Schoolchildren's growth and development phenomena in one of the Southern Federal District of Russia

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Introduction

School-age is sensitive period of growth and development to both favorable and unfavorable effects of environment. It involves two age crises then child's organism has both quantity and qualitative changes. Since adolescent mechanisms of growth and development depend on ecological, socioeconomic factors and his lifestyle. These factors modulate line age-related transformation determined by heredity. It is widely held that school has effects not only on growth and development but also on children's health. Innovation processes in education system with teaching intensive information loading negatively affect on schoolchildren's health. Modern educational informative program choice is based on its prestige without physical, psychical and intellectual implications of schoolchildren.

Methods

The 93114 boys and 98836 girls aged between 7 and 17 years came from Rostov region (Southern Federal District of Russia), participated in "Our good health school" regional project. The study was conducted in 232 regular schools of Rostov region during the 2012 – 2014 school seasons. The project was approved by the Ministry of Education and Ministry of Public Health of the Rostov region. Informed consents were obtained for all children's parents and legal guardians. The aim of project is monitoring the parameters of physical development and health status of schoolchildren using hardware software system "ARMIS". "ARMIS" is a microprocessor complex registers anthropometrical, physiological, psychophysiological parameters of schoolchildren. Measurements were made by trained school nurse. Only sex, height, weight data were entered manually, the other measurements were performed using system "ARMIS". Anthropometrical measurements were conducted according to the standard methods (WHO, 2007). Body mass index (BMI) defined as the body mass (kg) divided by the square of the body height (m2); Force index defined as the best result of handgrip dynamometry (daN) divided by the body mass (kg).

Results

The received data on the height and weigh for schoolchildren between 7 and 17 years of age of both sexes are presented in Fig. 1 and 2. In both sexes the height and weight increased across ages with no substantial differences between them.

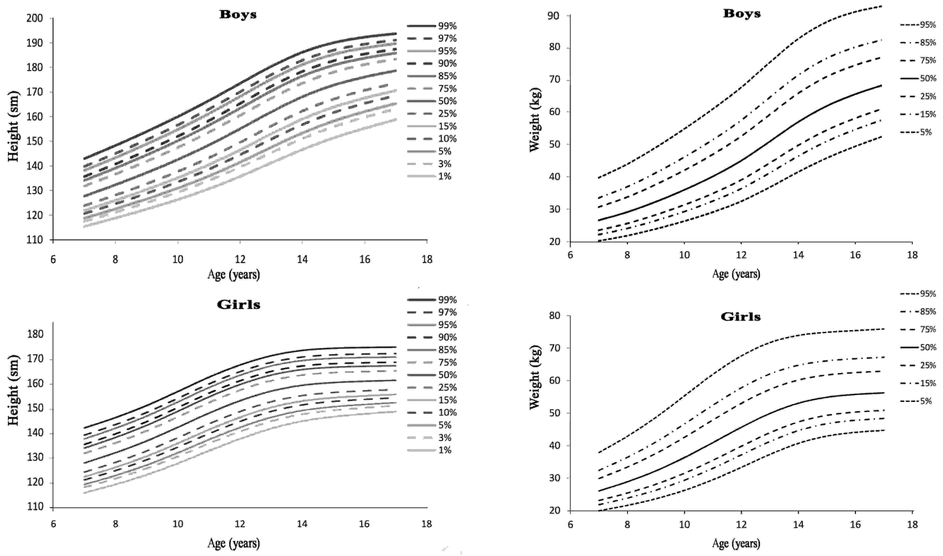

Fig. 1. The centile interval for height (A) and weight (B) in schoolchildren from Rostov region between 7 and 17 years of age.

It was established gender differences in height and weight values across all ages. Fig. 2 shows substantial differences of means height, BMI, hand grip strength, Force Index between boys and girls [student t test for independent samples, $p < 0.05$]. Boys were shorter from 11 and 17 years of age and lighter at 10 year of age than girls of the same age. Boys showed greater BMI values than girls at all ages with the exception at ages between 13 and 14 years. In high school boys generally had greater weight than girls. Since 13 year of age boys were leader not only on height and weight values but also on functional developmental quotient - hand grip strength and Force index.

Fig. 3 shows children in different administrative centers of Rostov region differed in anthropometrical and physiological parameters of development. Children come from regions with high level of socio-economical development (it were settlements round of coast of Azov sea and bank of the rive Don) had higher parameters of growth.

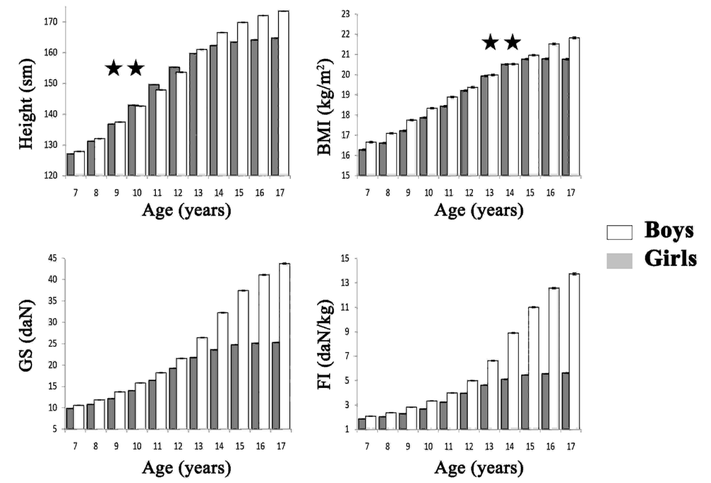

Fig.2. Comparison means (error of mean) height, BMI, right hand grip strength (GS), Force Index (FI) between girls and boys. Asterisk marks statistical unreliable differences.

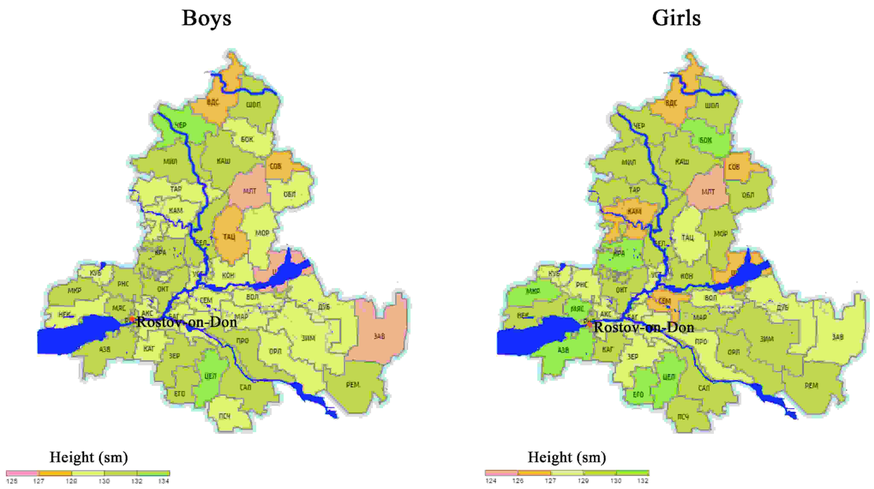

Fig.3. The average values of schoolchildren's height (aged 6-8 years) in Rostov region

Conclusion

The main aspects of modern studies of human growth and development are acceleration, secular trend and retardation. Understanding as ecological and socio-economic factors influence on development of children is a principal in these studies (Godina, 2006). An overall picture of children's development of various ethic and social groups from different region of Russia are mixed picture. It is therefore important to develop references for children development in each region to assess children's health. The growth and development hard depend on external factors. We develop concept about development as a maturation of functional capabilities typical for each age-related stage of development (Voynov, 2011). During each stage of development important role play not only heredity but and environment of children. The children's growth and development are uneven process. So, an age-related periodization discovers how are important critical and sensitive periods in development, which specific for different organ system (Farber and Bezrukih, 2001). An each period of development are unique and depended on heredity, sex of children and environment. An external factors (climate, ecology, urbanization etc) act on organism to accelerate or retard the children's growth and development.

According to our data, at the period of life from 7 to 17 years children have intensive growth and physical development. The boys and girls have the similar age-related changes of weight and height. But girl's height and weight values demonstrated acceleration from 10 to 12 years and its deceleration after 14 years. The height and weight values monotonically increased in boys. The girls were taller than boys at the 11-12 years. Girls had acceleration at ages between 11 – 14 years to the weight, height, force index and respiratory output data. The boys had height acceleration since 12-13 years to 18 years and changing of height is monotonically across all ages. In whole, data of current study have showed what children's development realized not only in relation with ontogeny but in accord with ecological and social factors.