

## CHANGES IN THE SOMATIC CHARACTERS OF 10-18 YEARS OLD HUNGARIAN STUDENTS ACCORDING TO SETTLEMENT SIZES

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### Abstract

Authors studied the body height, body weight, and chest circumference on normal breathing of 20585 boys and 28128 girls. The conclusion could be drawn that with the two-sample Student's test, demonstrable deviation between the body measurement means of 10-18 years old youth living at settlements of different size could only be detected in 16.4% of the cases to the benefit of those living at larger settlements.

The results are based on the data pertaining to Hungarian students examined between 1981 and 1984 and originate from a cross-sectional growth studies.

*Key words:* physical development, settlement size

### Introduction

Between the two world wars an increase in the mean values of the somatic characters — body height, body weight, chest circumference of the youth — was observed. In special literature this phenomenon is called acceleration according to BENNHOLDT-THOMSEN (1941).

The observations from different countries verify that this phenomenon is unambiguously demonstrable independent of the ethnical groups. The factors which can be brought into connection with acceleration have been divided into two groups by GRIMM (1966). Among others, this author mentioned the effect of urbanization as well. The causes of the increase in body measurements of the youth, however, cannot unambiguously be explained by one of the many factors, or by the joint effect of several ones. Nevertheless, without a doubt the living standards of a given population, the state of development of a society, the improvement of the hygienic conditions, and in general, the environmental factors may all play significant role in it.

On the basis of all these it may be more correct to accept the opinion according to which one should speak of the decrease of the effect of the factors inhibiting the development of youth, i.e. the degree of retardation, rather than of acceleration (VÉLI, 1972).

Even among the Hungarian studies on body growth we can find evidence of the fact that the body measurements of students of the same age and sex living at

larger settlements are higher compared to those living at smaller settlements (RAJKAI, 1951, 1959; EIBEN, 1956; FARKAS, 1961). However, the question arises, whether these differences between the body measurement means of youth living at settlements of different size can be observed nowadays or not.

We wish to provide newer data to decide this question, on the basis of our recent studies.

### Sample and method

Between 1981 and 1984, during the course of studies on the factors influencing the puberty of girls, we had opportunity to study the somatic characters pertaining to 32156 girls and 22898 boys. The body measurements were determined by the method of MARTIN (MARTIN and SALLER, 1956). The measurements were specified in case of every person by the same scientist, using Harpenden-type anthropometer, steel measuring tape, calipers and medical scales (with accuracy of 50 g). In this way we wished to avoid the methodologic error which could be caused by various techniques of measuring. The data collection was related first of all to the 10–18 years old age group, although studies were also performed on students of younger age as well as on nursery-school children. The domicile of the students was also recorded while collecting the data, which was grouped into one of the followings, taking the census data into consideration:

- (0) — settlement with 100–200 thousand inhabitants,
- (1) — settlement with 50–100 thousand inhabitants,
- (2) — settlement with 10–50 thousand inhabitants,
- (3) — settlement with 5–10 thousand inhabitants,
- (4) — settlement with less than 5 thousand inhabitants.

Since the sample size was rather high, it was possible to comparing the body measurement means of the students living at the settlements of various size.

The most important parameters (sample size, arithmetic mean, standard deviation, range) were calculated from the basic data with R-55 type computer according to half-year age groups formed on the basis of the IBP's decimal age-table, at the László Kalmár Cybernetic Laboratory of the Attila József

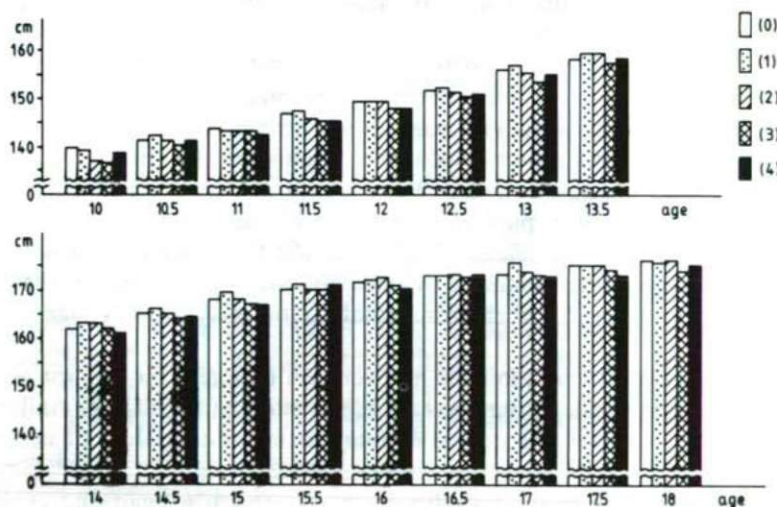


Fig. 1. Body height means for boys according to the size of their domicile

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In Figs. 1.-6. the means of body height, body weight and chest circumference on normal breathing are demonstrated according to half-year age groups between 10-18 years of age, on the basis of the above-mentioned five settlement groupings.

At the same time it was also verified by two-sample Student's test whether the differences manifested between the means of the certain somatic characters regarding the students of the same sex and age, grouped into the two-two different settlement categories could be statistically demonstrated. Ten settlement-pairs could be formed on the basis of the five settlement groups (e.g.: (0)-(1), (0)-(2), (1)-(2)

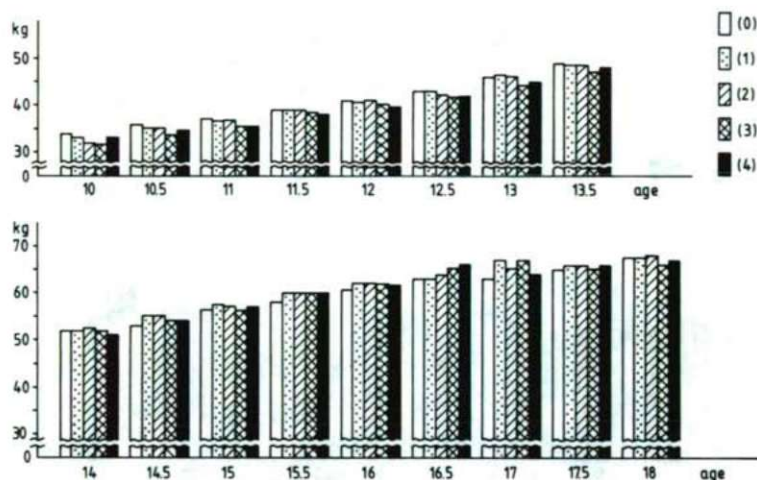


Fig. 2. Body weight means for boys according to the size of their domicile

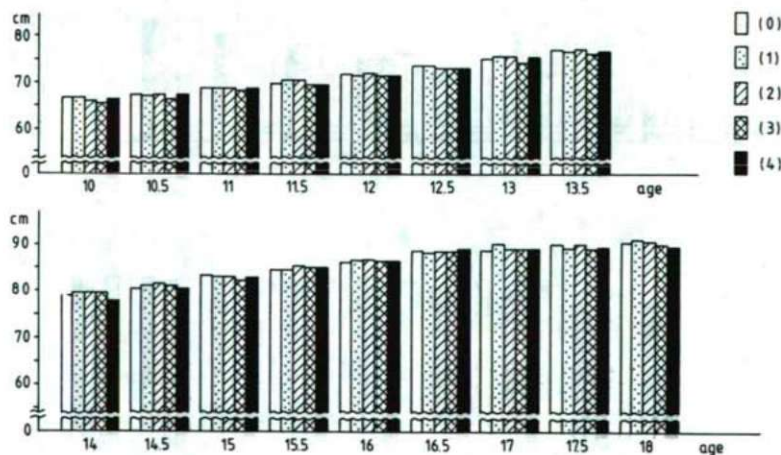


Fig. 3. Chest circumference means on normal breathing for boys according to the size of their domicile

etc.), which resulted a total of 170 combinings according to character, taking the number of age groups into consideration. Table I. presents separately, according to character the number as well as relative frequency of those cases in which the results of the Student's test the deviations between the arithmetic means in the case of the settlement pairs at the probability levels lower than 95%, of 95% and higher than 95%.

The deviations verified at the probability level of 95% or higher mean that the body measurement means for the students living in larger settlements are statistically higher than that of the students living in smaller settlements.

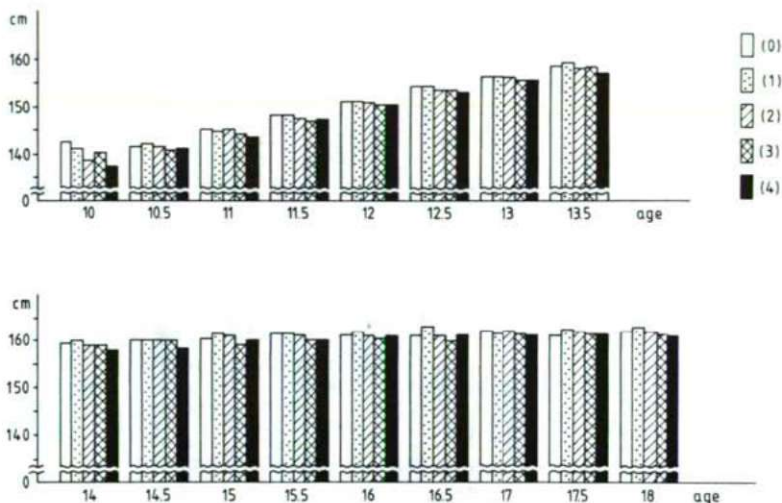


Fig. 4. Body height means for girls according to the size of their domicile

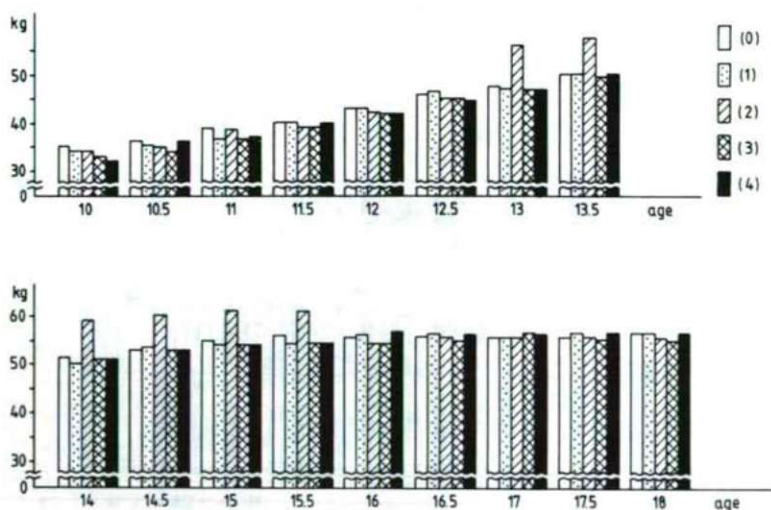


Fig. 5. Body weight means for girls according to the size of their domicile

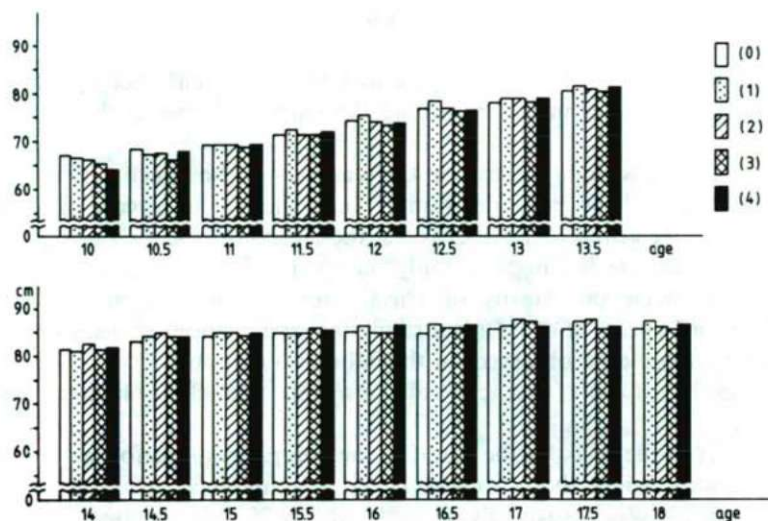


Fig. 6. Chest circumference means on normal breathing for girls according to the size of their domicile

Table 1. Frequency of occurrence of probability levels according to sex and characters

Character	Significance							
	To the benefit of larger settlement						To the benefit of smaller settlement	
	p < 95%		p = 95%		p > 95%			
	n	%	n	%	n	%	n	%
a/ Boys								
Body weight	142	83.5	10	5.9	9	5.3	9	5.3
Body height	124	72.9	17	10.0	26	15.3	3	1.8
Chest circumference	160	94.1	5	2.9	3	1.8	2	1.2
b/ Girls								
Body weight	128	75.3	6	3.5	17	10.0	19	11.2
Body height	105	61.8	13	7.6	49	28.8	3	1.8
Chest circumference	147	86.4	9	5.3	4	2.4	10	5.9
Iliac diameter	155	91.2	-	-	2	1.2	13	7.6

## Results

No far-reaching conclusions can be drawn from the mentioned figures in respect to the somatic character means regarding the students living at the settlements of different size.

The means show slight increase in the tendency of the larger settlements in case of the body height of the girls, for example, nevertheless, in the case of body weight concerning the age group of 13–15.5 years, the means for the girls grouped into the (2) settlement size are the highest. Only minimal differences could be determined graphically between the means of chest circumference on normal breathing, especially from 14 years of age. Only a slight degree deviations in body measurement means for boys could be observed on the column-diagrams.

The results of the t-test control, however, provide a higher amount of information.

In respect to the boys, as the result of the comparisons performed for the three characters (body height, body weight, chest circumference on normal breathing), from 510 cases it was statistically proved only in 70 that the body measurement means in a given age group of the boys living at larger settlements are confirmatively higher. This means 13.7% of the cases.

Four characters were taken as a base in the case of the girls verifiable differences concerning iliac diameter could only be determined in two out of the 170 cases.

This shows that the change in this secondary sex characteristic has no connection with the size of the settlement the studied student lives at.

Taking the three characters studied for boys as a basis, verifiable higher mean to the benefit of the students living at larger settlements was demonstrated in 98 cases in respect to the girls. This meant 19.2% of the total cases.

Accordingly, all these refer to the fact — at least in the case of the 10–18 years old youth — that the body height, body weight and chest circumference on normal breathing means concerning the students living at larger settlements are averagely higher only with 16.4% taking both sexes as a basis and thus considerable relationship cannot be demonstrated between the size of the settlement and the physical development of the students living there.

Naturally, this does not mean that the effect of the settlement size is regarded to be less important in the case of the students younger than 10 years. It is feasible that the probable retardation manifest in the development of the children under 10 years of age living at smaller settlements is stopped by the peak height velocity and thus essential differences can be observed in their case compared to the rest of the students during the course of puberty.

All these experiences give evidence of the fact that the determination of the level of physical development is necessary at certain intervals, since the social development, the changes in living standards and living conditions of a population imply modifications in the physical development of the juvenile population living there as well. At the same time, these observations also call attention to the fact that there may be changes in the degree of the effect of the environmental factors brought into connection with body growth, too.

## References

- BENNHOLDT-THOMSEN, C. (1941): Die somatische Wandlung des Gross-stadtkindes. — *Z.Rassenkunde*. 12, 249.
- EIBEN, O. (1956): Városi és falusi ifjúság testfejlődésének összehasonlító vizsgálata (Comparative study of the physical development of urban and rural youth). — *Biol.Közl.* 3, 115-134.
- FARKAS, GY. (1961): Szegedi 6-18 éves fiúk és lányok főbb testméretei (Wichtigere Körpermasse 6 bis 18-jähriger Knaben und Mädchen in der Stadt Szeged). — *Anthrop.Közl.* 4, 103-135.
- FARKAS, GY. (1983): Changes in body measurements of adolescent children in Szeged, Hungary, between 1958 and 1981. — *Acta Biol. Szeged.* 29, 179-188.
- FARKAS, GY., HUNYA, P., HERENDI, I. and SZEKERES, E. (1983): Studies on the menarcheal age of the girls of county Csongrád (Southern Hungary). — *Acta Biol. Szeged.* 29, 169-178.
- GRIMM, H. (1966): Grundriss der Konstitutionsbiologie und Anthropometrie. — VEB Verlag Volk und Gesundheit. Berlin. 70-91.
- MARTIN, R. and SALLER, K. (1956): Lehrbuch der Anthropologie in systematischer Darstellung. — Gustav Fischer Verlag. Stuttgart. 323-324., 332-333., 339., 342.
- RAJKAI, T. (1951): A hajdusámsoni iskolásgyermek testmagassága, mellkerülete és testsúlya (Die Körperhöhe, der Brustumfang und das Körpergewicht der Schulkinder in Hajdusámson). — *Ann.Biol.Univ. J.*, 277-289.
- RAJKAI, T. (1959): A sárrétudvari iskolásgyermek embertani vizsgálata 1952. évben (Anthropologische Untersuchungen von Schulkindern in Sárrétudvari im Jahre 1952). — *Anthrop.Közl.* 2, 15-35.
- VÉLI, GY. (1972): Akceleráció vagy retardáció? (Akzeleration oder Retardation?) — *Anthrop.Közl.* 16, 105-114.

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