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INTER-GENERATIONAL EDUCATIONAL ADVANCEMENT AND BODY HEIGHT

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Summary. This study investigates the association between body height and inter-generational social advancement through education. Questionnaire data were collected from 2800 students (1023 men and 1777 women) from the universities of Wrocław, Poland. The questions referred to three generations: the students and their parents and grandparents. Information was collected on the age, body height and weight of the students and their parents, and on the parents' and grandparents' education. The lowest body heights were typically found for individuals from families with the lowest educational levels, whereas the greatest body heights were found for those brought up in families with a high educational status or in families who had upgraded their status. The size of the change in the educational level of parents is only associated with fathers' and female students' body height. Individuals who had advanced from a middle educational level or who came from families with this type of advancement were found to be significantly taller, on average, than those upgrading their educational level from the lowest position. The results show that, for men, educational advancement during the course of their lives or in the earlier generation is more favourable to achieving higher stature, whereas for women, the multi-generational tradition of a high educational status is of greater significance.

Introduction

There has been much recent interest in 'upward mobility' or movement up the 'social ladder' and its association with various indexes of physical and mental development. The variables most often studied are hormone levels, blood group systems, eye and hair colour, duration of pregnancy, life span, mental and physical condition, subjective feelings of impairment or satisfaction, and level of intelligence (Remer, 1976; Brown, 1982).

Social and economic stratification can be observed in the inhabitants of countries undergoing urbanization and industrialization. An individual's social position can be assessed on the basis of their education, professional status and family size, as well as how many utilization objects they possess or the surface area of their flat. This evaluation is particularly significant in anthropological studies of the physical

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development of children and youth (Bielicki *et al.*, 1981; Bielicki, 1989; Hulanicka, 1990).

Studies on the phenomenon of social mobility and its association with the rate of growing up and reaching physiological maturity, have mostly looked at one of the most 'sensitive' criteria of social inequality, i.e. body height. Many researchers have found that people who have been promoted socially tend to be taller compared with those who have not (Cliquet, 1968; Bielicki & Charzewski, 1977, 1983; Schumacher & Knussmann, 1979; Charzewski, 1981; Schumacher, 1982; Mascie-Taylor, 1984, 1998; Panek *et al.*, 1988; Lasker & Mascie-Taylor, 1989; Bielicki & Waliszko, 1992; Nyström-Peck, 1992; Cernerud, 1995; Gronkiewicz, 1996; Bielicki & Szklarska, 2000; Blane, 2000).

Studies of social mobility most often use information on two generations: parents and their children. Only very few scientific dissertations (Charzewski, 1981; Bock & Sykes, 1989; Hulanicka, 1990; Bielicki & Waliszko, 1992) have included information on three generations. Thus the material on grandparents, parents and university students analysed in this study can be regarded as very valuable, the more so because of its large sample size. In addition, although much research has been conducted with 'easy access' groups, such as military conscripts or individuals undergoing medical check-ups, it is rare for a study of social mobility to use university students (Miller, 1961; Kobyliansky & Arensburg, 1977; Drozdowski & Stańda, 1986). Another advantage of this material is its homogeneous character with regard to education of the third generation analysed.

The goal of this study is to examine to what extent body height is associated with inter-generational social advancement through education.

Data

Questionnaire data were collected from 2800 students (1023 men and 1777 women) from the universities of Wrocław, Poland. The questionnaire included questions referring to three generations: students and their parents and grandparents. The students were born in the years 1972–1980, and they were 18–26 years old when examined. As certain data, especially those related to the generations of parents and grandparents, were missing, the analysis of particular traits shows differences in numbers.

The questionnaire gathered information on age, body height and weight of the students, as well as body height and weight of their parents. Numerous studies (Gerylovova & Bouchalova, 1974; Himes & Roche, 1982; Palta *et al.*, 1982; Stewart, 1982; Wich, 1983; Stewart *et al.*, 1987; Nyström-Peck, 1994; Krzyżanowska & Umławska, 2002) have confirmed that measured and declared body heights are in close agreement ($0{\cdot}86 \leq r \leq 0{\cdot}98$), and thus it is entirely justified to use the questionnaire data in this study, and the values provided can be regarded as reliable. The questionnaire also included questions on social and economic status: place of residence prior to the commencement of studies in the case of students, place of residence in early childhood and for most part of life in the case of parents and grandparents, education and number of siblings in the parent and grandparent generations, and the number of above-standard property goods in students' families.

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Parents' and grandparents' educational level is classified as follows for all three generations: 1 – at the most primary school education; 2 – vocational or incomplete secondary education (without maturity exam passed); 3 – complete secondary education (with maturity exam passed); 4 – commenced or completed post-secondary school or incomplete studies (without MA degree obtained); 5 – completed MA studies; 6 – continuation of education after higher education studies (postgraduate studies, second line of studies, doctorate studies, etc.).

The students' parents were born in the years 1939–1959, and were thus aged 39–59 at the time of examination. The average age of fathers was 49·8, and that of mothers 47·6. The grandparents were born at the beginning of the 20th century in the years 1900–1939.

Among the parents, fathers more often than mothers had vocational education or incomplete secondary education (25·5%), or had completed MA studies (28·1%). They also more often continued studying after graduating from higher education (10·8%) (Table 1). As for mothers, they most frequently completed secondary education (with maturity exam passed) (30·2%) or post-secondary education (18·0%). The lowest educational level, similar for both sexes, is represented by 2·6% of parents. Over three-quarters of grandparents discontinued their education at the lowest level (primary and secondary education) (Table 1). A particularly low educational level is found for the grandmothers, with approximately 57% having completed only primary school. All the remaining categories of education are to a greater extent represented by men.

The students were significantly taller compared with a selected group of military conscripts from city intelligentsia families (Bielicki *et al.*, 1997) examined in 1995 (Table 2). The data demonstrate that university students constitute a specific group of young people, distinguished with respect to their body heights.

In accordance with the phenomenon of inter-generational changes of anthropometric trait values broadly discussed in the literature (among others Bocheńska, 1972; Panek, 1978; Bielicki *et al.*, 1981; Charzewski, 1981; Kaur & Singh, 1981; Bielicki *et al.*, 1988; Szopa, 1988; Wolański, 1988), this study found a significant increase in body height between the students' and parents' generations. Moreover, essential differences were noted in the educational structure of the three generations, with an increase, in subsequent generations, of the percentage of individuals with a completed university education (grandparents 6·3% and parents 35·6%).

Methods

The analysis of information on the educational level of the three generations – grandparents, parents and university students – allowed two main groups to be distinguished among the families examined. The first group – those moving up the 'social ladder' – includes individuals promoted with respect to education, who have been conventionally named 'mobile'. The other group – the remaining people who have not been promoted – is described as 'non-mobile'. Due to their low number, those who have moved down the 'social ladder' were not included in the analysis.

For each of the analysed family groups, the arithmetic mean, standard deviation and range of variability of body height have been calculated.

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Table 1. Education of parents and grandparents

Education level	Fathers		Mothers		Total		Fathers of students' fathers		Fathers of students' mothers		Mothers of students' fathers		Mothers of students' mothers		Total	
	n	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%
1	70	2·5	77	2·8	147	2·6	1157	43·5	1137	42·1	1551	57·4	1537	56·5	5382	51·3
2	711	25·5	470	16·8	1181	21·2	742	27·9	784	29·0	609	22·6	636	23·3	2771	26·5
3	623	22·4	841	30·2	1464	26·3	375	14·1	405	15·0	345	12·8	346	12·7	1160	11·1
4	297	10·7	502	18·0	799	14·3	130	4·9	156	5·8	97	3·6	124	4·6	507	4·8
5	785	28·1	708	25·4	1493	26·8	204	7·7	176	6·5	81	3·0	69	2·5	530	5·1
6	300	10·8	191	6·8	491	8·8	50	1·9	44	1·6	16	0·6	12	0·4	122	1·2
Total	2786	100	2789	100	5575	100	2658	100	2702	100	2699	100	2724	100	10472	100

Table 2. Comparison of mean heights (cm) of students and conscripts

Data	Year of investigation	Height				Author
		n	Mean	SD	*p* value	
Students	1998	1020	180·50	6·51		Own data
Conscripts	1995	1519	179·44	6·40	<0·001	Bielicki *et al.* (1997)

The significant differences between the two groups were assessed by means of Student's *t* test for independent populations, taking into consideration the assumptions of distribution normality as well as variance homogeneity (Guilford, 1964; Blalock, 1977; Ferguson & Takane, 1997; Moczko *et al.*, 1998). In the case of non-homogenous variances, the Cochran–Cox test (Stanisz, 1998) was applied for the evaluation of differences between the two means. The normality of distributions was checked by means of the Shapiro–Wilk test, which is used most frequently and is highly powerful, whereas the homogeneity of variances was assessed with the use of Levene's test.

In order to compare the values of the arithmetic means of body height for a number of social position categories, a model of a single-factor variance analysis (ANOVA) was also used. The significant values of differences obtained in the variance analysis were examined with the use of Tukey's *post-hoc* test enabling the means grouping on the basis of the NIR test (the Least Essential Difference) (Łomnicki, 1999). Of the *post-hoc* tests applied in the case of non-correlated variables, the NIR test is one of the most powerful and offers the highest constant total α level irrespective of the number of comparisons performed. It is particularly recommended for verification of the hypotheses of equality among a lot of means (Hair *et al.*, 1995; Ferguson & Takane, 1997; Coolidge, 2000).

Three levels of education were distinguished. Primary school and vocational school education (categories 1 and 2) were classified as low-level education – L. Those filling in categories 3 or 4 on the questionnaire were classified as having middle-level education – M; and those filling in categories 5 and 6 were classified as having high-level education – H.

Results

Parents' body height versus their educational advancement

Table 3 demonstrates that grandparents' and parents' education has a considerable influence on the gradient character of body heights of all groups of parents analysed. It is significant that in the non-mobile group of parents, the difference between extreme values of body heights is similar for both sexes, and amounts to 3·21 cm for fathers and 2·92 cm for mothers (Table 3).

As expected, the lowest body heights are demonstrated, like grandparents, by parents who had completed, at the most, primary school or vocational school

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Table 3. Height (cm) of parents in relation to their educational mobility

Education		Height of fathers			Height of mothers		
Grandparents	Parents	*n*	Mean	SD	*n*	Mean	SD
Non-mobile parents							
L	L	660	174·24	6·32	481	162·56	5·30
M	M	64	177·08	5·80	110	163·17	6·06
H	H	55	177·45	5·99	58	165·48	5·30
Mobile parents							
L	M	632	174·87	5·85	910	162·77	5·15
L	H	481	175·23	5·97	376	162·87	5·36
Total from L↑		1113	175·03	5·90	1286	162·80	5·21
M	H	146	176·46	6·21	121	163·07	5·60

Categories of education: L=low, M=medium, H=high.

Table 4. Significant values of differences between the mean body heights of parents and grandparents included in Table 3 evaluated by the NIR test

	Fathers					
Mothers	L–L	M–M	H–H	L–M	L–H	M–H
L–L		***	***	ns	**	***
M–M	ns		ns	**	*	ns
H–H	***	**		**	**	ns
L–M	ns	ns	***		ns	**
L–H	ns	ns	***	ns		*
M–H	ns	ns	**	ns	ns	

*p<0·05; **p<0·01; ***p<0·001; ns=not significant.

education (L–L), while the greatest body heights are found for parents from high-level education families (H–H). Fathers who upgraded their educational level in relation to their parents (L–H; M–H), as well as those from middle- or high-level education families (M–M; H–H), are significantly taller than non-mobile fathers (L–L) (Table 4). Furthermore, fathers who upgraded their educational level from secondary education (M–H) are considerably taller (p<0·01) compared with those whose parents only completed elementary education (from L↑) (Table 3).

Women from high-level education families (H–H) are distinctly different from other groups. They are significantly taller than those who upgraded their education from low- (from L↑) (p<0·001) and middle- (M–H) (p<0·01) level education (Tables 3 and 4).

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Students' body height versus educational advancement of their parents

A tendency for body height increase with education can be observed among students from families that did not undergo any educational advancement. Students from low-level education families are characterized by the lowest body heights (L–L), while the greatest body heights are demonstrated by students from higher education families (H–H). As for the differences between extreme values, they amount to almost 3 cm for students in the father's line and approximately 2·6 cm for students in the mother's line (Table 5). It is also worth noting that in the group of non-mobile parents with high-level education (H–H) there is a difference (approx. 0·8 cm) in stature for students in the father's and mother's line. This difference, however, is statistically insignificant (Table 6).

Students whose parents upgraded their education to secondary (L–M) or university level (L–H) tend to be taller than those from families without educational advancement (L–L), yet the differences, particularly in the case of fathers' families, are not statistically significant (Table 6). As for students with mothers who upgraded their education from a low level (from L↑), they are significantly taller ($p<0·05$) than the students with mothers from low-level education families (L–L) (Table 5).

It is significant that the mean body height of students whose fathers come from high-level education families (H–H) differs by 2·16 cm from that of students whose fathers were promoted to higher education (L–H). This difference described is considerably smaller for mothers, and amounts to only 0·82 cm.

The mean body heights of students whose parents were promoted with regard to education (L–M; L–H; M–H) have small inter-group variability (Table 5). As a result, there are no significant differences between the advancement groups mentioned (Table 6).

Only among female students with non-mobile fathers is there no clear body height gradient. As expected, the smallest mean body height is demonstrated by female students with parents with the lowest educational level (L–L), while the greatest mean body height is found for female students from well-educated families (M–H) (Table 7).

Similarly for parents and male students, educational advancement in the female students' families (L–M; L–H) is associated with their gaining taller body heights than in the case of those with non-mobile parents (L–L). What is more, female students whose mothers have secondary level education (M–M) have practically the same body height as those whose mothers upgraded their education to secondary school (L–M) or higher (L–H) (Table 7).

Unlike the male students, the female students show significant ($p<0·05$) differences in mean body height between the groups of parents who were promoted from low- (from L↑) and middle- (M–H) level education (Table 7).

With regard to the female students' body heights, two groups can be distinguished. The first includes women from no-advancement families, of type L–L and M–M (in the case of mothers) and H–H (in the case of fathers), as well as those from mobile families (L–H; L–M). The other group includes female students, who are distinctly distinguished by a greater mean body height, from middle- (M–M) or high-education level families (M–H; H–H) (Table 7). It is interesting to note that unlike in male students' families, a higher differentiation of body height (Table 7) can be observed

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Table 5. Height (cm) of male students in relation to their parents' educational mobility

Education		Height of students (males)			Education		Height of students (males)		
Parents of fathers	Fathers	*n*	Mean	SD	Parents of mothers	Mothers	*n*	Mean	SD
				Non-mobile parents					
L	L	223	179·96	6·71	L	L	150	179·50	7·13
M	M	25	180·84	6·18	M	M	38	180·82	7·79
H	H	27	182·93	7·10	H	H	27	182·15	7·08
				Mobile parents					
L	M	202	180·35	6·38	L	M	323	180·36	6·36
L	H	203	180·77	6·32	L	H	151	181·33	6·34
Total from L↑		405	180·56	6·35	Total from L↑		474	180·67	6·35
M	H	66	180·15	6·44	M	H	53	180·92	6·38

Categories of education: L=low, M=medium, H=high.

Table 6. Significant values of differences between the mean body heights of male students included in Table 5 evaluated by the NIR test

Mothers	Fathers					
	L–L	M–M	H–H	L–M	L–H	M–H
L–L		ns	*	ns	ns	ns
M–M	ns		ns	ns	ns	ns
H–H	ns	ns		ns	ns	ns
L–M	ns	ns	ns		ns	ns
L–H	*	ns	ns	ns		ns
M–H	ns	ns	ns	ns	ns	

*$p<0{\cdot}05$; **$p<0{\cdot}01$; ***$p<0{\cdot}001$; ns=not significant.

among the analysed groups of educational advancement of female students' families, which is confirmed by the NIR test results (Table 8).

Both parents and students from families representing the lowest educational level (L–L) are characterized by the shortest mean body height, while the highest values are noted in individuals from higher education families (H–H or M–H) (Tables 3, 5 and 7).

It is interesting to note that fathers' and female students' mean body heights shows differentiation depending on the educational advancement of their families; hence the significant differences between groups upgrading their education from the low- (from L↑) or middle- (M–H) level education.

Unlike mothers, the lack of mobility in the fathers' families (L–L; M–M; H–H) is associated with gaining higher stature by male and female students. A similar dependence, but related to parents promoted with regard to educational level, was observed solely in mothers (Tables 3, 5 and 7).

The mobility of fathers who upgraded their educational level to secondary (L–M) or university (L–H) compared with that of their parents, is associated with their body height as well as – to a similar extent – their sons' body height. An analogous situation was noted among mothers and their daughters. It must be stressed that in the group of parents who upgraded their educational level (advancement of type L–H), the highest values of body height were obtained by male students (Table 5), while in the group M–H it was female students (Table 7).

It is worth noting that among parents who upgraded their educational level compared with that of their parents (the students' grandparents) (M–H), their mean body height and that of their sons and daughters are, in most cases, similar to those of the group of non-mobile parents with a middle level of educational (M–M).

Discussion

There are some limitations to the interpretation of the results of this study, largely due to the specificity of the student material used for the investigation. Undoubtedly,

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Table 7. Height (cm) of female students in relation to their parents' educational mobility

Education		Height of students (females)			Education		Height of students (females)		
Parents of fathers	Fathers	*n*	Mean	SD	Parents of mothers	Mothers	*n*	Mean	SD
				Non-mobile parents					
L	L	445	166·67	5·78	L	L	338	166·32	5·84
M	M	41	168·41	4·38	M	M	76	167·08	5·36
H	H	30	167·20	4·51	H	H	34	168·62	4·97
				Mobile parents					
L	M	444	166·83	5·63	L	M	601	167·05	5·62
L	H	292	167·34	5·49	L	H	232	167·01	5·45
Total from L↑		736	167·03	5·57	Total from L↑		833	167·04	5·57
M	H	84	168·49	5·40	M	H	72	168·76	5·58

Categories of education: L=low, M=medium, H=high.

Table 8. Significant values of differences between the mean body heights of female students included in Table 7 evaluated by the NIR test

Mothers	Fathers					
	L–L	M–M	H–H	L–M	L–H	M–H
L–L		ns	ns	ns	ns	**
M–M	ns		ns	ns	ns	ns
H–H	*	ns		ns	ns	ns
L–M	ns	ns	ns		ns	*
L–H	ns	ns	ns	ns		ns
M–H	***	ns	ns	*	*	

*$p<0{\cdot}05$; **$p<0{\cdot}01$; ***$p<0{\cdot}001$; ns=not significant.

university students constitute a distinct group that is homogeneous with respect to their educational level and is little diversified in respect of body height. Therefore, it may be assumed that the social gradients associated with the traits examined could be weaker compared with those of the general population, so if they occur at a statistically important level, their value for results interpretation will be significant. Difficulties in the unequivocal assessment of the results may also result from insufficient information in the literature about the relevant comparative data on the phenomenon of social mobility in the students' families as well as the data showing social transformations within the three generations.

University students have been shown to be taller than their peers who do not go to university (see Gworys, 1978, and Kolasa, 1980, who analysed female students from Wrocław, Poland). In addition, considerably greater values of somatometric traits of students compared with their peers who did not go to university have been noted by Gyenis (1980) in Hungarian students and Ohyama *et al.* (1987) and Takamura *et al.* (1988) among Japanese students. The students examined in the current study were distinguished by a significantly greater mean body height compared with that of military conscripts from a big city intelligentsia background (Table 2).

The auxological literature has many descriptions of the impact of social stratification on body height (among others: Brzeziński, 1964; Onat, 1977; Bielicki *et al.*, 1981; Charzewski, 1981; Malina *et al.*, 1983; Mascie-Taylor & Boldsen, 1985; Lin *et al.*, 1992; Lindgren & Cernerud, 1992; Wu, 1992; Łaska-Mierzejewska & Łuczak, 1993; Kaczmarek, 1995; Lusky *et al.*, 1997; Chabros, 1998; Nowicki, 1999; Rośląk, 2000). It is well established that a background that provides favourable living conditions with, among other things, better education, better nutrition, high-quality health care, hygiene care and a better distribution of family income, enables children to achieve taller stature compared with their peers from lower social classes (Bielicki *et al.*, 1981; Bielicki & Welon, 1982; Jedlińska, 1985; Bielicki, 1989; Charzewski & Bielicki, 1990; Malina & Bouchard, 1991; Cieślik & Kosińska, 1993;

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Łaska-Mierzejewska & Łuczak, 1993; Kromeyer *et al.*, 1997; Bielicki, 1998a). It is also well known that social differences in body height, although they are most distinctly expressed in the case of children at the age of puberty, do not disappear even after maturity has been reached (Waliszko *et al.*, 1980; Bielicki, 1981).

Taking into consideration the statements presented above it should be highlighted that most of the students examined constitute the offspring of parents with secondary (40·6%) or higher education (35·6 %) (Table 1). As pointed out by, among others, Welon & Bielicki (1971), Bergman & Orczykowska-Świątkowska (1976), Wolański (1983a, 1989), Malina & Bouchard (1991) and Kaczmarek (1995), another important factor for achieving large stature is the hereditary factor, whose share in the total phenotype variability of the body height trait is evaluated at 50–95%. Thus, high values of student body height may result from the genetic potential inherited from their parents.

The results of studies on the dependency of student body height on social and economic family background are at times contradictory. Numerous authors (among others Kolasa, 1980; Pepłowski, 1990; Malinowski & Jeziorek, 1992; Jopkiewicz & Zabrodzka, 1997) have indicated the role of parents' education in differentiating students' body height to a large extent. Lewandowski (1996) obtained different results in a group of Bydgoszcz higher education students: there were no significant differences in body height with regard to parental education.

The results obtained in the current study are consistent with those of many other studies: the smallest mean body height is represented by individuals from families with the lowest educational status, while the biggest was found for parents and students brought up in families with a high educational status or in families who upgraded their educational level by actively striving for it (Tables 3, 5 and 7).

Another important issue is the well-know fact that social differences are more strongly reflected in body height in the case of boys than girls. This is explained by the boys' greater sensitivity to various, both positive and negative, stimuli from the external environment (Bielicki, 1981; Bielicki *et al.*, 1981; Charzewski, 1981; Billewicz *et al.*, 1983; Jedlińska, 1985; Bergman, 1987; Panek *et al.*, 1988; Kaczmarek, 1995; Stinson – quoted after Bogin, 1999; Jopkiewicz, 2000). According to Wolański (1983b), the female organism is more strongly development-oriented, which means that a stronger development-disturbing factor is necessary to put it out from the determined development route. A lower sensitivity threshold for boys is the reason why their biological response to a change in social living conditions is generally faster than that of girls, while the changes occurring in the female organism are deeper and more durable (see, among others, Wolański, 1988; Ignasiak & Sławińska, 1993; Jopkiewicz *et al.*, 1999).

The extent of eco-sensitivity, diversified depending on sex, is also reflected in the above-mentioned studies. The parents' and students' body height in the groups of different educational advancement showed, in most cases, a gradient character that was more distinct in the case of men.

The results of analysis of parents' and students' body heights depending on the parents' educational advancement are as expected. As in Charzewski's (1981) and Hulanicka's (1990) studies, the tallest people in the analysed material come from families with traditions of better education (H–H or M–H). The shortest parents and

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Table 9. Extremes of body height of parents and students in relation to educational advancement of parents

Height	Social mobility (education) of students' parents			
	Fathers	Mothers	Students (males)	Students (females)
Highest values	H–H M–M L–L	H–H M–M L–L	H–H L–H L–L	M–H H–H L–L
Lowest values	L–M	L–M	M–H	L–M

students, on the other hand, are represented by members of families characterized by an elementary level of education (L–L or L–M) (Table 9).

The results obtained by Charzewski (1981) also indicate that the greater the degree of educational advancement, the taller the body height, particularly for men. In the case of women, a significant increase in body height is only obtained in the case of advancement from primary to secondary education, and from primary to higher education. Advancement from the middle level of education does not result in a significant increase in mean body height.

In the present study, the degree of educational advancement has proved to be significant only in the case of the body heights of fathers and female students. Fathers who advanced from low-level education (from L↑) are shorter than those who advanced from secondary education (M–H). A similar dependence, regardless of whether the advancement is related to the father's or mother's family, was noted in female students.

Hulanicka (1990), in a study of a large sample of Wrocław boys, did not observe any significant differences either in the body height of farmers' grandchildren whose fathers had upgraded their education or in boys whose fathers had only completed vocational education, which turned out to be consistent with the results for students. In neither male and female students whose parents had upgraded their educational level to the middle (L–M) or high level (L–H) (an exception being advanced male students' mothers), nor in male students whose parents had only reached the educational level of their parents (L–L), were significant differences in body height observed.

Hulanicka (1990) also found that the grandchildren of white collar workers were taller, on average, than farmers' grandchildren regardless of whether the boys' parents advanced socially in the sense of better education. Similar differences were noted in this study when comparing the grandchildren of grandparents presenting low-level education (L–L; L–M; L–H) with the grandchildren of grandparents with middle- or high-level education (M–M; M–H; H–H). What has proved essential is not only that taller male students are the grandsons of grandparents with high-level education, as would be expected, but that the level of grandparents' education is important in the case of female students and is independent of their parents' education.

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Even though the differences obtained are slight or below the threshold of statistic significance, they can prove a diversified degree of eco-sensitivity depending on sex. In the examined female students, the influence of a factor of better education of grandparents – acting longer and in a stronger way – is manifested to a larger degree, while the changes related to the parents' generation are favourable to gaining taller body height of male students.

In general, it can be ascertained that inter- or intra-generational educational advancement is undoubtedly favourable to reaching greater body heights, particularly in men. The importance of grandparents' educational status, clearly manifested in women, is also significant. The higher their position in the social hierarchy, the greater the chance that their granddaughters will grow up in better social living conditions, while the educational status of parents does not play an essential role here. Therefore, it can be stated that being brought up in the families of multi-generational traditions of a high educational level is favourable to taller body height of women.

Conclusions

The analysis of body height of parents and students in relation to the social position of their families, evaluated by means of the educational factor, has shown – in most cases – a gradient character of the trait examined, i.e. body height, more clearly indicated in the case of men.

The lowest body heights are typically found for individuals from families with the lowest educational level, whereas the highest body heights are found for those brought up in families with a high educational status or in families who had upgraded their status.

Parents and students undergoing educational advancement or brought up in education-mobile families are not distinguished by the highest values of body height compared with their non-mobile peers.

The educational advancement of parents is associated with their and the students' gaining intermediate values of body height between the non-mobile parents with low- and high-level education. Only in the case of female students were the highest values noted in the groups of parents who upgraded their education from secondary to a higher level.

The comparison of body height solely among educationally mobile individuals has demonstrated a significant association of body height with the size of educational advancement. The size of the change in educational level of parents is only associated with the fathers' and female students' body height. Individuals who advanced from a middle educational level or from families with this type of advancement are significantly taller than those upgrading their educational level from the lowest position.

The results show that, for men, the educational advancement in the course of their lives or in the earlier generation is more favourable to achieving higher stature, whereas, for women, the multi-generational tradition of a high educational status is of greater significance.

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