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CHANGES IN BODY MEASUREMENTS OF ADOLESCENT CHILDREN IN SZEGED, HUNGARY, BETWEEN 1958 AND 1981

GY. FARKAS

Department of Anthropology, Attila József University, Szeged
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Abstract

The averages in body weight, body height and normal breast circumference of 10—14.5 years old urban boys and girls were compared on the basis of four different measurements carried out at various time points. The observations are from single surveys. It is determined that between 1958/59 and 1966/67 the averages of the three body measurements increased in each age group, in the case of both sexes. According to the measurings in 1981/82 the increase in averages could only be observed in body height and weight, while the averages of the normal breast circumference were lower in 1981/82 than in the averages of 1966/67 in the majority of the age groups in both sexes.

This phenomenon was also observed in children of nursery age.

The menarche-median did not show any essential changes in the last 15 years.
Key words: body growth, menarche, acceleration.

Introduction

The supervision of the body growth of children is an everyday task. It is especially important in children living between approximately similar environmental conditions, where there is also a possibility to make conclusion of the general regularities on the basis of the data. Naturally, the major part of the examinations of growth following birth also comprises the examination of the adolescents, in which case the researchers also follow with attention the physiological maturation besides the body measurings.

Such examination of the children living in Szeged, a city in Southern Hungary having 200,000 inhabitants, was carried out in the years of 1958/59, 1961 and 1966/67 (FARKAS, 1961, 1966, 1969). A large part of these studies comprised mostly the examination of the factors influencing the puberty of girls (FARKAS, 1969, 1970, 1979a, 1979b, 1980a, 1980b). The results of these studies supported the observation of foreign researchers, according to which puberty is influenced by several environmental and endogenous biochemical factors (BARISIĆ and GAVRILOVIĆ, 1974; CHANG et al. 1967; ŁASKA-MIERZEJEWSKA, 1970; RICHTER, 1973; SIMELL, 1951; ŠTUKOVSKÝ et al. 1967; VALŠÍK and ŠTUKOVSKÝ, 1964), but also revealed newer relationships (FARKAS, 1979a, 1979b). According to our knowledge there has been no joint observation of these factors anywhere as yet in the case of one and the same child community, in the frame of larger material. Therefore we started a 3-years study in Csongrád county (Southern Hungary, county centre Szeged).

In the followings, in the frame of this study, the partial results of the data collection and measurements carried out in 1981/82 in Szeged are compared with the averages obtained earlier from the children of the same settlement.

Materials and methods

7000 girls and 4810 boys ranging from 10 to 19 years of age were measured in Szeged in the years 1981/82.

The measurements were taken with the general anthropometrical technique (MARTIN and SALLER, 1956), using anthropometer, scales measuring with 50g exactness, steel measuring tape and calipers.

The students were divided into half-year age groups on the basis of the decimal age group table, according to the formula of the year of age ± 3 months.

Using R-40 type computer and Osiris programme the most important parameters were determined according to characteristics. The arythmetic averages obtained in 1981/82 and 1966/67 were compared with two-sample t-test.

The parameters of the three body measurements originating from the two samples are shown on Tables 1.—6.

The growth curves designed on the basis of the arythmetic averages determined in the school years of 1958/59, 1966/67 and 1981/82 are observable on Figs. 1.—6.

It should be mentioned that the Tables contain only the parameters of the 10—14.5 years old children, therefore the total sample element number both in the case of boys and girls, does not reach the case number of the total boys and girls measured in 1981/82.

Results

On the basis of the data gained earlier it could be determined that the averages of body height, body weight and normal breast circumference of the children of Szeged showed an increase in both sexes and every age group compared to the previously obtained data (Figs. 1—6).

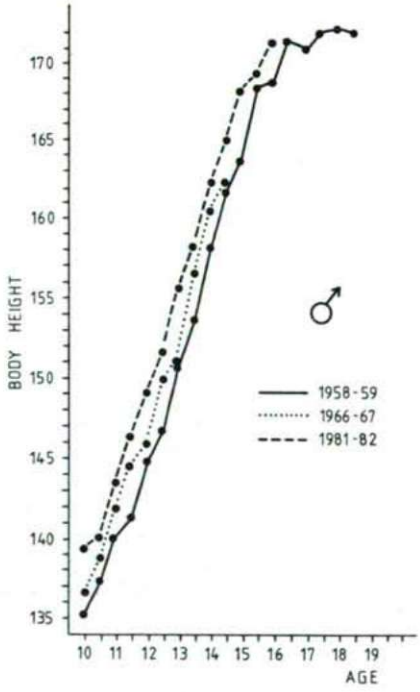

Figure 1. Growth curve of body height of the boys of Szeged.

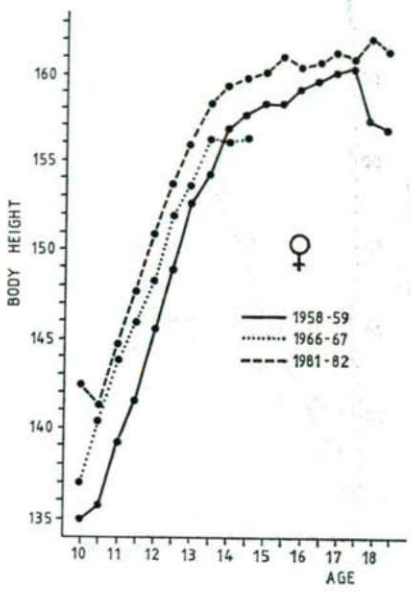

Figure 2. Growth curve of body height of the girls of Szeged.

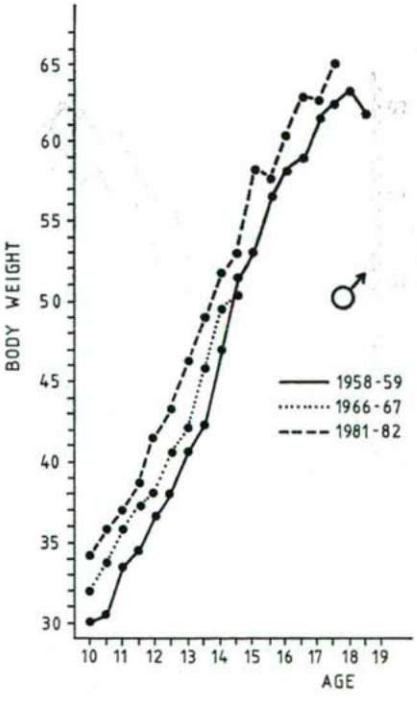

Figure 3. Growth curve of the body weight of the boys of Szeged.

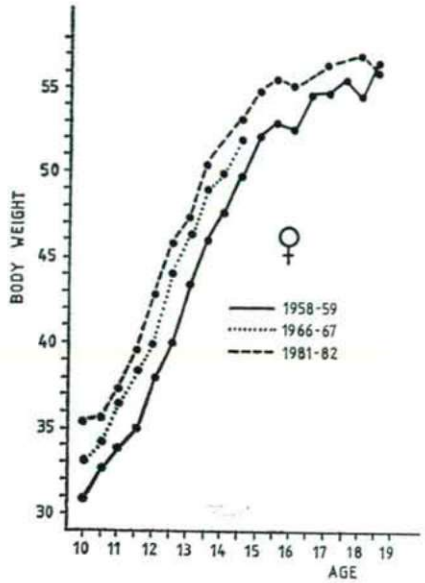

Figure 4. Growth curve of the body weight of the girls of Szeged.

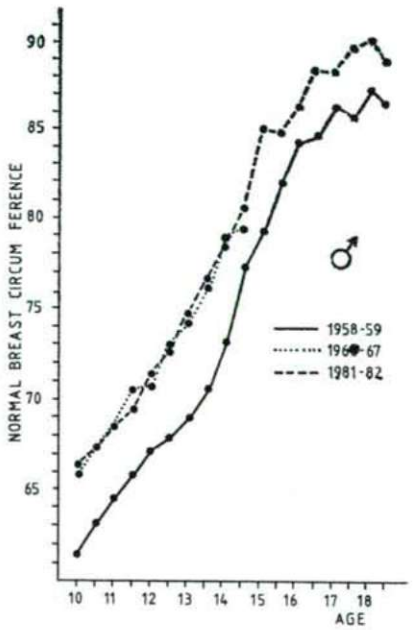

Figure 5. Growth curve of normal breast circumference of the boys of Szeged.

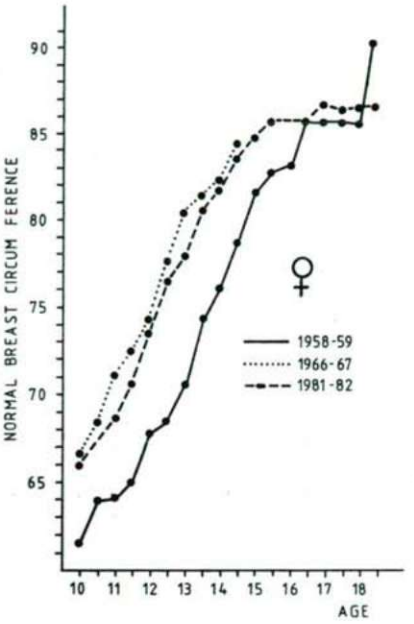

Figure 6. Growth curve of normal breast circumference of the boys of Szeged.

This acceleration phenomenon in Hungary was not only detectable in the case of the children in Szeged. The improvement of the living standards and hygienic conditions in Hungary after World War II can be mentioned as the unambiguous cause of this finding. Obviously, the high development in the medical attendance of children, among others, the decrease in the amount of child diseases, their milder course and prevention also play role in this.

The acceleration was observable in the puberty period of girls, too, since the menarche median of the girls of Szeged in 1958/59 was 13.20 years which decreased to 12.73 years by 1966/67 (FARKAS, 1969).

In connection with the acceleration the question naturally arises: how long can it last in the case of children living in a certain geographical region, under given socal-economic circumstances? The decision of this is only possible after the periodically carried out measurements. This was one of the causes for initiating another data collection in Szeged in 1981/82.

In Tables 1.—6. the averages of the 1981/82 measurements are compared with those of 1966/67. The averages of 1981/82 are also shown on Figs. 1.—6. In the last column of the mentioned Tables the differences between the averages of the two study periods are given, in such a way that in case the 1981/82 averages were lower than those of 1966/67, this was indicated by a negative sign. In the „t" column of the Tables the thickly set values indicate the differences of 95%, or the differences assertable with higher certainty.

On the basis of these Tables and Figures it is unanimously evident that the body height and weight averages of the boys and girls of Szeged between the age of 10—14.5 years are higher in every age group in 1981/82 than they were in 1966/67. Hovewer, the differences are not provable in every age group with statistic tests.

The higher stature averages obtained in 1981/82 in the 10, 11 and 14.5 years old boys and the 10.5, 11 years old girls cannot be proved by statistic methods. It was also experienced in the rest of the age groups that the latest measurement averages are higher than the earlier ones, but these are provable also by statistic procedure, on a level of 99% in the case of the girls — contrary to the boys. Therefore, there is a difference in this respect between the two sexes (Tables 1.—2.).

Table 1. The stature parameters of the boys of Szeged

1981/82			Age	1966/67			t	Diff.
n_1	$\bar{x}_1$	s_1		n_2	$\bar{x}_2$	s_2		
26	139.38	6.74	10.0	70	136.70	6.38	1.80	2.68
251	141.13	6.20	10.5	68	138.80	7.60	**2.61**	2.33
289	143.48	7.10	11.0	71	142.00	7.73	1.55	1.48
303	146.31	7.09	11.5	122	144.60	6.41	**2.31**	1.71
286	149.17	7.74	12.0	150	146.00	6.47	**4.29**	3.17
336	151.62	8.34	12.5	182	150.00	7.76	**2.16**	1.62
268	155.45	8.66	13.0	151	151.00	7.81	**5.23**	4.45
320	158.12	8.84	13.5	167	156.50	8.03	**1.98**	1.62
330	162.21	8.77	14.0	104	160.30	8.53	**1,95**	1.91
340	164.80	8.35	14.5	29	162.20	9.01	1.60	2.60
2749				1114				

Remark: In the „t" column the thickly set values indicate the differences provable by 95%, or by higher probability.

Table 2. The stature parameters of the girls of Szeged

1981/82			Age	1966/67			t	Diff.
n_1	$\bar{x}_1$	s_1		n_2	$\bar{x}_2$	s_2		
38	142.63	7.25	10.0	58	137.10	5.98	**4.07**	5.53
395	141.50	6.61	10.5	69	140.60	6.62	1.04	0.90
487	144.80	7.35	11.0	72	144.00	7.54	0.86	0.80
480	147.77	7.48	11.5	113	146.10	6.76	**2.17**	1.67
473	151.03	7.20	12.0	119	148.40	7.20	**3,56**	2.63
474	153.73	6.94	12.5	112	152.00	6.79	**2.38**	1.73
528	156.01	6.88	13.0	120	153.70	7.27	**3.29**	2.31
466	158.33	6.85	13.5	89	156.20	5.88	**2.75**	2.13
392	159.32	6.04	14.0	57	156.10	4.99	**3.84**	3.22
377	159.82	5.92	14.5	23	156.40	4.45	**2.72**	3.42
4110				832				

Remark: In the „t" column the thickly set values indicate the differences provable by 95%, or by higher probability.

Similar phenomenon was observable between the two sexes in the body weight averages, too. The averages of 1981/82 are higher both in girls and boys. At the same time, however, these differences can only be proved by statistic test in one age group in case of the girls (12 years of age), but in 5 age groups in case of the boys (10.5; 12—13.5 years of age). The provable level was 99% in case of both sexes (Tables 3.—4.). It seems, therefore, that the average values of the boys verifiably higher in several cases, were the results of more intensive increase in body weight, which also seems to be supported by the fact that between the 10—14.5 years the total differences in the case of the two samples were 24.85 kg in boys and 16.30 kg in girls.

Table 3. Body weight parameters of the boys of Szeged

1981/82			Age	1966/67			t	Diff.
n_1	$\bar{x}_1$	s_1		n_2	$\bar{x}_2$	s_2		
26	34.21	7.08	10.0	70	32.00	5.33	1.65	2.21
252	35.75	7.32	10.5	68	33.80	6.19	**2.01**	1.95
289	37.15	7.58	11.0	71	35.90	6.23	1.29	1.25
303	38.93	8.42	11.5	122	37.40	7.43	1.7.	1.53
286	41.47	8.93	12.0	150	38.10	7.29	**3.98**	3.37
336	43.33	9.61	12.5	182	40.70	7.91	**3.16**	2.63
268	46.31	9.80	13.0	151	42.20	8.27	**4.35**	4.11
320	49.01	10.54	13.5	167	45.90	8.08	**3.36**	3.11
330	51.67	11.04	14.0	104	49.60	9.09	1.74	2.07
340	52.92	10.20	14.5	29	50.30	9.18	1.34	2.62
2750				1114				

Remark: In the „t" column the thickly set values indicate the differences provable by 95%, or by higher probability.

Table 4. Body weight parameters of the girls of Szeged

1981/82			Age	1966/67			t	Diff.
n_1	$\bar{x}_1$	s_1		n_2	$\bar{x}_2$	s_2		
38	35.44	6.71	10.0	58	33.10	5.43	1.88	2.34
395	35.70	7.75	10.5	69	34.20	6.81	1.51	1.50
487	37.53	8.82	11.0	72	36.60	8.52	0.84	0.93
480	39.68	8.71	11.5	113	38.50	7.23	1.34	1.18
473	42.97	9.28	12.0	119	40.00	7.23	**3,25**	2.97
474	45.80	9.72	12.5	112	44.10	8.83	1.69	1.70
528	47.29	9.72	13.0	120	46.30	8.81	1.02	0.99
466	50.43	11.06	13.5	89	49.00	8.58	1.15	1.43
392	51.84	8.89	14.0	57	49.80	8.24	1.63	2.04
377	53.12	9.68	14.5	23	51.90	12.07	0.58	1.22
4110				832				

Remark: In the „t" column the thickly set values indicate the differences provable by 95%, or by higher probability.

The average values of the normal breast circumference in several age groups in the case of boys were lower in 1981/82 than in 1966/67 (10.5—11.5; 12.5; 14 years of age) but these differences were not provable by t-test (Table 5). In the case of girls the

Table 5. Normal chest circumference parameters of the boys of Szeged

1981/82			Age	1966/67			t	Diff.
n_1	$\bar{x}_1$	s_1		n_2	$\bar{x}_2$	s_2		
26	66.39	5.62	10.0	70	66.00	4.18	0.37	0.39
251	67.31	5.83	10.5	68	67.50	4.59	0.35	—0.19
289	68.53	6.22	11.0	71	68.70	4.53	0.22	—0.17
303	69.54	6.60	11.5	122	70.60	5.72	1.55	—1.06
286	71.39	6.75	12.0	150	70.80	5.56	0.92	0.59
336	72.71	7.34	12.5	182	73.00	5.69	0.46	—0.29
268	74.67	6.51	13.0	151	74.10	5.62	0.90	0.57
320	76.61	7.56	13.5	167	76.30	5.54	0.47	0.31
330	78.68	7.52	14.0	104	78.80	6.51	0.15	—0.12
340	80.49	6.94	14.5	29	79.40	6.22	0.82	1.09
2749				1114				

averages of the latest sample — with the exceptance of the 10 years old girls — were lower in every other age group in 1981/82 than those of the 15 years earlier samples, one part of which (11—11.5 and 13 years old girls) was also provable by statistic methods (Table 6).

Table 6. Normal chest circumference parameters of the girls of Szeged

1981/82			Age	1966/67			t	Diff.
n_1	x_1	s_1		n_2	x_2	s_2		
38	66.84	5.58	10.0	58	66.60	4.55	0.23	0.24
395	67.33	7.24	10.5	69	68.40	6.54	1.15	—1.07
487	68.72	7.78	11.0	72	71.10	6.31	**2.55**	—2.42
480	70.63	7.75	11.5	113	72.40	6.67	**2.23**	—1.77
473	73.59	8.05	12.0	119	74.20	6.04	0.77	—0.61
474	76.38	8.28	12.5	112	77.60	7.13	1.44	—0.22
528	77.94	8.31	13.0	120	80.20	7.50	**2.74**	—2.26
466	80.40	9.20	13.5	89	81.20	6.55	0.78	—0.80
392	81.66	7.34	14.0	57	82.10	5.87	0.43	—0.74
377	83.30	7.99	14.5	23	84.20	8.60	0.52	—0.90
4110				832				

Remark: In the „t" column the thickly set values indicate the differences provable by 95%, or by higher probability.

It should be mentioned that all measurements were made by the author, therefore the difference cannot be considered as menthodological differences.

From the above, therefore, the interesting experience can be concluded on the basis of the measurings carried out at various periods that while between the years 1958/59 and 1966/67 the acceleration process could be proved unanimously, between the years of 1966/67 and 1981/82 this only limited to the body weight and height, which, however, cannot be observed in every age group. The normal breast circumference — which is one of the indicatives of the size of the chest and also the vital capacity of the lung — showed a lag, in case of both sexes, compared to the averages of the earlier 15 years. Although this cannot be proved statistically in the case of the boys, it is a factual data. This latter observation calls attention to the fact that the motion developing the respiration of adolescent school children is not ensured as should necessary (firstly due to lack of time), which explains to a certain extent the increased fatigability of these children.

We should only like to mention as an interesting fact that similar experience was gained when comparing the body measurement averages of children of nursery age (FARKAS, 1983).

We do not wish to report in detail on the degree and causes of the menarche median changes, since this will be the subject of another study. However, we should like to mention that in the last decades we obtained the following values from the examination of girls of Szeged (FARKAS, 1964, 1972):

In 1958/59 the median on the basis of the data from 1441 girls was 13.20 years,
In 1961 the median on the basis of the data from 1469 girls was 13.03 years,
In 1966/67 the median on the basis of the data from 1136 girls was 12.73 years,
In 1981/82 the median on the basis of the data from 6984 girls was 12.77 years.

It can be seen from the comparison that the period of puberty between 1958/59 and 1966/67 definitely decreased, while it showed no essential changes during the last 15 years.

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Address of the author:
DR. GY. FARKAS
Department of Anthropology
A. J. University, H-6701 Szeged
P.O. Box 660, Hungary