Original Article

SECULAR CHANGES IN GROWTH AND SEXUAL MATURATION IN CHILDREN AND ADOLESCENTS FROM THE REGION OF EASTERN RHODOPI

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Summary

The purpose of this study is to characterize the dynamics and direction of secular changes in growth and sexual maturation in children and adolescents in the region of the Eastern Rhodopi. In the analysis of temporal changes we used data from three time span - 1907-1960 1960-1980 and 1980-2006. In this study 1481 children and adolescents, (699 boys and 782 girls) aged 7 to 17 years, were investigated. Basing on our results, we can say that there are temporal and inter-sexual differences in the processes of growth and sexual maturation. With respect to growth in all three time periods we observed changes of acceleration and they are the most intensive till 1960. In both sexes after the 80's of 20th century, similar processes of deceleration were found for chest circumference and body diameter, which indicates the occurrence of asthenization of the body. There was a decrease of head circumference and cephalic index in recent years and that testifies to the appearance of a trend towards debrachycephalization. The first decade of 21st century, the girls, that we surveyed, have about 5 months lower average age of menarche.

Key words: secular changes, asthenization, debrachycephalization, menarche

Introduction

It is clear that the processes of growth and development are genetically determined, but to a great extent they are influenced by many factors as well. There is a variety of environmental factors which have different effects on the physical development during the stages of ontogenesis. Socio-economic status, nutrition, chronic diseases, heliogenic effects and etc. can cause a delay or acceleration to the hereditary growth potential of individuals [1, 2]. They can influence even the course of the internal uterine development which leads to larger or smaller newborns' sizes [3]. From the early 20th to the first decade of the 21st century, the morphological status of children and adolescents has permanently been changing in dependence on the specific life conditions. We can observe periods of intense increase in body parameters, retention periods, and even periods of delay of growth processes [4]. Many authors reported the dissimilar level of acceleration occurrence as a typical global phenomenon in the sexes, constitutional types and also in the populations of different geographical areas. This provoked our interest to verify the specificity of the body physical development and the processes of sexual maturation in children and adolescents in the region of Eastern Rhodopi Mountains.

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Materials and Methods

For the realization of the objective, we used data transversely collected from schools of the municipalities Lyubimets, Svilengrad and Ivailovgrad. We tested 1481 children and adolescents (782 girls and 699 boys), aged 7 to 17 years. They were grouped in 1-year age groups.

Nine anthropologic features were measured through the classical method [5].

The average age of menarche occurrence was recorded by "status-quo" method or retrospectively.

The mathematical processing of results was performed with a computer program "Statistics 6.0", and the following analyses were applied: descriptive statistics, nonlinear probit-regression analysis, graphical analysis, and alternative nonparametric analysis.

For the analysis of secular changes, we used data of tested children and adolescents from three time spans - 1907 [6], 1960 [7], 1980 [8] and 2006(the present study).

Results and Discussion

Basing on our results, we can say that there are time and inter-sexual differences in developmental processes. Regarding the height, in the three time spans-until the 60's, until 80's and until 2006, we observed acceleration changes in both sexes, and they were the most intensive until 1960 - Fig.1 and Fig.2. During the last years of the twentieth and the beginning of the XXI century, the positive trend in increasing height remains almost the same, but the changes are trifling. It should be noted that the maximum additions to body length in boys, for the majority of ages, were between the 60's and 80's, and in girls - between the 80's and 2006.

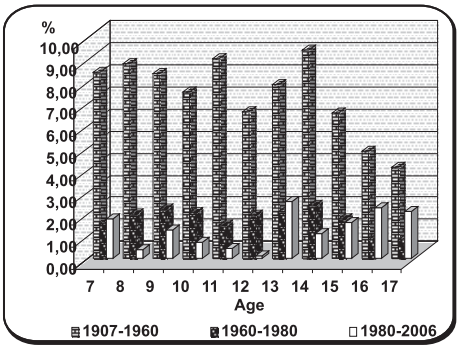

Fig.1. Secular changes of the height in boys

As we notice, in the late XX and early XXI century, there is a significant increase in body weight of boys, especially in the age interval 9-14 years, and it is obvious in their high percentage of obesity and overweight - Fig 3 and Fig.4. In girls, after the 80's of the twentieth century, we observed the opposite - a minor relatively increase in weight, even processes of deceleration occur in them after 15 years of age.

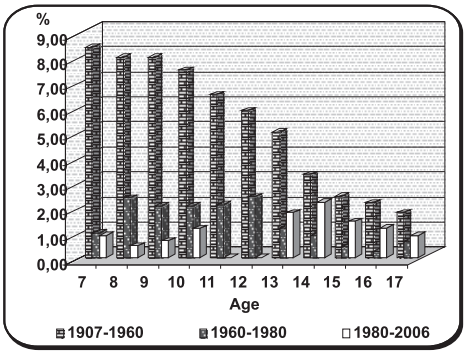

Fig.2. Secular changes of the height in girls

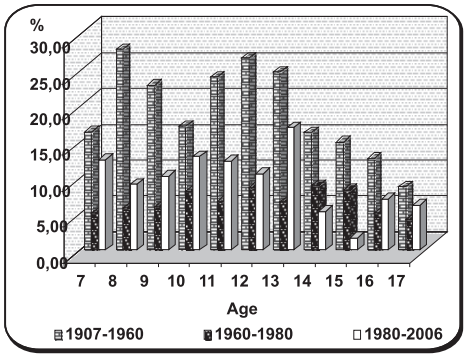

Fig.3. Secular changes of the weight in boys

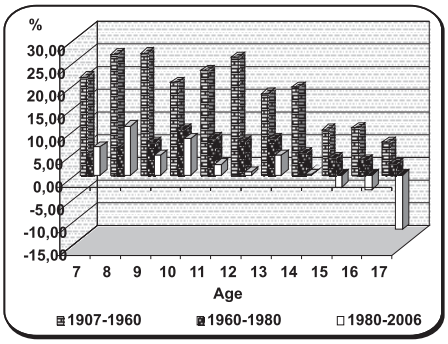

Fig.4. Secular changes of the weight in girls

The increase in chest circumferences in both sexes was most intensive up to 1960 - Fig 5 and Fig.6. Between the 60's and 80's, the processes of acceleration are slower, while in the latter years of the twentieth and the beginning of the XXI century, deceleration processes occur, which is especially evident in girls. Similar deceleration processes can also be seen in breast diameters and this indicates the occurrence of body asthenization.

Deceleration changes after the 80's can be observed in head circumferences as well, which is typical for both sexes at all ages - Fig. 7 and Fig 8. This can be explained with the appearing trend to debrachi cephalisation in contemporary children and adolescents, to which also the reducing of head widths and head index values testify, in recent years.

From the literary reference that we made about the average age of menarche, we found that it occurred at the age of 14.1 years in the 30's - Fig.9. Between the 30's and 60's we observed positive secular changes, as the average age got about 1 year lower - 13.02 years.

From the 70's until the end of the century we observed stabilization of the acceleration processes in terms of the average age of menarche 12.8-12.9 years. In this study, we found about 4 months lower age of occurrence of Me - 12.3.

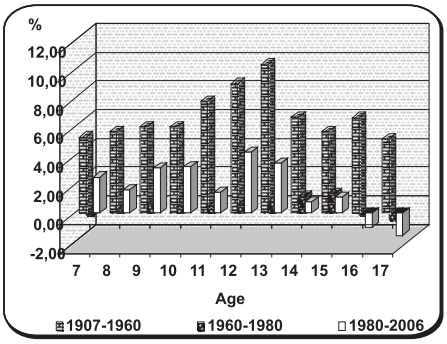

Fig.5 Secular changes of the chest circumferencein boys

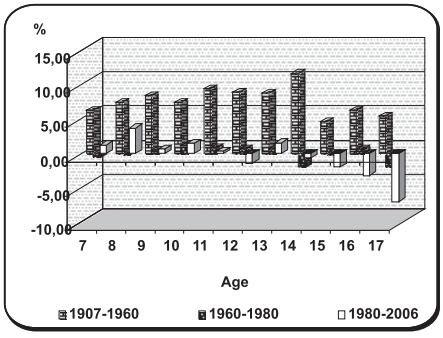

Fig.6 Secular changes of the chest circumferencein girls

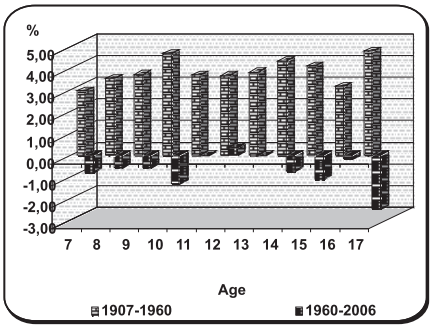

Fig.7. Secular changes in head circumference in boys

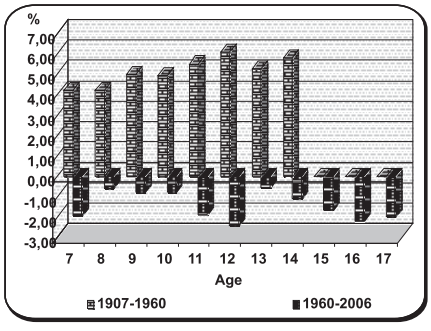

Fig.8. Secular changes in head circumference in girls

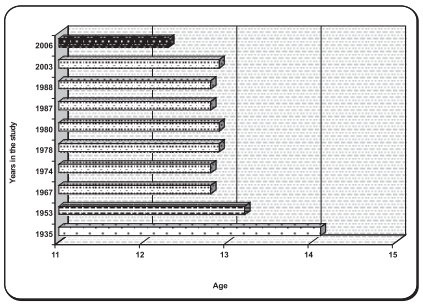

Fig.9. Secular changes in the average age of menarche

From this analysis, we can express the assumption that the processes of growth and sexual maturation are not necessarily required to run at one and the same speed in the different time periods, even a non-synchroneity is possible to occur to some extent due to the different eco-sensitiveness and the influence of the environmental factors on the processes of growth and sexual maturation.

Conclusions

The secular changes and their direction showed that:

1. The acceleration processes in the physical development of adolescents are intensive between the 60's and 80's of XX century. After the 80's, in most age groups, a relative stability in the indicators for growth was observed, even some deceleration changes in body diameters and chest circumferences, and this confirms an occurring trend towards body asthenization in recent years.
2. In both sexes, for the late XX and early XXI century, in all age groups, head circumferences and widths decrease, while the differences in head lengths and facial heights increase.
3. For the first decade of XXI century the girls tested have about 4 months lower average age of menarche.

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