

SOME OBSERVATIONS ON THE WEIGHT HEIGHT RELATIONSHIP DURING GROWTH

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Several ways of representing the relationship between two metric variables during growth are available, viz., weight/height diagram; log weight/log height diagram; and log weight/height diagram. While *Hiernaux* (1964) shows that the weight/height and log weight/log height diagrams present certain complexities in interpretation, he recommends the log weight/height diagram as the simplest one in interpreting the relationship between the two variables. The distribution of stature being gaussian, this variable should not be transformed; the log transformation of weight makes its distribution nearly normal.

By plotting the log of mean weight against mean stature for each age class, the points so obtained fall very nearly into a straight line for long periods of growth, except for a few points, due perhaps to small samples, etc. A trend line can then be traced visually to fit the points, without any computation. It is the purpose of this paper to observe the log weight/height diagrams for various populations of the Indian sub-continent and compare these to the situation obtained in the case of the populations outside India. Already published data on age groups 6 years and above have been utilized for this purpose.

MATERIAL

The material for this analysis has been derived from the following published sources on the Indian populations:

I) the cross-sectional survey of Indian children and young adults (boys and girls both) ranging in ages from birth to 21 years, published by the ICMR (1968);

II) the cross-sectional survey of Maharashtrian boys and girls aged from birth to 21 years (*Sharma*, 1970);

III) the 6 to 20 years old boys and girls measured at Bikaner, Rajasthan (*Banerji & Bhattacharya*, 1968);

IV) the 6 to 16 years old boys and girls 'belonging to a farmers community from Punjab' (*Bansal*, 1969); and,

V) the 5,273 boys and girls from 4 to 15 years old measured in 1954 in Madras (ICMR, 1956).

From outside India the following published series have been used, which allow a fair study of the influence of sex on growth:

I) the survey of heights and weights of children and youth in the United States (*Hathaway*, 1957);

II) the 6 to 16 years old boys and girls of apparent North European ancestry, measured in Rio de Janeiro, Brazil (*Evelth*, 1967-68);

III) the 3 to 18 years old boys and girls of Warsaw, Poland (*Miesowicz*, 1964); and

IV) the cross-sectional survey of North American Negro children of low income families (*Verghese, et al.*, 1969).

DISCUSSION

Data on Indian Populations: The plots for log weight/height for each age class of the populations of the Indian sub-continent and of those outside it, are shown in Figure I.

Taking the ICMR (1968) norms for Indian boys as the base, we see that the relationship is almost perfectly linear for Indian boys for ages 6 to 16 years. The trend line for Indian girls for ages 6 to 12 years almost coincides with that of the boys. After 12 years there is a steep rise and is almost linear when fitted to the adult values. Here it is significant to note that the velocity curves (i.e., annual mean increment plotted against age) for the data in Indian girls (ICMR, 1968) shows a spurt in height at age 12 years and in weight at age between 12-14 years. This shows that the trend line of log weight/height becomes steeper as puberty sets in.

In the diagram the plots for the populations of Punjab, Rajasthan, Maharashtra and Madras are seen scattered very closely around the Indian trend line, and the relationship is almost completely linear. The trend lines for Punjabis and Rajasthanis are parallel to the Indian trend-line, while the lines for Madrasis and Maharashtrians are nearly parallel.

The girls' trend lines in the Indian populations invariably take a steep ascent at about or just after 12 year age point, from the respective trend lines. This indicates that puberty spurt in girls sets in at about 12 years, in all the Indian populations.

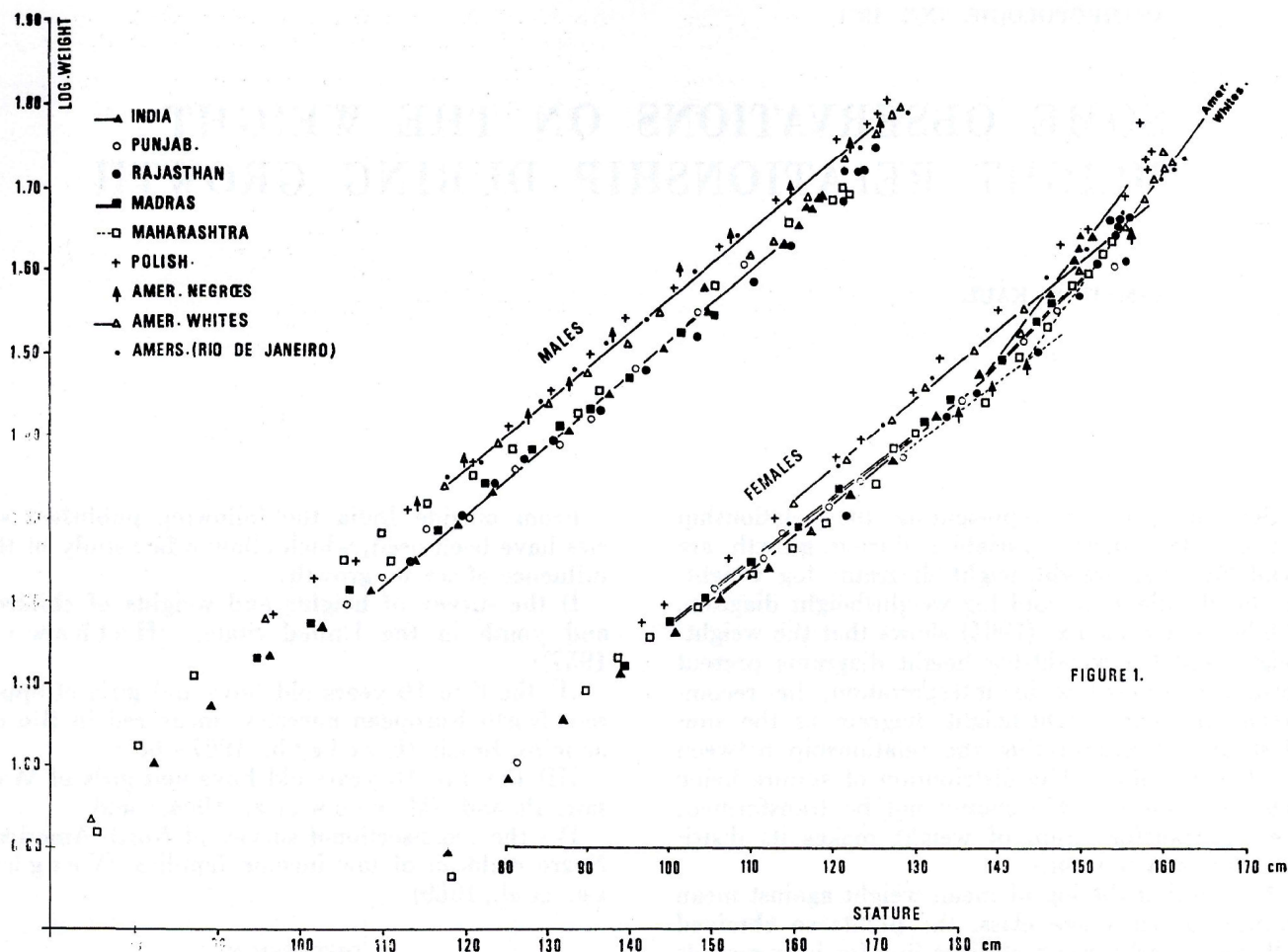


FIG. 1.

Data on Other Populations outside India: The relationship of log weight to height in the North American White children (Hathaway, 1957) plotted in the figure is almost perfectly linear for ages 6 through 18 years in boys and for ages 6 through 13 years in girls. In girls the line takes a steep ascent at this point (13 years) and the line fits well to the adult values. The data plotted for American Negro boys of the lower socio-economic group (Verghese, et al., 1969) almost fit the lower socio-economic group (Verghese, et al.) North American White trend line. Comparing these measurements on Negroes with the North American Caucasoid boys, Verghese and his associates (1969) observe their height and weight to be similar.

The Warsaw boys and girls in their log weight/height relationship follow almost perfectly a linear path which is just above and parallel to the North American trend-line. The girls' trend line takes a steep ascent at about 13 years. For a given height the Warsaw children seem to be heavier, at each age class after 9 years, than the North American White children.

The plots for American children living in tropical Rio de Janeiro, Brazil, are nearly perfectly linear and close to the North American trend-line. There is, however, a slight tendency for the line to be less

steep which may be because for a given height the weight of the Rio children is generally greater than that of North Americans for ages 9 to about 15 years.

At each age American children are heavier than Indian children for a given value of height. As such the log weight/height relationship lines for both are placed well apart, though running parallel to each other. Whereas the graph shows a steep rise at about 13 years for the American White girls, for the Indian girls it shows at the age 12 years.

It is noteworthy that the graphic representation of the log weight/height relationship in the case of girls takes a steep ascent at an age which coincides with the mean age at which puberty sets in. This observation would not have been so vivid if a simple weight/height relationship were to be plotted.

SUMMARY

Log weight/height relationship has been observed in nine population groups. The relationship is nearly perfectly linear for ages 6 through adult years in males. In females it shows almost the same picture till about 12 years when it suddenly shows a steep upward trend to mark the puberty spurt. It is emphasized that this observation of log weight-

height relationship is more vivid than any other representation.

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