

BODY HEIGHT, BODY WEIGHT AND BMI OF THE SCHOOLCHILDREN IN THREE URBAN AREAS OF HUNGARY

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Abstract: The present study has two purposes, first to describe the body development characterised by body height, body weight and body mass index (BMI) of the schoolchildren in a sample of three urban areas (the cities of Győr, Budapest, Nyíregyháza and their immediate vicinities) in Hungary with different historical and economical background, as well as to compare these body measurements among the three subsamples. The second purpose of it was to study the effect of the urbanisation on the body development in urban and rural comparison among and within the subsamples. For this reason local (urban) and non-local (rural) groups were made in the sample. Those children, whose place of birth and living place were the same, were considered as local, and the other children as non-local. The total sample consists of 4719 schoolchildren from 7 to 18 years of age, but for local and non-local comparison they were drawn together into three (7-10, 11-14 and 15-18) age groups. There were no significant differences found in the three body parameters either in boys or in girls among and within the three subsamples, when they were grouped according to their age. In local and non-local comparison only the height of the boys showed significant differences among and within the subsamples. Contrary to the boys, there were no significant differences found in the girls.

Keywords: Body height; Body weight; BMI; Urban and rural schoolchildren.

Introduction

Human growth and body development are influenced both by genetical and environmental factors. A considerable proportion of the differences in body size caused by environmental factors are related to urban and rural divergence in dwelling place. This urban - rural difference is a well documented phenomenon. Comparative growth studies at the turn of the century showed that children in the cities are larger than those in rural areas and they also showed a more advanced maturation than their rural counterparts (see summing up Eveleth and Tanner 1976, Bodzsár and Susanne 1998). But, in some of the well-developed countries these differences are going to disappear (Walter 1975, W-Lindgren 1988).

In Hungary Darányi and Jankovich (1935) were the first ones, who showed urban - rural differences in body size of schoolchildren living in Budapest and in a village of the surroundings of Budapest. Eiben (1956) found the same differences in Eastern-Hungary, in boys of secondary schools originating from the city of Debrecen and from the surrounding villages. Gyenis (1997) found similar differences in university students born in Budapest and students born elsewhere in the country.

Material and methods

The sample comprise 4719 schoolchildren from 7 to 18 years of age from elementary schools, secondary schools and vocational training schools of three different historical and economical urban areas of Hungary, namely the cities of Győr, Budapest and Nyíregyháza, as well as their immediate vicinities. Among them Győr is an old town in Western-Hungary, but with various modern industry. In spite of the political change in Middle- and Eastern-Europe in 1989, which caused the sudden crash of the industry and agriculture of the former "socialist" countries situated here, this north-west part of Hungary has become a favourite territory of the foreign investments. Budapest is the capital of Hungary, and the most developed city of Hungary, in all aspects. Nyíregyháza is a younger city in Eastern-Hungary, with less developed industry, mainly with agricultural background and surrounded by less developed villages, and also with small ranches.

From the several measurements taken of the sample, only body height, body weight and BMI were analysed for the purpose of this study: to investigate the differences in body development of the schoolchildren of the three areas, as well as, to analyse the urban and rural differences in the sample. In order to make statistical analyses three groups were made of the sample. The "total" groups comprise all of the male and female schoolchildren of the whole sample or of three areas. The "local" (urban) groups consist of the schoolchildren who were born and have been living in one of the cities, while the "non-local" (rural) groups are made up of the schoolchildren who were born in one of the given cities, but have been living outside the city, or who were born outside one of the cities, but have been living in the city, or who were born outside one of the cities and have been living outside this city. For the analyses among and within the local and non-local groups of the sample, the children were drawn together into three (7-10, 11-14 and 15-18) age groups.

The three body characteristics were analysed independently for boys and girls and by one dimensional. We investigated the effects of local and non-local background and the cities by a hierarchical maximum likelihood estimation method after the elimination of the age effect. The significance of different factors was calculated by ANOVA method on a 5 percent level.

Results and discussion

It is long time a general and well known trend in auxology that the children of the larger cities are taller and heavier, than the children of the smaller cities, or villages. In Hungary Eiben et al. (1996) found the same phenomenon in their Hungarian National Growth and Physical Fitness Study carried out in the 1980s. Gyenis (1997) showed similar differences in university students born in Budapest and elsewhere in the country, who were studied between 1976-1990. Contrary to these results Farkas and Takács (1986) described only minor differences in body height, body weight and chest circumference of schoolchildren living at settlements of different size in Hungary carried out in the first half of the 1980s.

The results of the present study seem to be a better match with the results of Farkas and Takács (1986), than with other studies in Hungary (Bodzsár 1998). In Table 1 the values of the body height of the investigated schoolchildren do not show any significant differences among the three subsamples either in the case of the boys, or of the girls.

Table 1: Mean body height (cm) of boys and girls

Age	Total			Budapest			Győr			Nyíregyháza		
	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD
BOYS												
7	79	124.85	5.08	24	126.12	4.60	30	123.47	4.49	25	125.30	5.92
8	147	129.16	5.64	66	130.48	5.54	45	127.79	5.49	36	128.45	5.65
9	141	134.34	5.73	58	135.57	5.75	40	134.29	5.77	43	132.73	5.39
10	161	141.32	6.73	55	140.09	7.28	70	142.09	6.26	36	141.71	6.63
11	152	145.45	7.20	51	145.25	6.84	65	145.11	7.46	36	146.36	7.36
12	151	150.07	7.99	51	149.27	7.54	60	150.33	7.98	40	150.69	8.65
13	151	159.14	9.11	49	159.14	10.93	49	159.10	7.97	53	159.17	8.39
14	148	166.56	9.31	42	168.72	9.55	45	163.90	8.99	61	167.03	9.05
15	280	171.99	7.51	67	173.02	7.90	100	172.07	8.05	113	171.30	6.72
16	249	175.62	7.34	68	177.12	8.27	87	174.66	6.53	94	175.42	7.24
17	278	177.03	6.91	86	176.28	7.33	97	177.17	6.43	95	177.57	7.00
18	169	178.05	6.58	58	178.20	6.90	33	178.81	5.63	78	177.63	6.75
GIRLS												
7	79	125.10	5.33	27	126.17	5.65	30	124.51	5.67	22	124.59	4.42
8	133	129.45	6.21	53	129.64	6.38	42	127.96	5.67	38	130.83	6.33
9	151	135.67	6.21	52	137.40	6.28	48	134.41	5.95	51	135.09	6.09
10	181	140.17	7.67	62	139.35	7.65	72	140.85	7.42	47	140.20	8.12
11	139	147.14	7.11	43	146.60	6.70	55	147.17	7.19	41	147.65	7.56
12	154	153.07	7.90	47	152.77	8.12	68	152.38	8.63	39	154.64	6.02
13	157	158.57	7.09	50	158.46	7.02	49	158.89	7.44	58	158.39	6.98
14	149	162.88	6.23	48	161.47	6.55	49	163.31	6.16	52	163.79	5.87
15	399	163.06	5.80	116	163.52	5.92	151	163.03	5.53	132	162.70	6.01
16	426	163.64	5.72	170	163.15	6.06	132	163.73	5.08	124	164.21	5.86
17	411	163.90	6.05	179	163.28	6.28	131	165.41	5.77	101	163.04	5.65
18	234	165.10	5.99	98	164.91	5.97	61	165.67	5.66	75	164.88	6.31

Table 2: Mean body weight (kg) of boys and girls

Age	Total			Budapest			Győr			Nyíregyháza		
	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD
BOYS												
7	79	24.75	4.76	24	25.69	5.36	30	24.32	3.87	25	24.38	5.19
8	147	27.06	4.78	66	27.55	4.34	45	26.55	5.11	36	26.80	5.16
9	141	30.64	6.39	58	32.07	7.43	40	30.46	5.78	43	28.89	4.90
10	161	34.46	7.93	55	34.33	7.42	70	34.31	8.41	36	34.97	7.93
11	152	37.89	9.78	51	36.89	9.04	65	38.02	10.59	36	39.07	9.39
12	151	42.30	9.47	51	40.62	7.92	60	43.27	10.57	40	43.01	9.47
13	151	49.69	12.41	49	49.28	10.59	49	50.07	13.60	53	49.72	13.02
14	148	55.36	13.34	42	57.24	10.16	45	51.29	11.02	61	57.07	16.08
15	280	60.03	11.69	67	59.94	10.23	100	61.12	13.00	113	59.13	11.28
16	249	63.78	11.52	68	64.83	10.82	87	64.74	12.23	94	62.14	11.26
17	278	67.15	10.70	86	67.30	10.87	97	66.70	10.89	95	67.46	10.46
18	169	67.53	9.35	58	67.21	8.45	33	66.53	6.04	78	68.20	11.04
GIRLS												
7	79	24.93	5.67	27	24.74	4.96	30	25.30	6.07	22	24.67	6.16
8	133	26.83	5.26	53	26.71	4.91	42	26.21	5.44	38	27.69	5.56
9	151	30.92	6.39	52	33.20	8.08	48	29.71	4.86	51	29.74	5.03
10	181	34.23	8.90	62	34.84	10.87	72	34.19	7.69	47	33.49	7.83
11	139	38.43	8.58	43	38.50	8.84	55	39.09	9.66	41	37.45	6.66
12	154	45.09	11.24	47	45.72	9.97	68	45.07	13.01	39	44.34	9.43
13	157	48.21	8.76	50	49.01	8.25	49	48.92	9.73	58	46.91	8.30
14	149	54.17	10.42	48	53.91	11.91	49	54.42	10.02	52	54.17	9.47
15	399	55.33	9.63	116	55.29	8.92	151	55.05	9.46	132	55.69	10.45
16	426	55.85	8.80	170	55.83	8.95	132	56.30	7.24	124	55.41	10.08
17	411	56.11	8.12	179	55.94	8.54	131	56.21	6.92	101	56.30	8.83
18	234	57.65	8.52	98	57.33	8.30	61	56.70	7.14	75	58.85	9.73

Table 3: Mean body mass index of boys and girls

Age	N	Total		N	Budapest		N	Győr		N	Nyíregyháza	
		Mean	SD		Mean	SD		Mean	SD		Mean	SD
BOYS												
7	79	15.79	2.16	24	16.08	2.79	30	15.87	1.67	25	15.41	2.02
8	147	16.15	2.06	66	16.13	1.84	45	16.17	2.28	36	16.15	2.22
9	141	16.86	2.58	58	17.30	3.00	40	16.80	2.39	43	16.33	2.04
10	161	17.12	2.91	55	17.36	2.81	70	16.85	3.02	36	17.27	2.89
11	152	17.73	3.32	51	17.35	3.21	65	17.85	3.61	36	18.06	2.96
12	151	18.64	3.16	51	18.11	2.54	60	19.00	3.70	40	18.78	2.99
13	151	19.45	3.76	49	19.29	2.66	49	19.63	4.45	53	19.44	4.00
14	148	19.80	3.66	42	20.06	2.82	45	18.94	2.93	61	20.26	4.51
15	280	20.21	3.18	67	19.99	2.89	100	20.51	3.50	113	20.06	3.05
16	249	20.62	3.13	68	20.62	2.80	87	21.15	3.37	94	20.14	3.06
17	278	21.38	2.92	86	21.59	2.79	97	21.23	3.23	95	21.35	2.71
18	169	21.28	2.56	58	21.15	2.31	33	20.81	1.61	78	21.57	3.01
GIRLS												
7	79	15.84	2.92	27	15.49	2.60	30	16.21	3.04	22	15.78	3.21
8	133	15.91	2.18	53	15.80	1.99	42	15.89	2.32	38	16.08	2.33
9	151	16.70	2.49	52	17.47	3.22	48	16.37	1.86	51	16.23	1.97
10	181	17.23	3.22	62	17.70	4.27	72	17.08	2.56	47	16.83	2.41
11	139	17.62	3.05	43	17.82	3.33	55	17.88	3.47	41	17.07	1.91
12	154	19.05	3.61	47	19.37	2.85	68	19.17	4.30	39	18.44	3.10
13	157	19.09	2.74	50	19.44	2.53	49	19.29	3.02	58	18.63	2.65
14	149	20.40	3.71	48	20.66	4.38	49	20.40	3.60	52	20.16	3.15
15	399	20.77	3.23	116	20.66	3.03	151	20.68	3.12	132	20.99	3.51
16	426	20.83	2.89	170	20.94	2.97	132	20.99	2.49	124	20.51	3.16
17	411	20.89	2.82	179	20.98	2.97	131	20.54	2.27	101	21.18	3.16
18	234	21.14	2.90	98	21.06	2.67	61	20.66	2.42	75	21.66	3.46

Table 4: Body height in local and non-local grouping

Total	Total Local ^a	Non-L ^a	Total ^b	Budapest Local ^d	Non-L	Total ^b	Győr Local ^d	Non-L	Total ^b	Nyíregyháza Local ^{c,d}	Non-L ^c
BOYS											
Age group 7-10											
442	384	58	157	139	18	177	160	17	108	85	23
133.59	133.62	133.37	134.02	134.17	132.82	133.86	133.56	136.71	132.51	132.83	131.33
8.47	8.58	7.78	7.28	7.52	5.12	9.30	9.27	9.40	8.64	8.90	7.68
Age group 11-14											
499	394	105	144	126	18	200	165	35	155	103	52
154.96	154.72	155.88	155.25	155.15	155.94	153.26	152.65	156.11	156.90	157.51	155.70
11.47	11.39	11.78	12.43	12.30	13.69	10.71	10.44	11.65	11.23	11.15	11.40
Age group 15-18											
675	366	309	130	103	27	251	117	134	294	146	148
175.32	175.90	174.63	176.31	176.17	176.85	174.83	175.39	174.34	175.30	176.12	174.48
7.43	7.56	7.22	7.29	7.51	6.51	7.53	7.71	7.36	7.39	7.51	7.19
GIRLS											
Age group 7-10											
470	413	57	159	146	13	181	165	16	130	102	28
134.16	134.02	135.19	134.44	134.26	136.51	133.90	133.91	133.78	134.18	133.85	135.39
8.54	8.52	8.67	8.10	8.05	8.69	9.05	9.14	8.37	8.38	8.21	9.02
Age group 11-14											
517	442	75	157	140	17	198	171	27	162	131	31
155.31	155.04	156.90	154.54	154.80	152.42	154.86	154.14	159.47	156.61	156.49	157.10
9.21	9.19	9.24	9.32	9.08	11.23	9.65	9.61	8.66	8.44	8.61	7.81
Age group 15-18											
1026	518	508	280	192	88	418	168	250	328	158	170
163.94	164.26	163.60	163.53	163.80	162.96	164.27	164.93	163.83	163.86	164.13	163.60
5.82	6.00	5.62	6.09	6.09	6.09	5.61	5.94	5.33	5.85	5.92	5.78

^a Significant difference between the two groups of boys ($p < 0.033$)

^b Significant difference among the three groups of boys ($p < 0.014$)

^c Significant difference between the two groups of boys ($p < 0.033$)

^d Significant difference among the three groups of boys ($p < 0.044$)

Table 5: Body weight in local and non-local grouping

Total	Total Local ^a	Non-L ^a	Total ^b	Budapest Local ^d	Non-L	Total ^b	Győr Local ^d	Non-L	Total ^b	Nyíregyháza Local ^{c,d}	Non-L ^c
BOYS											
Age group 7-10											
442	384	58	157	139	18	177	160	17	108	85	23
29.78	29.92	28.88	30.14	30.23	29.42	29.83	29.85	29.68	29.19	29.55	27.88
7.19	7.38	5.76	6.64	6.81	5.19	7.50	7.68	5.65	7.47	7.75	6.34
Age group 11-14											
499	394	105	144	126	18	200	165	35	155	103	52
45.75	45.44	46.90	45.68	45.19	49.11	44.47	44.13	46.07	47.45	47.84	46.68
12.14	12.10	12.31	12.28	11.69	15.80	11.92	12.21	10.49	12.17	12.18	12.25
Age group 15-18											
675	366	309	130	103	27	251	117	134	294	146	148
64.09	64.99	63.04	64.58	64.71	64.11	64.28	65.21	63.46	63.72	65.01	62.46
11.63	11.99	11.12	11.50	11.21	12.76	11.62	12.27	11.00	11.74	12.37	10.97
GIRLS											
Age group 7-10											
470	413	57	159	146	13	181	165	16	130	102	28
30.13	30.09	30.44	30.70	30.68	30.96	29.95	29.96	29.91	29.69	29.46	30.51
7.80	7.90	7.10	8.75	8.83	8.09	7.39	7.49	6.35	7.12	7.10	7.26
Age group 11-14											
517	442	75	157	140	17	198	171	27	162	131	31
46.24	45.87	48.43	46.59	46.93	43.84	46.12	45.07	52.81	46.04	45.79	47.13
11.20	11.15	11.30	11.63	11.74	10.55	11.78	11.48	11.65	10.04	9.99	10.35
Age group 15-18											
1026	518	508	280	192	88	418	168	250	328	158	170
55.84	55.61	56.08	55.63	55.40	56.14	55.88	55.89	55.87	55.96	55.56	56.34
8.52	8.34	8.69	8.61	7.83	10.12	7.93	8.41	7.60	9.17	8.91	9.41

Table 6: BMI in local and non-local grouping

Total	Total Local ^a	Non-L ^a	Total ^b	Budapest Local ^d	Non-L	Total ^b	Győr Local ^d	Non-L	Total ^b	Nyíregyháza Local ^{c,d}	Non-L ^c
BOYS											
Age group 7-10											
442	384	58	157	139	18	177	160	17	108	85	23
16.51	16.57	16.12	16.64	16.64	16.61	16.45	16.52	15.76	16.41	16.52	16.00
2.53	2.59	2.06	2.55	2.60	2.24	2.50	2.57	1.51	2.56	2.63	2.27
Age group 11-14											
499	394	105	144	126	18	200	165	35	155	103	52
18.80	18.74	19.01	18.67	18.52	19.71	18.71	18.71	18.68	19.04	19.07	18.99
3.42	3.50	3.08	3.13	3.03	3.69	3.64	3.87	2.37	3.38	3.44	3.28
Age group 15-18											
675	366	309	130	103	27	251	117	134	294	146	148
20.77	20.92	20.59	20.71	20.77	20.48	20.94	21.10	20.79	20.66	20.88	20.44
3.05	3.13	2.95	3.04	2.83	3.76	3.03	3.19	2.89	3.08	3.29	2.84
GIRLS											
Age group 7-10											
470	413	57	159	146	13	181	165	16	130	102	28
16.53	16.54	16.46	16.76	16.79	16.38	16.50	16.50	16.58	16.30	16.26	16.44
2.79	2.86	2.26	3.28	3.34	2.60	2.51	2.52	2.40	2.49	2.60	2.10
Age group 11-14											
517	442	75	157	140	17	198	171	27	162	131	31
18.97	18.88	19.51	19.30	19.37	18.75	19.01	18.75	20.64	18.61	18.54	18.93
3.40	3.38	3.49	3.59	3.60	3.62	3.59	3.52	3.70	2.91	2.88	3.04
Age group 15-18											
1026	518	508	280	192	88	418	168	250	328	158	170
20.76	20.60	20.92	20.78	20.64	21.08	20.69	20.53	20.80	20.83	20.61	21.03
2.83	2.84	2.81	2.84	2.68	3.14	2.63	2.83	2.49	3.07	3.04	3.09

Table 2 and 3 present the body weight and BMI of the male and female schoolchildren, where we also do not find any significant differences among the three subsamples.

In the Tables 4, 5 and 6 the sample was divided in three age-groups. Classifying the sample local and non-local groups and into three age-groups, it seems to be less homogenous, since some significant differences can be found in the body height of the boys (Table 4). There is a significant difference between the total local and non-local groups and another significant difference appears, when the total values of the three subsamples are taken into comparison. Significant difference can also be shown between the local and non-local boys of Nyíregyháza. The last significant difference is among the local groups of the three subsamples. It may be interesting, that there is no significant difference among the non-local groups of the three subsamples.

In body weight and BMI (Tables 5-6) of the schoolchildren we can not find any significant differences either in boys or in the girls. In the columns of the Tables 5-6 the first line shows the number of the cases, the second one the values of Mean and the third one the SD-s.

Contrary to our results, Koniarek and Bergman (1993) found greater differences between two groups of young adult people of Wroclaw, who were born inside or outside of the city. The people of this latter group migrated from various regions of Poland to Wroclaw after the World War II. Bielicki and Welon (1982) found similar significant differences between urban and rural groups in a survey of conscripts in 1976. But the results of Kromeyer et al. (1996) are closer to our results, because they found only small differences between the schoolchildren aged 12-15 years from Jena City and rural district of Jena. At the same time Koniarek and Bergman (1993) showed greater differences in males, than in females, which is in harmony with our results.

But our sample differs a little from the other samples mentioned above. From the local and non-local groups of our sample the local ones represent true urban populations, while the non-local ones are not real rural populations. They are heterogeneous subsamples, because they consist of children born out of the cities and have been living in the surrounding settlements of the cities, and also of those children, who were born outside of the cities, but have been living in the cities, or children, who were born in the cities, but have been living in the cities at the time when their body measurements were taken. Thus, the non-local groups are not real rural, but mixed ones and this might be the explanation for the few differences we found in our sample between the local and non-local children.

The reason, that in our sample significant differences between the local and non-local groups appeared only in the height of the boys in the total values and in Nyíregyháza may be the following: the city of Nyíregyháza is situated in the eastern part of Hungary and this region of the country is less developed than the other parts of Hungary, and the urban-rural differences are larger here, than in the other two areas. Therefore the non-local boys of Nyíregyháza are smaller in height and lighter in weight than their local counterparts, while there is no such kind of great difference between Budapest, Győr and their immediate vicinities.

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References

- Bielicki, T., Welon, Z. (1982): Growth data as indicators of social inequalities: The case of Poland. *Yearbook Phys. Anthropol.*, 25; 153-167.
- Bodzsár, É. B., Susanne, C.(Eds): *Secular growth changes in Europe*. Eötvös Univ. Press, Budapest.
- Bodzsár, É. B. (1998) Secular growth changes in Hungary. in: Bodzsár, É. B., Susanne, C.(Eds): *Secular growth changes in Europe*. Eötvös Univ. Press, Budapest, 175-205.
- Darányi G., Jankovich A. (1935): Egészségügyi vizsgálatok budapesti magániskolákban és egy pestkörnyéki munkáslakta községben. (Medical surveys in Budapest private schools and in an elementary school of a surrounding village inhabited by physical workers. - In Hungarian) *Népegészségügy*, 16; 163-171, 208-215, 253-257.
- Eiben, O.G. (1956): Comparative study of growth and development in urban and rural youth (in Hungarian with Russian and English summaries). *Biol. Közl.*, 3; 115-134.
- Eiben, O.G., Barabás, A., Kontra, G., Pantó, E. (1996): Differences in growth and physical fitness of Hungarian urban and rural boys and girls. *Homo*, 47; 191-205.
- Eveleth, B.P., Tanner, J.M. (1976): *Worldwide variation in human growth*. IBP 8. Cambridge University Press, Cambridge, London - New York - Melbourne.
- Farkas, Gy., Takács, T. (1986): Changes in the somatic characters of 10-18 years old Hungarian students according to settlement sizes. *Acta Biol. Szeged*, 32; 191-197.
- Gyenis, G. (1997): Continuing positive changes in height and weight of Hungarian university students. *Ann. Hum. Biol.*, 24; 475-479.
- Kromeyer, K., Zellner, K., Jaeger, U. (1996): Socio-economic factors and growth of schoolchildren in Jena. In: Bodzsár, B. É. and Susanne, C. (Eds): *Studies in human biology*. Eötvös Univ. Press, Budapest. 131-137.
- Koniarek, J., Bergman, P. (1993): Social and anthropological characteristics of Wrocław-Old Town inhabitants born inside and outside of the city. *Homo*, 44; 229-241.
- W-Lindgren, G. (1990): Growth studies on Swedish schoolchildren. In: W-Lindgren, G. (Ed.): *Growth as a mirror of conditions in society*. Stockholm Institute of Education Press, Stockholm. 71-85.
- Walter, H., Fritz, M., Welker, A. (1975): Untersuchungen zur sozialen Verteilung von Körperhöhe und Körpergewicht. *Z. Morph. Anthropol.*, 67; 6-18.

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