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HEIGHT STANDARDS OF CHILDREN AT AGES 2 TO 16 ALLOWING FOR HEIGHT OF PARENTS, BASED ON THE "BUDAPEST LONGITUDINAL GROWTH STUDY"

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Abstract: *Based on a longitudinal study of children in Budapest the authors investigated the relationship between the height of 588 boys and 665 girls and that of their parents. We determined the correlation of the children's height measurements with those of fathers, mothers and the mid-parent height. Highest correlation has been found with mid-parent height (r = 0.44 – 0.59). Linear regression parameters have been determined yearly from age of 2 to 16 according to the method of Tanner et al. Based on these parameters height standards of the children have been constructed.*

Key words: *Budapest Longitudinal Growth Study; Mid-parent height.*

In the course of the Budapest Longitudinal Growth Study, carried out between 1970 and 1988 the height measurements of the children's parents have also been recorded, thus making possible the analysis of the correlation between the height of children and their parents. During these 19 years of investigation we analysed the data of those children only, whose height was measured each year and the height of their parents was known as well. Altogether 1253 cases, the height measurement data of 588 boys and 665 girls and of their parents have been investigated. The model can be accepted to be representative for the population of Budapest.

From the methodological point of view a problem was caused due to the sampling technique used, since the height measurement data of the children related to different ages, having been fixed at the time of the measurements though the dates of birth of the children were distributed consistently in the 12 months of the year. As a consequence the height measurement data relative to exact ages could be estimated only by an interpolation within ± 6 months.

Insofar as the interval of the interpolation ranged from 1 to 6 months, the possibility of an error in the interpolation was little. We used various methods of interpolation: parabolic, exponential and linear methods; at ages 1 to 4 years the exponential, from age 5 years the parabolic or linear interpolation proved most suitable. It is to be remarked that there was only a minor (maximum 4 mms) difference between the results of the parabolic and linear interpolation.

Based on the height measurement data interpolated into ages 2 to 16 years, as well as on the height measurement data of the parents we computed correlation and regression. We investigated the correlation between the height of father–son, father–daughter, mother–son, mother–daughter at ages 2 to 16 years.

The value of the correlation coefficient ranged between 0.37–0.49, there were no significant differences between the mentioned groups of any ages. We must mention that for the correlation of the height of the father and the mother we got a value of 0.37, which means a very significant correlation.

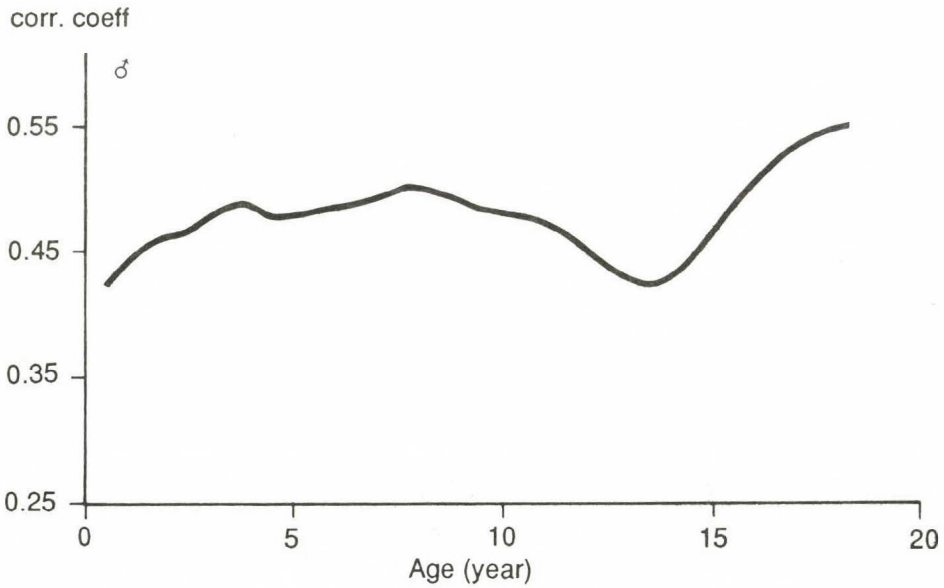

Fig. 1: Correlation of children's height with mid-parent height, based on the "Budapest Longitudinal Growth Study". Boys (n = 588)

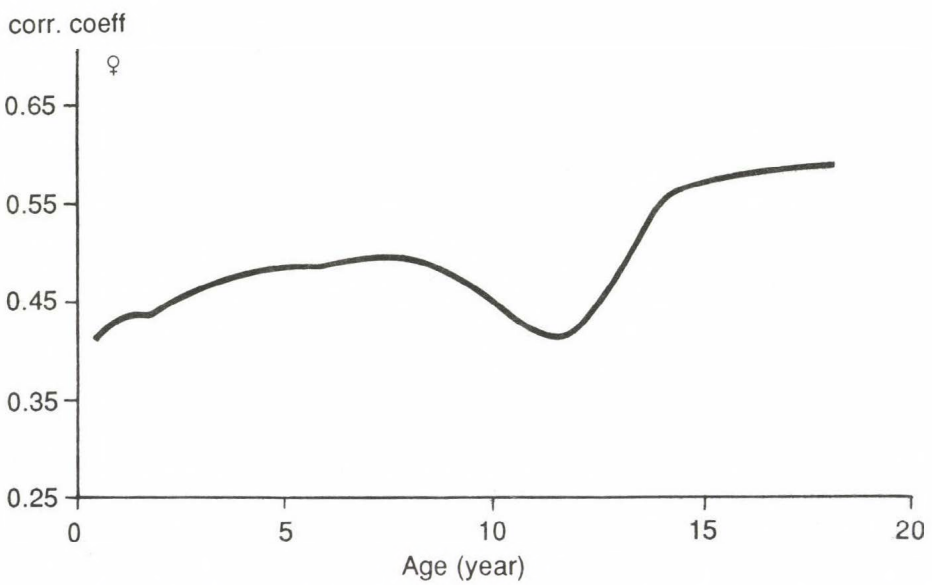

Fig. 2: Correlation of children's height with mid-parent height, based on the "Budapest Longitudinal Growth Study". Girls (n = 665)

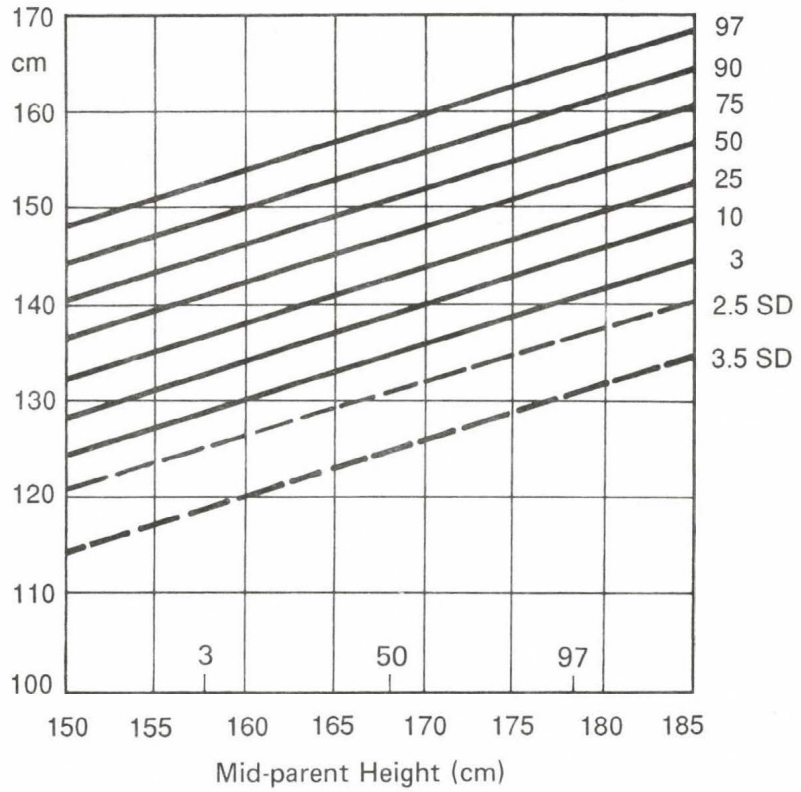

Fig. 3: Height Standards of 11 year old girls allowing for mid-parent height
(n = 665; Y = 60.7 + 0.503 * X; var (r) = 38.85)

We Investigated the correlation between the mid-parent height and the height of children, on the basis of the publications of Tanner and cos. The values of the correlation coefficients are demonstrated by *figures 1* and *2*. The correlation is much closer than that between father–child and mother–child.

Figure 1 shows the correlation coefficient of the height of the 588 boys and their parents, its values are between 0.44 and 0.55 at ages 2 to 18 years. It is well demonstrated that the correlation in adolescence temporarily decreases, due to the alteration of growth rate.

Figure 2 shows the correlation between the height of 665 girls and of their parents at different ages. The value of the correlation coefficient is between 0.44 and 0.59 at the ages 2 to 18 years. The decrease of the correlation in the case of girls is more expressed than that in the case of boys.

For evaluating the healthy growth of children the consideration of the height of parents is essential/important. On the basis of computing the regeession between the mid-parent height and the height of their children, we determined the height standards of the children in Budapest at the ages 2 to 18 years.

Figure 3 shows the height standards of girls at the age of 11 years plotted against the mid-parent height. The abscissa represents the mid-parent height (between 150–185 cms), the ordinate the height of the child. The regression line

$$y = 60.7 + 0.503 * X$$

determines the 50 percentile line, while the 97, 90, 75, 25, 10 and 3 percentile values can be estimated on the basis of the regression variance, according to the normal distribution. The value of 2.5 and 3.5 SD are also demonstrated as the critical limits, indicating growth disorder. The x-axis shows the 50 percentile value of mid-parent height (168.5 cms), as well as the 3 and 97 percentile values (158.4 and 178.6 cms).

Similarly to this figure we prepared the standard height chart at the ages 2 to 5 years on a semi-annual basis, and at the ages 5 to 16 years on an annual basis, by sexes.

According to the method publicated by Tanner et al. It is possible to chart the reference height standard of numerous groups of ages on the basis of the standardization of the regression coefficients. The estimations have been done, however, the computed charts hawe not been finished yet, so we cannot present/display them now.

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