Physical Development of Belarussian Children

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Abstract Anthropological research on children from Minsk was carried out within the framework of medical ecological monitoring. Besides the wide anthropometrical program, a study of the ecological conditions in the areas where the children examined reside and train was carried out. Comparison of the basic parameters of physical development in various age groups and the analysis of annual increases shows intensification of growth among modern children despite some decrease in the rates of acceleration. Some increase in body length and decrease of body weight as well as the reduction of chest circumference is common. Regional studies, particularly in the radiation control zones, show the dependence of physical development on the ecological situation. J Physiol Anthropol Appl Human Sci 24(4): 463–464, 2005 http://www.jstage.jst.go.jp/browse/jpa [DOI: 10.2114/jpa.24.463]

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Introduction

The negative influence of the complex environmental factors connected with the Chernobyl accident and the disintegration of the Soviet Union has affected the growth, puberty, physical development and health of schoolboys and college students. Anthropological and medical research carried out in schools have shown that only 10 percent of today’s schoolboys are healthy, 50 percent of children being in the second group of health, i.e. those who are frequently ill, and 40 percent being patients with chronic diseases and invalids.

The influence of the ecological situation on children living in the regions of the radiation control has shown infringement on endocrine and immune systems as well as various kinds of metabolism. The remote consequences of such influences are not yet properly clarified. They can appear in genetic and somatic changes. This fact determines the necessity of the constant monitoring of the children and youth, both in the areas of the radiating control, and all over the republic.

In the complex research program which was carried out by our department, an important role is allocated to the study of physical development and the variability of its parameters in the ontogenetic process. The basic purpose of our research was the monitoring of somatic development and its variations in different environmental conditions at the republican, regional and interethnic levels.

Materials and Methods

After the Chernobyl disaster, the Department of anthropology and ecology of the Institute of Arts, Ethnography and Folklore, started observations of physical development of children and teenagers in the separate zones of the radiating control of the Brest area (Stolin and Luninec), Gomel area (Hoyniky), Mogilev area (Cherikov) and in a relatively safe area (Postavi, Shkorovshina) in comparison with populations of Minsk. The data received have allowed us to characterize the local features in the growth and physical development of children, depending on such factors as radiation, anthropogenic pollution of the environment, and urbanization.

Children and adults from 3 to 60 were studied in the above-mentioned areas. The total number of investigated subjects exceeded 10,000. The anthropological program included large number of different traits measured according to standard procedure. For normality, the distribution was checked by Rokitski’s test. The means, standard deviations, and medians have been calculated. The nonparametric criterion of Mann-Whitney was applied to measure the reliability of the distinctions.

Results and Discussion

Two age groups of the first (6–8 years) and the second (12–13 years) periods of growth acceleration are characterized first of all. It has been shown that the level of physical development of these children and teenagers in the zone of the radiating control is closely connected to the radiation. The higher the radiating pollution is, the lower the parameters of physical development are; the tempos of growth are slowed down, terms...
of the first and second peaks of the growth gain are late, the scope of the sexual distinctions is higher, the percent of the contrast somatotypes is higher, and the common tendency to asthenization is evident (Tegako, 1996).

The children and teenagers living in two areas of Minsk with contrasting ecological factors have been investigated. Zavodskoj district is characterized as a high-risk zone, while the Zelenij Lug area has minimal ecological risk.

Anthropological screening has not revealed significant differences in the basic parameters of the physical development of schoolboys in both groups. However, in the zone of high ecological risk, the percentage of low and disharmonious physical development is raised.

The dynamics of relative annual gains in different Belarus groups was analyzed using differences between means in relation to mid-annual gains.

The first period of activization in the body length gain among boys and girls is marked at the age of four to five years. The second period is at 12 to 15 years among boys (to 14 years among girls). From the age of 20, the processes of growth are almost complete both in men and women. Increase of body weight among boys is the most significant from 7–8 years, then from 13 to 15 years. In the interval of 15 to 16 years the tempo of body weight increase is considerably reduced. Transition to the low level of body weight gain among the girls comes a year earlier.

Chest circumference values increase among boys most intensively at the age of 9 to 16 years. And the highest level of growth is marked at 15 to 16 years. Girls demonstrate intensive increases of this parameter at an age from 4 to 5 years, 6 to 7 years, 9 up to 11 and 13 to 15 years.

A number of groups of children and young people from rural regions, settlements of town type, regional centers, as well as Minsk, were compared to characterize the local type of physical development and the processes of growth. Basically, physical development of young people is higher in the regional centers and large cities than in the villages. However, the direction and significance of differences vary in each age period.

Children from Minsk and the Minsk region demonstrate the differences between children from cities and villages. It should be noted that there are no significant differences between these children during the life period to 10 years; the peculiarities in physical development become significant in the older groups. By 16–17 years the distinctions become reliable. Among boys the distinctions are: 4–6 cm in body length, 6–8 kg in weight, 3–5 cm in chest circumference. Among girls the distinctions are: 6 cm in body length, up to 1 kg in body weight, with no distinctions in chest circumference.

Some shifts in the physical development and the processes of growth are marked comparing the development of the previous and the subsequent generations. Considering the results of comparison, modern boys at the age of 3 to 6 years exceed the boys who were born in 1962–63 in all of the parameters, in particular, by 3–8 cm in body length, 1–3 kg in body weight, and 2–3 cm in chest circumference. Modern boys from 7 to 9 have lower basic parameters than the boys who were born in 1970–71. The parameters of boys from 11 to 17 years in all age groups are superior for modern boys if compared with the boys of their age in the 1970s. For example, for those older than 20 (22–24 years), the body weight of male students has increased by 1–2 kg, body length by 3–4 cm.

Leptosomization and acceleration of growth are the basic tendencies in physical development of modern children. The evidence of an on-going positive secular trend is a 2–4 cm increase in body length in the generation of 17-to-18-year-old men compared with 26-to-29-year-olds, 30-to-45-year-olds and 36-to-40-year-olds. At the same time, the previous generations surpass modern males in the values of chest circumference and body weight.

A similar phenomenon is typical for girls. Distinctions are in most cases statistically significant.

Parameters of physical development in the city are higher than in the rural areas. This superiority is typical for both boys and girls and is more expressed from 9 to 11 years.

Comparison of the basic parameters of physical development in various age groups and the analysis of annual increases shows intensification of growth among modern children despite some decrease in the rates of acceleration. Some increase in body length and decrease of body weight as well as reduction of chest circumference is common. Regional studies, particularly in the zones of the radiating control, show the dependence of physical development on the ecological situation.

References


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