



### PHYSIOLOGICAL ASPECTS OF THE HEALTH OF SCHOOLCHILDREN IN NIZHNY NOVGOROD REGION

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The paper presents the comparative analysis tendencies of the statistical parameters of physical development of rural and urban schoolchildren in Nizhny Novgorod region. The results indicate that in the context of maintaining major characteristics of growth processes of children and adolescents in Nizhny Novgorod region both positive and negative changes in the physical development of today's schoolchildren have occurred.

Keywords: morphofunctional indicators, gender differences, urban schoolchildren, rural schoolchildren, group of physical development.

**Relevance of research.** There is a regular monitoring of physical development of children and adolescents with periodic review of standards in Nizhny Novgorod region. Many studies [1,2] confirm the difference between the level of physical development (PD) of rural schoolchildren (RS) and urban schoolchildren (US), which is caused by the influence of environmental factors, the level of information stress, household and physical activity, the level of sanitary and epidemiologic assurance in the educational institution and others.

The objective characteristic of morphofunctional status of children, depending on the place of their residence and socioeconomic status has important theoretical and especially practical meaning determining the health level, and it is also relevant in the process of creating new standards of PD [3,4]

**The purpose of research** - stating the peculiarities of morphofunctional status of the schoolchildren based on a comparative analysis of the parameters of physical development of children and adolescents living in rural areas and in a large industrial city.

**Materials and methods of research.** Revealing the morphofunctional peculiarities of schoolchildren we used standard indicators of PD of RS in Nizhny

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Novgorod region and of US in Nizhny Novgorod surveyed by a generalizing method in 2011/12 years. [5,6,7]

**Results and discussion.** Rural boys are significantly shorter than urban ones on the average index of body length (BL) at 7, 9, 11 and 14 years on 2,3-4,1 cm. Maximum boys' difference on BL was revealed in 14 years (4.1 cm). In 16-17 years, rural boys exceed on the BL (0.4-0.9 cm) and body weight (BW) (0.2-0.3 kg) their coevals, but these differences were not statistically confirmed. Urban boys 7, 12 and 14-15 years have a greater BW than their coevals in the region, the largest differences (6.9 kg) were registered in the 14-year age group.

The attention is drawn to the fact that there is no significant difference in the BL among urban and rural girls, except the age of 10-14 years, when urban girls are taller than rural ones on 1.3-1.8 cm. Concerning BW, there is no significant difference in all age groups. Gender differences in BL and BW as of US and RS are most evident in 15 - 17 years.

The first crossing of the growth curves of BL as a demonstration of sexual dimorphism related to the different terms of boys' and girls' puberty processes, was stated in 12 years among US and the second in 14 years, ie than boys surpass girls in BL. The first crossing among RS is stated the year earlier, at 11 years, and the second also in 14.

The analyses of chest circumference (CC) indicates, that the adolescents of 14-15 years in Nizhny Novgorod region have a smaller chest (2.0-3.0 cm) than their coevals in Nizhny Novgorod. But among rural girls of 13-17 years these index is higher on 1.4-2.5 cm. Gender differences on this index among RS are revealed in almost all age groups (8-10, 12-14 and 16 -17 years) and among schoolchildren of Nizhny Novgorod only in 15-17 years.

The 14-year-old urban boys have maximum annual growth in BL, BW and CC (7.9 cm, 7.9 kg and 4.9 cm, respectively). Among rural adolescents, this maximum is stated in 15 (8.7 cm, 9.7 cm and 5.6 kg respectively). Among girls, both urban and rural ones, the highest increase of total body size, that is almost equal, was revealed in the 12-year age group.

The most important characteristics of growth and development of the schoolchildren are functional indicators of the body, changing in ontogeny similar to the total body size. These are vital capacity of lungs (VCL) and right hand dynamometry (RHD), which age increase was revealed both among US and RS.

Boys of 12-15 years of Nizhny Novgorod have large values of VCL than rural ones with a maximum prevalence of 0.58 liters in 14 years.

The power indicator of the right hand of rural boys of 7-12 years and girls of 7-11 years prevail over those of urban schoolchildren. There was an unexpected revelation of 16-17-year-old urban girls with a stronger hand (1.2-2.3 kg), than in rural areas.

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Gender differences in the values of VCL and RHD were stated in all age and sex groups - boys of every age group have higher physiometric indicators than girls. Physiometric growth is more expressed among boys.

The analysis of hemodynamic parameters showed the slowing of the heart rate (HR) of rural students compared with the urban ones almost in all age and sex groups, except boys of 8 years old and children of 7 years old, with a maximum difference among boys aged 17 to 12 bpm. min, and 17-year-old girls - 13.3 bpm. per min. Most girls have higher heart rate than boys except US of 9, 16 and rural ones of 7-8, 10-11, 14 and 17, where there is no statistical significance.

The similar tendency of lower averages was stated among rural children in the values of systolic blood pressure (SBP): among boys of 7—8, 14—17 years old and girls of 7—9 и 17 years old.

There was a negative feature among rural children - high rate of diastolic blood pressure (DBP). In all age and sex groups, it was significantly higher than in the city. Among 13-year-old boys and 12-year-old girls it is higher on 8.2 mm. Hg. Gender differences in SBP were more obvious in the older age group of schoolchildren: in modern boys average SBP index exceed those of girls on 6,9-11,1 mm. Hg.

DBP index has no gender differences except 14-year-old rural teenagers.

The results of group evaluation of physical development showed the lower part of children with normal development, especially among urban boys, comparing to the standard. The proportion of children with physical abnormality exceeded the standard values in the group with overweight and high body length. This fact testifies to the developmental disharmony of modern US and RS, with the prevailing values among children of Nizhny Novgorod.

### **Conclusion**

A comparative analysis revealed the convergence of morphofunctional status indicators of urban and rural schoolchildren in total body parameters concerning statistically significant differences in the values of the cardiovascular system functioning.

It is stated that with the increase of years, there is an increase in average quantities of the studied parameters of morphofunctional development, with the exception of the heart rate. On the index of BL, BW and CC there is a double cross of growth curves as a relevance of sexual dimorphism in connection with the earlier maturation of girls. Gender developmental peculiarities were defined: boys of every age group have higher physiometric indicators and they are more intensive than in girls.

These data do not contradict with the knowledge of the averages of age-sex dynamics of morphofunctional indicators and we can speak about the preservation of age developmental patterns of physical development of urban and rural schoolchildren

in the contemporary socio-economic conditions.

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