

## Characteristics in the Dynamics of Physical Development of Students Aged 14-18 Years

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Certain characteristics have been traced in the individual development of students of the two sexes aged 14-18 years in two surveys carried out with an interval of 20 years. Making use of different methods an assessment has been made of the degree of development and the related alterations of the basic morphological, functional and motive indexes.

It is stressed that as a phenomenon acceleration has been on the wane in recent years which affects the total body sizes, the changes in the vegetative functions and motive activity. It is pointed out that the type of acceleration and retardation processes — harmony and disharmony, should be taken into consideration when assessing the different types of indexes of the individual.

*Key words:* physical, biological and psycho-emotional development.

An organism's physical development is a complex biological process the regulation of which is affected by a number of endo- and exogenic factors. They result in quantitative and qualitative alterations, in an organism's morpho-functional indexes, taking place at different speed and continuance.

The influence of the secular trend and the acceleration in growth is being taken into account in the past decades and this changes the general somatic appearance of the individual persons and of the entire population.

The indicated characteristics in the development of the individual explain the emerging "sensitive" critical periods during which the individual development is characterized by a specific set of the most efficient factors of the environment, which combined with the genetic preconditions reveal an organism's biological potential in the best way.

The interest of anthropologists in the connection between structure and function is justified because defining the ideal model of physical fitness always corresponds with an optimal structure.

### Material and Methods

The results from the alterations in the basic medico-biological indexes of the students in the 14-18-year age bracket have been compared during two four-year peri-

ods (1980-1984; 2000-2004) from Plovdiv and Haskovo districts. 243 boys and 198 girls were observed during the first period, while in the second one - 296 boys and 212 girls, evenly distributed in the abovementioned age groups.

The characteristics of observation of the units were distributed in several groups: assessment of the degree of development; alteration in the basic morphological indexes; alteration in the functional indexes; assessment of the motive activity.

The assessment of the degree of biological maturity was carried out by means of  $R_{\text{c}}$  and skeletometric methods in the first period and through skeletometric methods in the second period.

The standard anthropometric methods were used to assess the morphological indexes, while the functional indexes were assessed by means of tests and apparatus methods. The motive activity was assessed through tests characterizing the basic motive qualities and coordination capabilities of the individual.

The annual growth in the individual types of indexes and the general growth for the periods under examination were traced. This provided for an opportunity to highlight certain characteristics of the development and its more precise prognostication.

The data from the surveys have been presented in numerous tables and diagrams.

## Results

To assess the degree of development we used the correlation between the calendar and biological age and the degree of alteration in the individual indexes.

The deviations from the norm of the biological development in relation to acceleration and retardation in the two sexes in the periods under examination were traced. It has been proved that the variation width of the differences is the biggest with boys of over 14 years. With girls it begins considerably earlier, yet certain changes are observed in this period. The analysis of the data shows that during the 2000-2004 period the deviations were less well manifested as compared to the first period under examination, which testifies to a halt and a decrease in acceleration as a phenomenon. (Figs. 1 and 2).

Tracing the type of acceleration and retardation in the compared periods shows that it changes differently with boys and girls. During the first period 95.78% of the boys and 91.87% of the girls showed a harmonious type of acceleration. During the second period these figures were respectively: 96.05% and 95.54%. In assessing the retardation for the first period 90.37% of the boys and 88.32% of the girls showed a harmonious type of retardation, while in the second period the figures were 96.29% and 94.97% respectively.

What impresses is that with girls the harmonious type of retardation decreases in the second period, while the disharmonious one increases. As far as boys are concerned, both types of retardation increase in the second period under examination.

The puberty leap with the accelerated boys takes place in a saltatory mode, for a short period of time and has its peak before 15 years. With the normally developed boys it is witnessed in the 16<sup>th</sup> year too, but is not too well manifested. With retarded boys the puberty leap is even, does not show a pronounced peak and has a longer duration.

As for the accelerated girls over 14 years of age a continuation of the earlier reached peak is witnessed after which the development starts to descend. The normally developed girls mark a peak in the puberty leap in their 14<sup>th</sup> year and the height increases though at a less acceleration speed. With retarded girls the puberty leap has a plateau-like acceleration of an even nature and longer duration.

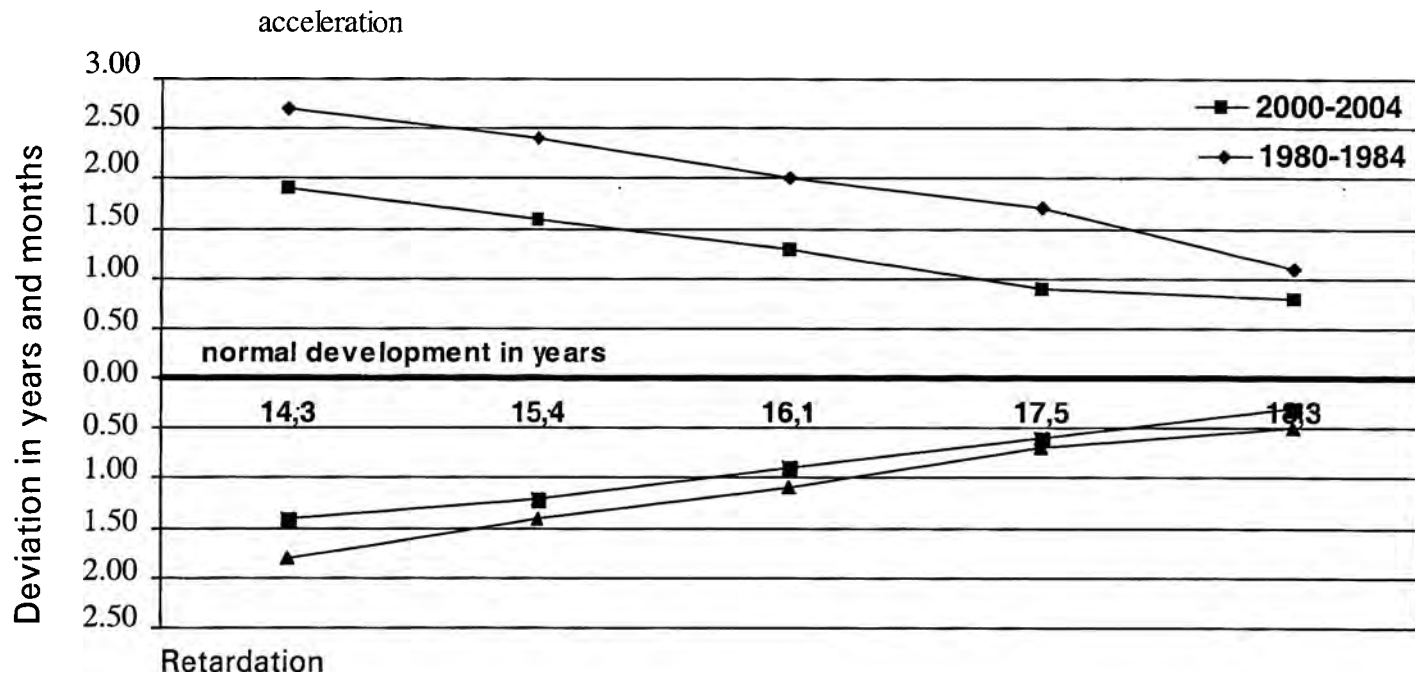


Fig. 1. Degree of biological maturity of boys 14-18 years of age studied in the periods 1980-1984 and 2000-2004 (in years and months)

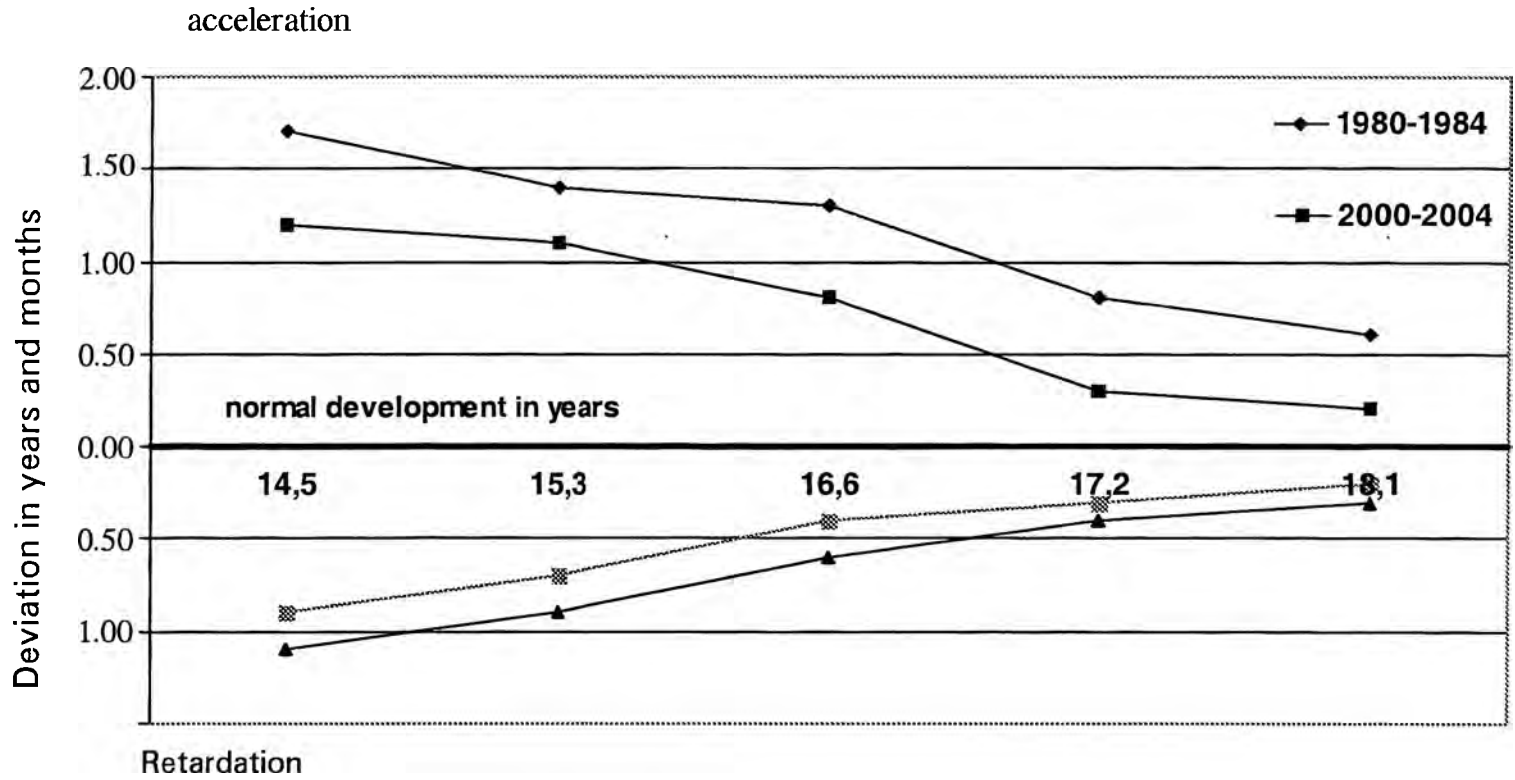


Fig. 2. Degree of biological maturity of girls 14-18 years of age studied in the periods 1980-1984 and 2000-2004 (in years and months)

Both surveys testify to one and the same data concerning body proportions. The children of an earlier maturation have a relatively longer torso, shorter limbs, wider diameters of the chest and chest measurements. This is used for a purposeful selection in sports, art and some other professions.

There also exist differences concerning the vegetative indexes of children with a different biological development. Most often they are connected with changes in the pulse frequency, the cystologic, diastolic and pulse blood pressure, with the speed of the blood flow, the stroke and minute volume of the heart, the use and absorption of oxygen, the power supply, economization of the vegetative functions, etc.

The harmonious and disharmonious types of acceleration and retardation show different adaptive reactions to the cardio-respiratory system and the homeostatic regulative reactions.

The morphological status of children in the different stages of biological maturation influences the dynamics of growth of the motive and coordination capabilities which is most clearly seen between 13-14 and 15 years of age. This plays an important role in assessing the planning of the educational and training load and for forecasting the high sports breaks.

## Conclusions

- The overall assessment of the growth and development should always take into consideration the degree of the biological maturation and the way it runs.
- The results of the two surveys (with an interval of 20 years) show a lull and decrease in acceleration as a phenomenon.
- Nearly 1/3 of the normal population shows an accelerated or retarded development of organism as a whole, or of one or several of its indexes.
- No statistically significant differences between the participants surveyed by us and the Bulgarian population with regard to height and the body mass have been established.
- The nature of an individual's development influences the functions of the individual systems and of organism's motive activity.

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