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## A comparative study on the constitutional type of high-school students belonging to different generations

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### Abstract

Presumably, identifying the coordinates regarding the constitutional type of certain high-school age generations would emphasise the effect of the instructional process specific to the field of Physical Education and Sports, and it would motivate the people involved to make an improvement in their work. I have organised a study at the Sportive High-school from Romania, in two classes from different generations (2016–2017 and 2017–2018). The research methods I used were: the study of the bibliographical material, the observation, the tests, the statistical-mathematical method and the graphical representation method. Over the 9 months of the research, the students took their classes as established in the curricula, and the results of the research confirm the previously stated hypothesis, thus constituting strong arguments for the study of the role and importance the specific means of physical education have on the general physical development of high-school students.

**Keywords:** Constitutional type, high-school students, different generations, physical development.

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## 1. Introduction

Studies of human constitution and mental features are traditionally among the main concepts of anthropological research (Stupina & Bakholdina, 2010). The physical development assessed through anthropometric indexes (size, weight and body dimensions) represents a way of evaluating the actual collective and individual biological potential (Dobrescu & Constantinescu, 2006). According to professor Demeter (1982), 'growth is about the quantitative accumulations in the body, generally, or in different particular segments, ensured by the cellular multiplication and by the increase in number of interstitial substances, a phenomenon that can be observed by the increase in volume, modification of body shape, dimensions and its constituent parts'. That is why, it is necessary for the Physical Education and Sports specialists' investigation results to be usable in practical activities, and to be based on feedback (Tudor, 2001). The specialised literature shows us an intensification of the preoccupations for knowing physical development, somatic, physiological and psychological characteristics of age groups, proving the fact that a good knowledge of these particularities objectifies the instructive-educational process (Nicu, 1972). Physical development represents one of the main aims of physical education in school and a demand of today's society (Dobrescu & Petrovici, 2015). In the current conditions of rearranging the teaching process on new, democratic, bases, an increase in the effectiveness of physical education classes is really necessary. Due to the students' age, high-school represents a very important period in the children's growth and development. This paper tries to demonstrate the effectiveness of the instructive activity conducted during the physical education class, which is ensuring a good physical development, a special importance during this period (age of 15–16) having the physical exercise, practiced rationally, according to each individual's morpho-functional particularities, age and gender. That is why, I have chosen to conduct a comparative study of high-school students, from a point of view of their physical development, taking into consideration the role played by the physical education class in forming constitutional types, from one generation to another.

## 2. Material and methods

The aim of this research was to study the evolution of high-school students, from a point of view of their physical development, taking into consideration the role played by the physical education class in forming constitutional types, from one generation to another.

The objectives of the research envisaged: identifying the evolution of the anthropometric parameters in high-school students; identifying the coefficients for somatic parameters: the indexes for nutrition, thorax (Erissmann), proportionality (Adrian Ionescu) and their evolution.

I started this research from the idea to find the most obvious reference points for physical development between two generations of high-school students, which could constitute a motivation for an applicative intervention. In developing our research, I started from the following hypothesis:

Presumably, identifying the coordinates regarding the constitutional type of certain high-school age generations would emphasise the effect of the instructional process specific to the field of Physical Education and Sports, and it would motivate the people involved to make an improvement in their work.

In order to verify my hypothesis, I have organised a study at the Sportive High-school from Roman, in two classes with 28 students of 15–16 years old, from different generations, respectively, from academic years 2016–2017 and 2017–2018.

I have conducted initial and final testing of the somatic parameters during similar time periods in the school year for the both groups, respectively, October and June. The testing conditions were identical, the material conditions in the high-school gymnasium being optimal for conducting the physical education instructional activity.

The research methods I used were: the study of the bibliographical material, the observation, the tests, the statistical-mathematical method and the graphical representation method.

The research was about conducting somatic measurements in the subjects selected from academic years of 2016–2017 and 2017–2018. The initial tests were conducted in the month of November of each studied year, whereas the final tests, in April. They comprised seven somatic parameters (height, weight, bust, thoracic perimeter, Ionescu, Quetlet and Erissmann indexes) (Epuran, 2005). The values from the 2018 generation tests were compared to the ones from the 2007 generation.

Over the 9 months of the research, the students took their classes as established in the curricula, and the data resulted after the initial and final tests were recorded in centralising tables and charts, emphasising the dynamic of somatic parameters.

### 3. Results and discussions

In order for the reader to have a general view very close to the objectivity of the results, in the following lines, I will present the results obtained after making the statistical-mathematical calculations for every parameter (Figures 1–3).

The value for the height obtained during the study is not eloquent for any of the group of subjects, in the sense that 0.50 cm is not really a performance, unless we take into consideration the short time the research was conducted. This is also emphasised by the small progression rate values. Also, the scatter indexes values are higher, but this does not prove a large deviation from the average. The amplitude of the final values, vs. the initial ones, is minimal, in both groups, which proves a homogeneity of the subjects.

The body weight records, at the end of the research, a growth slightly larger in 2017, than for 2018, with 0.28 kg. The acceleration of weight gaining, specific to teen-age period, is emphasised by the values of the progress rates in this group. The scatter indexes are smaller in both groups and they emphasise a closeness to the average value, in 2018 being observed a much better homogeneity than in 2017.

The Quetlet index proves at the end of the research for the students to have a better nutritional state in 2017, the higher progression rate proving the same. We can see that the standard deviation has somewhat larger values for this indicator, the homogeneity of the values being smaller in 2018. In direct ratio with the height, we can see an increase of the bust values with 0.03 cm more in 2017, which proves that in 2018, the height growth was accomplished through the elongation of the legs. In this sense, we can see that the progression rate for the last year was also larger. Although the homogeneity of the values is equal, the average deviation indexes are better in 2018.

The proportionality index for the body segments is in direct ratio with the one suggested by Adrian Ionescu, according to the age of the subjects. This is also proven by the progression rate values recorded in both groups. Although the standard deviation is smaller in both groups, we can see a larger variability coefficient, while the amplitude signifies a better homogeneity.

The acceleration of the weight growth in 2017 is emphasised also by the thoracic perimeter values, higher than the ones for 2018 although the difference in the average values of the initial and final testing is higher with 0.58 cm in 2018. This is also emphasised by the value of the Brada coefficient. The average deviation values are also small and prove a closeness to the average, the amplitude showing a better homogeneity in 2018.

The negative values of the Erissmann index in 2018 emphasise the growth period of the teen-agers at this age, called the period of the narrow thorax. This index better represents here the evolution, recording a plus value of 1.64. The amplitude and the scatter indexes prove a homogeneity of the average values and a minimal deviation from the general average value for both groups.

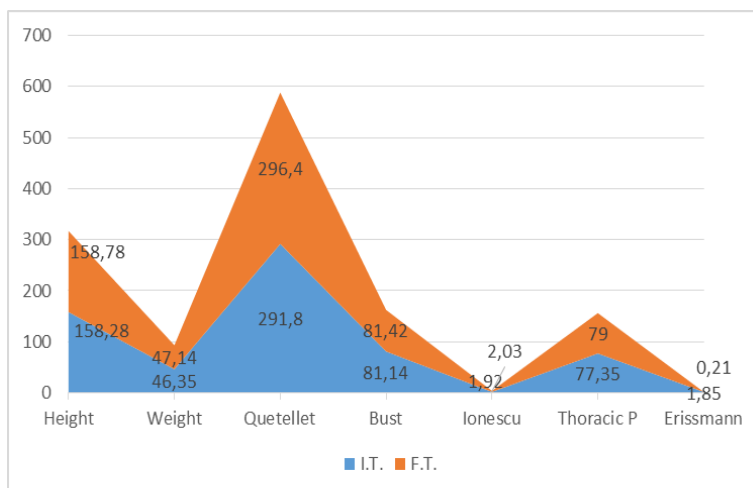


Figure 1. Average results for the 2018 generation

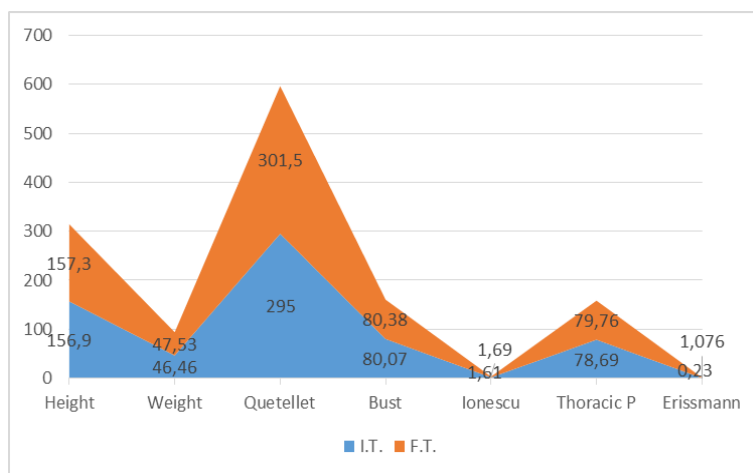


Figure 2. Average results for the 2017 generation

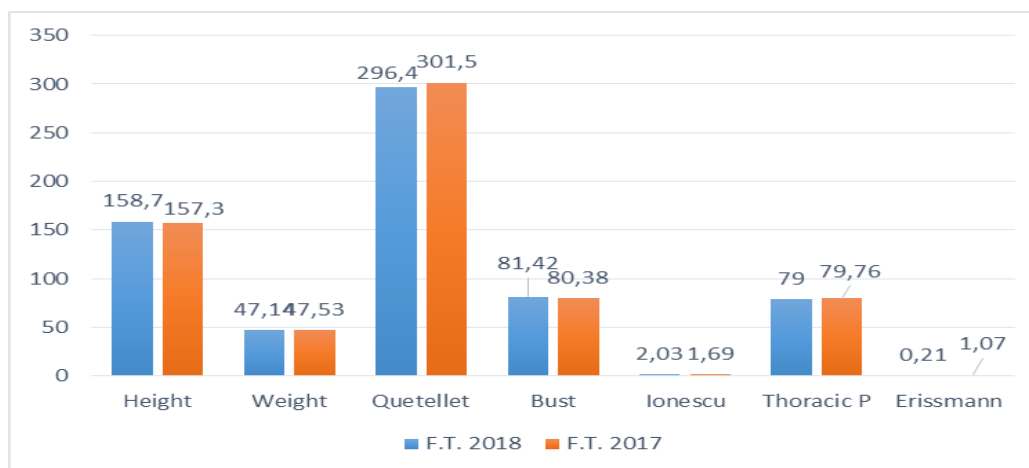


Figure 3. Comparative average results for the 2018/2017 generations

### 3.1. Discussions

The constitutional type (the phenotype) is composed, at all its components, of the genotype (hereditary legacy) and paratip, acquired under the influence of the external environment (Scribd, 2019). Body development is a unique process, that is why we must talk about the growth and differentiation of the body, instead of growth and development, seeing that growth is a component of development (Safrit & Wood, 1989). Other authors think that physical inactivity, sedentary lifestyle, represents a great danger for the individual and society (Tudor, 2005). WHO estimates that this phenomenon causes 1.9 million annual premature deaths in the world, and something less than 1/3 of them happen in the European Region (Martin et al., 2006). Studies show that although this age category is recommended to exercise at least a moderate intensity for at least 1 hour per week, for a minimum of 5 days per week, less than half of the subjects are doing it, and regardless their age, girls are less active than boys, and this difference grows with age. (WHO Europe, 2013).

### 4. Conclusions

Following the results obtained during the study, several conclusions can be drawn:

- i. The methods used during the physical education class improve the body's morphological line and posture, modifications obtained through a process of growth of the height (0.5 cm in 2018 and 0.40 cm in 2017), bust (0.31 cm), and thoracic perimeter (1.65 cm in 2018 and 1.07 cm in 2017).  
We can see also that the exercises used during the lesson contributed to a decrease of adipose tissue, and a drop in weight (0.79 kg in 2018 and 1.07 kg in 2017).
- ii. By analysing the anthropometric indexes at the end of the research, we can see a good state of nutrition (Quetlet index) in 2017 (301.5), with sensible tendencies towards an unsatisfying state in 2018 (296.4); I consider that being a consequence of the recession period.  
We can see a better body segment proportionality (A. Ionescu index) in the 2018 students (2.03), in comparison with the 2017 ones (1.69), and a ratio that is characteristic for their age.
- iii. The results of the research confirm the previously stated hypothesis, thus constituting strong arguments for the study of the role and importance the specific means of physical education have on the general physical development of high-school students.

### Acknowledgements

Research has observed the ethical standards of research and the team that carried out this study declares on their own responsibility that the subjects participating in the research and their parents were informed of the voluntary nature of participation in the research, understood the information received and requested for research. They understood that withdrawal from the research could be done at any time, without any adverse consequences on the participant or legal representative.

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