ANNALES
UNIVERSITATIS MARIAE CURIE-SKŁODOWSKA
LUBLIN — POLONIA
VOL. XLVI, 5 SECTIO D 1991

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Relation Between Somatic Development and Some Environmental Factors in Male Population of Vocational Mining Schools in the Lublin Coal Basin*

Ocena rozwoju fizycznego uczniów zasadniczych szkół górniczych Lubelskiego Zagłębia Węglowego w zależności od niektórych warunków środowiskowych

Somatic development of a child, although genetically determined, depends also on the influence of biogeographic and socio-economic factors of the environment. The effects of these factors popular in the literature are seen in the differences of somatic development of children brought up in urban and rural environments. In comparison with urban population, country children are characterized by lower growth and body mass, delayed manifestation of sexual maturity, greater amount of incorrect posture features, worse state of nutrition and lower index of mental development (1, 9, 12, 13, 14). The diferences in somatic development of children were also found while comparing the size of agglomeration and socio-professional factors determining parents' level of education and financial situation of the family (3, 4, 12, 15). One could also observe the improvement of somatic development of children living in regions of quick and intensive urbanization and industrialization (9, 11, 16).

This paper aims at the evaluation of the relation between somatic development and some environmental factors in male population of vocational mining schools in the Lublin Coal Basin. It is only of introductory character and may be a starting point for further long-lasting studies aiming at the analysis of the changes in somatic development of young population living in the Lublin Coal Basin — a heavy industrialized area which undergoes socio-economic and environmental changes.

* This paper is a part of the study supported by the Institute of Occupational Medicine, Łódź, Poland (Grant No. CPBR 11.11.59).

MATERIAL AND METHODS

The material used in this paper is only a part of the broad study performed on population of pupils from Chełm, Lublin, Ostrów Lubelski and Piaski, who started their education in vocational mining schools. The studies were performed in September—October 1986 and March—June 1987. The sample group included 893 pupils, 14—17 years of age. Simple somatic features were used for comparative analysis: height, body mass and Quetelet index meaning body mass per 1 cm of body height. Body height was measured with anthropometer from the basis to vertex, exact to 0.5 cm. Body mass was measured with medical scales, exact to 0.5 kg. Quetelet index was calculated after the formula (17):

$$QI = \frac{\text{body mass (g)}}{\text{body height (cm)}}$$

Centile position of body height and body mass was assigned to each boy according to the centile net developed by Pediatric Institute of Medical Academy in Lublin for boys from the Lublin region. At the evaluation stage, the so-called principles of "narrow" (75—25 c) and "broad" (90—10 c) norms were adapted. And we assumed that boys, placed in the portions below 10 or above 90 centile, depart from the assumed norm in respect to both examined morphological features (7).

Data concerning the place of living, social background and economic conditions of the family were determined on the grounds of a detailed questionnaire dealing with the socio-living conditions of a pupil. The obtained results were analyzed with the use of IBM PC/XT. Arithmetic averages and standard deviations were calculated for each group with regard to some selected environmental conditions. *t*-Student test for independent variables was employed for calculating significance of differences among average values, assuming $p < 0.05$ as statistically significant differences.

RESULTS

The analysis of absolute values within separate channels of the centile net revealed 53.3% of the examined sample in the limits of "narrow" norm in respect to height values and 48.1% in respect to body mass. "Broad" norm of these features included respectively 81.2% and 75.4% of the examined group of boys. Only 2.7% of the population were included in extreme channels of centile net which points to the deficiency of the examined somatic features. The height above the limit of 90 centiles was revealed in respect to 16% of the pupils and the body mass above this limit was revealed in respect to 21.8% of the boys.

Table 1 presents the average values of height, body mass and Quetelet index within the groups divided according to the age of the examined. Boys who were 14 and 17 years old were of minor number so the examined indicators were analyzed in respect to the group of pupils 15 and 16 years old and they comprised respectively 72.9% and 22.8% of the examined population.

Figure 1 presents the distribution of young population according to the place of living, socio-professional background of the parents and relative wealth of the family. Boys coming from the country outnumber in the examined population 65.6%, those coming from small towns make 22.4% and only 12% of the examined lived in large cities above 100,000 inhabitants. Nearly half of the

Table 1. Relation between body height, body mass, Quetelet index and age of pupils of vocational mining schools in the Lublin Coal Basin

Age group years	Number	Body height $\bar{x} \pm SD$	Body mass $\bar{x} \pm SD$	Quetelet index $\bar{x} \pm SD$
14	8	160.4±8.1 (148.0—171.0)	47.3±5.2 (40.0—53.0)	294.0±21.5 (266.2—330.2)
15	651	168.0±7.0 (145.0—187.0)	57.8±8.9 (34.0—103.0)	343.3±43.8 (231.3—569.8)
16	204	170.9±7.4 (149.0—192.0)	61.3±8.4 (39.0—92.0)	358.2±41.5 (260.0—534.9)
17	29	171.9±7.1 (152.0—187.0)	62.5±7.7 (43.0—77.0)	363.0±35.4 (282.9—428.4)
Total	892	168.7±7.2 (145.0—192.0)	58.7±8.9 (34.0—103.0)	346.5±43.7 (231.3—569.8)

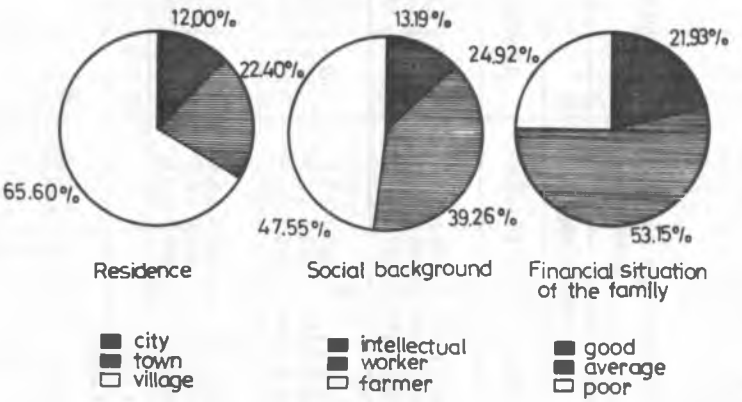

Fig. 1. Characteristics of the examined group related to some environmental factors

examined — 47.6% are of farmers background, 39.2% of workers' families and only 13.2% come from educated families. The financial conditions of their families were defined as good by 21.9% of pupils, 53.1% defined it as average, and 25% as poor.

Table 2 presents the average value of the examined somatic features in two age groups in respect to the examined environmental features. It was found that pupils living in large cities were taller by about 4.4 cm, and boys coming from small towns were taller by about 1.7 cm than the boys of the same age coming from the country. These differences proved to be statistically significant. When making allowance for social background it was found that body height of boys coming from the country was statistically less significant than body height of boys from farmers' or educated families ($p < 0.001$). Substantial disparities in body height between boys coming from large cities and those from the country and between

Table 2. Average values of body height and mass compared to age and some environmental factors of pupils from vocational mining schools in the Lublin Coal Basin

Environment factor	Number			Body height ($X \pm SD$)			Body mass ($X \pm SD$)		
	Total	15 years	16 years	Total	15 years	16 years	Total	15 years	16 years
Residence:									
city	104	66	34	172.0 ±6.9	170.6 ±6.6	174.4 ±7.1	60.9 ±7.7	59.6 ±6.9	63.3 ±9.0
town	194	162	43	169.6 ±6.8*	168.5 ±6.3*	172.6 ±6.5	59.4 ±8.6	58.1 ±8.0	62.9 ±9.2
village	568	422	123	167.9 ±7.2**	167.4 ±7.1**	169.4 ±7.5**	58.2 ±9.2**	57.5 ±9.4	60.4 ±8.0
Social background:									
farmer	412	296	97	167.6 ±7.1	167.1 ±7.1	169.3 ±7.0	57.8 ±8.4	56.9 ±8.4	60.0 ±7.5
worker	340	249	81	169.4 ±7.2*	168.5 ±6.7*	171.6 ±7.8*	59.3 ±9.3*	58.3 ±9.0	62.3 ±9.4
intel.	114	85	22	170.8 ±6.8**	169.7 ±6.7**	175.2 ±6.0**	60.6 ±9.5**	59.8 ±9.9**	63.8 ±8.4**
Financial situation:									
good	190	137	47	168.7 ±6.9	167.8 ±6.8	171.7 ±6.3	59.1 ±9.6	57.7 ±9.8	63.1 ±7.9
average	460	340	101	168.7 ±7.3	168.0 ±6.9	170.6 ±8.1	58.5 ±8.5	57.7 ±8.5	61.0 ±8.4
poor	216	153	52	169.1 ±7.4	168.3 ±7.1	170.8 ±6.9	59.1 ±9.1	58.4 ±8.9	60.5 ±8.9

* Significant differences between subgroups 1 and 2.

** Significant differences between subgroups 1 and 3.

the boys with farmers' background and those from educated families were found in a group of 16-year-old boys. Similar trend of changes in respect to the places of living and social background was also observed while comparing the body mass. It was significantly lower among the boys living in the country and coming from farmers' families while compared to those from larger cities ($p < 0.001$) and the boys of educated background ($p < 0.01$). No significant changes were observed while the values of body height and mass were compared to the declared economic conditions of the family.

Table 3 presents the average values of Quetelet index in the groups divided according to age and some selected environmental conditions. The lowest values of Quetelet index were observed among the boys brought up in the country and coming from farmers' families. And statistically significant was found only among pupils of farmers' background and those of educated background.

Table 3. Average values of Quetelet index compared to age and some environmental factors of pupils from vocational mining school in the Lublin Coal Basin

Environmental factors	Number			Quetelet index ($X \pm SD$)		
	Total	15 years	16 years	Total	15 years	16 years
Residence:						
city	104	66	34	353.5 ±38.3	349.0 ±33.5	362.5 ±47.7
town	194	142	43	349.3 ±42.8	344.2 ±40.2	363.6 ±46.9
village	568	422	123	345.5 ±45.0	342.5 ±46.5	355.6 ±38.2
Social background:						
farmer	412	296	97	343.5 ±40.8*	339.9 ±41.4*	354.0 ±36.3
worker	340	249	81	349.3 ±45.3	344.9 ±44.0	362.4 ±46.7
intellec.	114	85	22	354.0 ±48.98	351.4 ±51.0	363.7 ±45.5
Financial situation:						
good	190	137	47	349.1 ±47.8	342.7 ±49.0	367.1 ±40.2
average	460	340	101	345.8 ±41.6	342.7 ±41.5	356.9 ±41.0
poor	216	153	52	348.8 ±44.7	346.2 ±44.4	353.6 ±43.9

* Significant differences between subgroups 1 and 3.

DISCUSSION

In the performed studies, the simple somatic indicators have formed the grounds for the evaluation of somatic development, and they are the best parameters to differentiate the state of somatic development of young generation while compared to socio-economic conditions in Poland (16, 18). The obtained results revealed differences in somatic development of boys depending on the place of their living and their social background. Boys living in cities were found to grow quicker, both in respect to body height and mass, and they had higher Quetelet index while compared to the boys brought up in villages and in the

country. Young people of educated and workers' parenthood gave evidence of higher values of the examined somatic parameters than the pupils coming from the rural environment.

Some interesting information was gained when the average values of the examined somatic features were additionally analyzed in respect to each social environment. It was noticed that differences between the average values of body height and mass and Quetelet index were similar while comparing the groups of pupils coming from cities and towns to those coming from towns and rural environment. Similar trends were found when the differences between the examined indicators were compared in respect to the social background of pupils, when we compared pupils from educated families and those of workers' background to the ones from workers' background and those of farmers' families. Relatively highest differences in height were observed in a group of 16 years old boys coming from the country which may point to a delayed puberty growth spurt. And similar differences in Quetelet index point to the improper nutrition of maturing rural youth. The studies of Baszczyński (1) also indicated a malnutrition of country children. And the same was proved by Rafalski et al. (14).

No significant differences were found when somatic development was compared to financial situation of the families declared by the examined boys. This fact may result from the subjective evaluation of the level of wealth. Some authors believe that socio-economic features may be characterized best by calculating the amount of income per one member of the family and taking into consideration father's profession/job (3, 14, 18). The average body height of the examined population of 15- and 16-year-old boys was a little lower than the values characteristic of the population of boys coming from Warsaw and these values were presented in the table developed by Mother and Child Centre. And the average values of body mass of these two groups are almost identical (7). The values of Quetelet index show that 15 years old boys are of weak body structure but the situation changes when the boys are 16 years old and gain a strong constitution (17). When we compared the obtained findings to the average indicators of our district (6) it was found that the body height of the examined population coming from large cities was significantly higher than the values determined for young boys from Lublin district in the years 1970—1971. 15 years old boys were taller about 6. 7 cm and 16 years old ones, about 4 cm. The average body height of boys coming from the country turned out to be about 8 cm higher when compared with the previously designed norms (5). The average body mass of the examined boys was more than 6 kgs bigger than the values we gained in the 70's and the differences were found both in respect to boys coming from big cities and from the country (5, 6). The values of body height and mass of the examined pupils from mining schools are also significantly higher than those registered by Maksymowicz in 1978 and concerning boys from vocational schools in

Bełchatów (2). In the group of 15-year old boys coming from big cities the average indicator of height was the same as that of boys from Łódź and the average body mass was about 4 kgs lower (10).

The observed increase of average values of body height and mass of the examined pupils when compared with the results of previous studies, may be regarded as a positive phenomenon and it may be explained in terms of acceleration and secular trend (8, 9). They are manifested in reaching higher indicators of somatic development of the population when compared with previous generations. The examined studies also confirmed the opinions of other authors who claim that body height and body mass, although in a less significant way, are the indicators differentiating the level of somatic development of the examined groups of young people (13, 15, 16, 18).

Conclusions

1. The somatic development of pupils from vocational mining schools in the Lublin Coal Mining Basin points out to differences resulting from place of living and social background of the examined.

2. In the examined sample, pupils coming from the country are characterized by lower indicators of somatic development when compared to the boys coming from large cities.

3. Body height may be assumed as a proper indicator for differentiation of body development of 15—16 years old boys according to their socio-economic conditions.

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Otrzymano 1991.02.20.

STRESZCZENIE

Zbadano 893 uczniów zasadniczych szkół górniczych Lubelskiego Zagłębia Węglowego. Wiek badanych wynosił 14—17 lat, średnio 15,3 lat. Rozwój fizyczny oceniano na podstawie prostych wskaźników somatycznych, jak wysokość, masa ciała i wskaźnik Queteleta. Przeprowadzono analizę rozwoju fizycznego uczniów w zależności od miejsca zamieszkania, pochodzenia społecznego i sytuacji materialnej rodzin. Badania wykazały zróżnicowanie rozwoju fizycznego chłopców wiążące się z miejscem zamieszkania i pochodzeniem społecznym. Uczniowie pochodzenia wiejskiego charakteryzowali się niższymi wskaźnikami rozwoju somatycznego niż uczniowie pochodzący z miast. Stwierdzono, że wysokość i w mniejszym stopniu masa ciała są dobrymi wskaźnikami różnicującymi rozwój fizyczny młodzieży miejskiej i wiejskiej.