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SOCIAL FACTORS AND PHYSICAL GROWTH OF SCHOOL CHILDREN IN JENA

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Abstract

The relation between social environment and growth was studied on bases of data on Jena school children examined in 1995. The number of children living in the household, and the professional status of the father and mother were analysed in their relationship to height, the body mass index (BMI) and the sum of the skinfolds.

Only a minor part of the variation in height is explained by the social factors. A statistically significant association was found between the professional status of the parents and the BMI and the sum of the skinfolds. Children of parents with a higher educational level were slimmer than children of parents with a lower status.

Key words: body height, skinfold thickness, body mass index, socio-economic factors and growth.

Introduction

Many publications have indicated (e.g. GOLDSTEIN, 1971; WELON and BIELICKI, 1973; WALTER et al., 1975; JOUBERT, 1982; MÜLLER-KÖNIG, 1983; JOHNSTON et al., 1987; LASKER, 1989) that, while there may be genetic differences between individuals, the variability in physical growth of children to a large degree reflects differences in the quality of their environments. Physical growth is a powerful indicator of the social and economic environment of human populations. The factors most frequently investigated include social-cultural parameters (ethnicity, and rural-urban differences), biological background (parents' height, birth weight, and birth length) and socio-economic factors (number of children in the household, and educational and professional levels of the parents).

In general, it has been found that children of a higher socio-economic status are taller than children of a lower status. While socio-economic differences are larger in countries with a low standard of living, a trend toward equal living conditions in different socio-economic classes has been found in developed countries (BRUNDTLAND, 1980; MEREDITH, 1984; CERNERUD and LINDGREN, 1991; etc.). In these countries, the differences in growth between social classes have decreased or levelled out. This

obliteration of social gradients is predominantly observed in those countries where there has been a general improvement in the living standards.

The aim of the present report is to analyse the relationships between the social characteristics of children from Jena (Germany) and their growth. The process of the unification of Germany in 1989 brought about important changes in the social, cultural and individual environments for the people, especially in the previously socialist region. The present study analyses only those socio-economic factors which were mainly established under socialist conditions. In further studies it will be establish whether the changes in the structure of the community have an effect on growth.

Material and methods

The analyses reported in this paper are based on data on Jena school children aged between 7 and 14 years, were examined in 1995. The present study is restricted to an analysis of height the and the sum of the skinfolds (sum of skinfolds = triceps + subscapula + coxa). The body mass index (BMI), calculated as body weight (kg) divided by stature (m) squared, was used to examine the weight-to-height relationships. Height and weight were measured as described by MARTIN and SALLER (1957) with standard anthropometric instruments. Height was measured to the nearest 0.1 cm on the scale. The children were weighed wearing only underpants. Weight was recorded to the last complete 500 g.

The technique of skinfold measurements was described in detail by TANNER and WHITEHOUSE (1975). In accordance with these authors, the skinfolds were measured on the right side of the body with GPM callipers.

Social data on the families of the children were obtained by means of a questionnaire, which had to be filled out by the parents. The data on 1032 children (498 boys and 534 girls) will be considered in this study. The number of children in the household, the professional status of the father and the professional status of the mother are analysed in their relations to the anthropometric parameters mentioned above.

The professional status of the parents was categorised as either skilled or highly qualified (university degree or high school diploma).

In the analyses, the anthropometric parameters were used in standard deviation units (SDS), in order to remove the effect of age. The SDS expresses the difference between a measurement for a child and the mean for the group of the same age and sex, divided by the standard deviation for that group. Since the distribution of weight and the sum of the skinfolds displayed statistically significant departures from normality (the KOLMOGOROFF-SMIRNOFF test was used to verify the assumption of normality; $p<0.05$), before calculation of the appropriate SDS for a child the measurements (x) were transformed ($1/\sqrt{x}$) to give an approximate Gaussian distribution in each age group.

The relationship between the height and the social variables was estimated by multiple regression analysis. As the distributions of the SDSs of the BMI and the sum of the skinfolds are skewed, the KRUSKAL-WALLIS test or the MANN-WHITNEY U test was used to analyse the relationship between these parameters and the social factors.

Results

Table 1 shows the frequency distribution of the social factors by sex. In the distribution of these parameters, no significant sex differences are observed (χ^2-test; $p<0.05$). For both sexes, there are more highly qualified mothers.

The multiple regression analysis shows that the social factors were not significantly associated with height in either sex (boys: $R^2=0.002$, $p=0.870$; girls:

R^2=0.013, p=0.135). Nevertheless, the mean values of the height standard deviation scores by sex and social group show a tendency to social gradients for all factors (Fig. 1). This tendency is more pronounced for girls than for boys. For both sexes, children from families with three or more sibs are on average shorter than those from families with less sibs. A relationship is also found between the height and the professional status of the parents; a higher professional level is paralleled by an increase in body height (except for the professional status of the father among boys).

Table 1. Frequency distribution of social variables according to sex.

Number of children	1 child		2 children		3 and more children		Total	
Boys	128	25.8%	279	56.3%	89	17.9%	496	48.3%
Girls	134	25.2%	297	55.9%	100	18.8%	531	51.7%
Total	265	25.5%	576	56.1%	189	18.4%	1027	
χ^2= 0.147 (d.f. = 2), p = 0.929								
Profession of father	skilled workers		highly qualified				Total	
Boys	259	60.8%	167	39.2%			426	48.3%
Girls	265	58.1%	191	41.9%			456	51.7%
Total	524	59.4%	358	40.6%			882	
χ^2= 0.658 (d.f. =1), p = 0.417								
Profession of mother	skilled workers		highly qualified				Total	
Boys	207	44.8%	255	55.2%			462	47.6%
Girls	241	47.3%	268	52.7%			509	52.4%
Total	448	46.1%	523	53.9%			971	
χ^2= 0.630 (d.f. =1), p = 0.427								

Figure 2 demonstrates the relationship between the BMI and the social parameters. The children of highly qualified parents have on average a lower BMI than the other children. The BMI values differ significantly across the professional groups.

Boys of larger sibships are on average lighter (lower BMI) than those of smaller sibships. The same is observed for girls (except for girls from two-child families). These differences are not significant.

Similar results were found as concerns the relation between the sum of the skinfolds and the social factors (Fig. 3). With an increasing number of children in the family, the sum of the skinfolds decreases. These differences, however, are statistically insignificant. The sum of the skinfolds is lower for children of parents with a higher professional level. These differences are statistically significant.

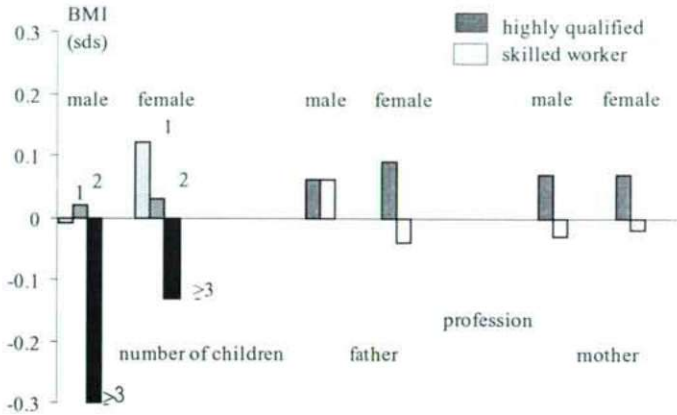

Fig. 1. Mean values of body height standard deviation scores in different social groups.

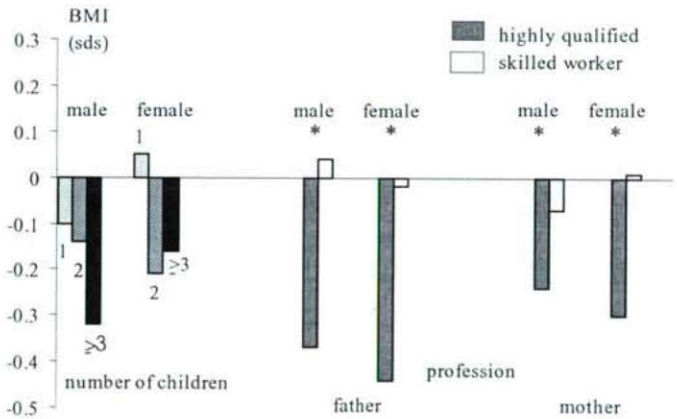

Fig. 2. Mean values of the body mass index standard deviation scores in different social groups.

Discussion

In this study, only a minor part of the variation in height is explained by the social factors. We found only a tendency to social gradients in height for all factors. Children of "higher" socio-economic status were taller than children of "lower" status. These differences are relatively small.

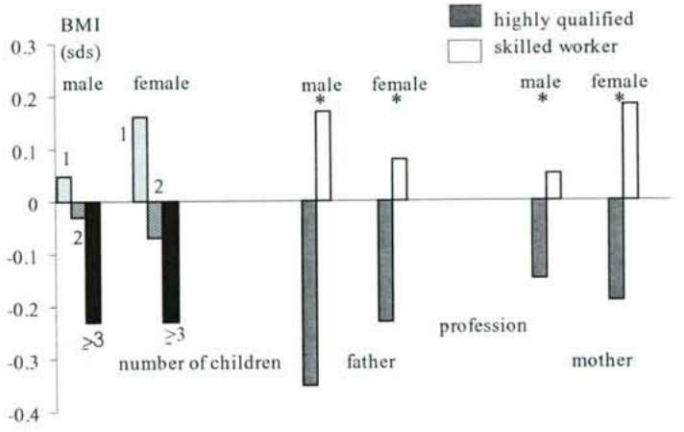

Fig. 3. Mean values of the sum of skinfolds standard deviation scores in different social groups.

Our observations of the limited effect of the social environment on height are confirmed by other German researchers: WALTER et al. (1975) showed this absence of socio-economic differences for height and weight on children aged 6 to 11 years from Western Germany. In East Germany, the previous GDR, only a few earlier studies (MARCUSSON, 1961; OEHMISCH, 1970; REISSIG, 1980) referred to social differences. For Jena children, JAEGER (1983) found differences in growth in relation to the birth order in 1975, but only small differences between pupils from the town or from the countryside. In 1975, SÄLZLER (1975) reported a diminishing difference in the growth of children in relation to the profession of the parents. These observations are in agreement with those obtained in other European populations (e.g. SMITH et al., 1980; LINDGREN, 1976; RONA and CHINN, 1986). It is presumed that this is a result of the improvement in the general living conditions (e.g. increasing incomes, reduction in the number of children per family, and improvements in hygienic conditions), which have especially favoured the situation of the lower social groups.

Our sample revealed a significant association between the social groups and the weight-to-height relationship and the skinfolds. In general, it was found that children of parents with a higher educational level are slimmer than children of parents with a lower status. In contrast, we found that children of larger sibships were on average slimmer than those of smaller sibships. These results are consistent with those of other studies: for children born in Sweden in 1967, LINDGREN (1994) found no height differences between different socio-economic classes, but the working-class children, and especially the girls, were still considerably heavier. The tendency to increasing slenderness (decreasing weight for height and decreasing skinfolds) in the higher social groups may be affected by differences in food consumption. Our results indicates that the professional status of the parents is obviously a principal determinant of the lifestyle of the families, especially as concerns eating and drinking habits. In the lower social

groups, no nutritional deficits are present under the existing conditions, and the nutritional condition of the families is a question of the educational level.

Apart from the more economic factors such as family size, education, housing, etc. we have to consider more details, including the quality of children's care, in further studies.

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