training loads.

Considerable attention in modern sports medicine is devoted to assessing the cardiovascular system. Along with heart rate monitoring, electrocardiography remains an informative method, allowing for the detection of early signs of functional and

structural myocardial changes. Psychoemotional state is an important component of adaptation to athletic activity. Children and adolescents, especially under competitive pressure, may develop signs of emotional stress, anxiety, and autonomic dysfunction, requiring the inclusion of psychological support in the medical monitoring system.

## Conclusions

Thus, regular swimming and rhythmic gymnastics have a multifaceted positive effect on the physical development and functional state of the cardiorespiratory system in children and adolescents. The development of stable adaptive responses contributes to improved health and physical performance.

At the same time, the effectiveness and safety of sports activities are only possible with comprehensive medical and educational support that takes into account age-related, morphofunctional, and psychoemotional characteristics of the body. The development and implementation of a system for objectively assessing children's functional reserves represents a promising approach to preventing health problems and optimizing training in youth sports.

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