Original Article

Physiological Assessment Of The Adaptation Processes Of The Organism Of Children To The Effect Of Physical Activity In The Conditions Of Karakalpakstan

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Abstract

The article presents the results of studies of the adaptation processes of the organism of children to the effect of physical activity in the conditions of Karakalpakstan. The revealed differences are noted not only in the absolute values of the indicators, but also in their increase in the load from the level of relative rest. The predominance of heart rate indicators, a decrease in oxygen consumption and oxygen utilization coefficient, a more pronounced increase in the myocardial stress index with a slight difference in mean arterial pressure for increasing load were established.

Keywords: Karakalpakstan, Children's Organism, Adaptive Processes, Stress Index, Physical Activity.

Introduction

One of the most important tasks of modern physiology is the study of the mechanisms of adaptation of a growing organism to various types of activity [2, 3]. The study of the dynamics of indicators of the cardiorespiratory system of children for various types of physical activity seems to be very relevant at the present time. When developing modern problems of adaptation and solving problems in the field of preserving the health of the younger generation, at least a three-dimensional assessment system is required, which should include biomedical, environmental and social criteria.

The study of the adaptive reactions of the child's body under the influence of various factors will make it possible to diagnose the occurrence and development of prenosological conditions at an early stage. This is necessary for timely correction, which consists in taking adequate measures to prevent the development of chronic pathological conditions.

Of particular importance is the identification of the so-called borderline prenosological conditions that occur on the verge of normal and pathological conditions and are characterized by an increased expenditure of functional reserves, taking into account onto- and phylogenetic aspects [1]. Children need a more detailed analysis, taking into account the formation of various variants of adaptive reactions under the influence of environmental factors, in the so-called "critical" periods of ontogeny, when adaptive processes occur against the background of complex, multi-link vegetative-humoral changes that lead to a restructuring of the functioning of all systems and limiting the possibility of adaptation [4, 6, 7].

The aim of the study is a comparative physiological assessment of the adaptive processes of the body of children to the effect of physical activity.

Material and Methods of Research

In total, 140 children born and living in various regions of Karakalpakstan were examined. The northern regions were identified - Chimbai, Karauzyak and Takhtakupyr; southern regions - Amu Darya and Beruni.

The examined children were divided into three groups - younger (7-9 years old), middle (10-12 years old), older (13-15 years old), and also, respectively, according to the sex and age composition. Dosed physical activity was set on a bicycle ergometer with magnetic braking and amounted to 1.0 watts per 1 kg of body weight of the child, the duration of work was 5 minutes, the

frequency was 60 rpm.

Results and its Discussion

Despite numerous studies on the problems of studying the adaptive systems of modern children, however, a number of issues have not been discussed, or have not been considered comprehensively, in a narrow range of ontogeny. In recent years, most of the works of modern researchers are devoted to the physical development of children [12, 13], and the results of complex functional studies are much less presented [2].

The results obtained showed the dynamics of the parameters of external respiration, gas exchange and the cardiovascular system in the examined children at rest and during the performance of a functional test with dosed physical activity (bicycle ergometric test). In the course of the research, it was found that at rest, the indicators of gas exchange of the function of external respiration have age-related dynamics. So the minute volume of respiration (MVR) tends to increase with age in both boys and girls. At the same time, the MVR indicators in all age groups in children living in the southern regions (Amudarya, Beruni) were higher than in children from the northern regions (Chimbay, Karauzyak, Takhtakupyr). Note that in boys of the older age group, these differences are somewhat weakly expressed.

According to the results of the research, it was revealed that the indicators of the heart rate, as well as the MVR, in all the examined children exceeded the normative data, although these differences are not statistically significant. In contrast to the MVR, the heart rate in children of younger and middle age groups living in the northern regions of Karakalpakstan exceeded the value of heart rate, according to the norm determined in children of this age, from the southern regions of the republic. The exception was girls aged 11-13, in whom these values are higher than in children from the southern regions (differences are not significant).

The background indicators of gas exchange, before the bicycle ergometric test, had significant differences. But, with age, O_2 and KIO_2 indicators tended to increase, and the values of these indicators were higher in children living in the southern part of Karakalpakstan (i.e., in the southern regions). So, if KIO_2 in children of the younger age group from the northern regions of the Republic of Karakalpakstan (Chimbai, Karauzyak and Takhtakupyr) was 28.1+1.3 ml/l in boys and 29.6+2.7 ml/l in girls, then among their peers living in the southern regions, it was 32.2 + 0.7 ml / l and 31.9 + 1.0 ml / l, respectively.

In the older age group of children from the northern regions, the KIO_2 for boys was 29.5+3.1 ml/l, for girls it was 34.1+4.0 ml/l. Whereas their peers from the southern regions have 36.1+1.2 ml/l and 35.9+1.3 ml/l, respectively (at $p<0.01$)

When performing a bicycle ergometric test - pedaling a bicycle ergometer with a load (0 W) and then during the performance of dosed loads of increasing power, there was a natural increase in heart rate, MVR, oxygen consumption. At the same time, heart rate indicators in children living in the northern regions in all age groups were higher than in children living in the southern regions of Karakalpakstan. The increase in the absolute values of the MVR for the increasing load did not have such a pronounced dynamics as the heart rate. It should be noted that boys from the northern regions in all age groups had higher MVR indicators than their peers from the southern regions.

The conducted studies made it possible to establish that differences are noted not only in the absolute values of these indicators, but also in their increase in load from the level of relative rest. Thus, the HR gradient (ΔHR) and the MVR gradient (ΔMVR) in children of the middle and older age groups, both in boys and girls, living in the northern regions, were higher than in their peers in their southern regions. It should be noted that the ΔMVR indicators in girls of the younger age group and boys of the middle age group did not have a significant difference.

Thus, on the basis of the conducted studies, it can be noted that the decrease in the level of physical performance in children from the northern regions, provided by an intensive increase in heart rate, was combined in our studies with an increase in the myocardial stress index (STI - the product of systolic pressure and heart rate). In most cases, a more intense increase in IUI was noted in children from the northern regions of the republic.

Conclusion

Taking into account the predominance of heart rate indicators, a decrease in oxygen consumption and oxygen utilization coefficient, a more pronounced increase in the myocardial tension index (INM) with a slight difference in mean arterial pressure per increasing load, it can be stated that all examined children from the northern regions have an increased load on structural elements myocardium and the cardiovascular system as a whole.

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