Commentary: Height and intelligence

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In 1892, WT Porter published a study of 33 500 students entitled ‘The physical basis of precocity and dullness’ in which he reported that taller students performed better academically than did shorter students of the same age. Since then many studies in developed and developing countries have shown that children who are shorter or whose linear growth is retarded tend to gain lower scores in tests of cognitive function. Similar associations have been found in adults. Further evidence of this link is published in the current issue of International Journal of Epidemiology. Pearce et al. found that in a cohort of children born in 1947—the Newcastle Thousand Families Study—those who were taller at the age of 9 or 13 years had a higher IQ at the age of 11 years, after adjusting for social class.

The authors say their results ‘suggest a continuing effect of postnatal growth on childhood cognition beyond the age of nine years’, but they acknowledge, ‘Other factors may play a role in this relationship’. There is certainly little evidence that an increase in height will itself cause a rise in intelligence. Among 2177 children studied longitudinally in the National Health Examination Survey of the 1960s, change in relative height between the ages of 8 and 13 years was not related to change in score on tests of intelligence or academic achievement. Furthermore, in a randomized controlled trial into the effects of long-term growth hormone therapy in children born small for gestational age, most of the treated children showed a gain in height of 1 SD or more, paralleled by increases in IQ, but the increase in height did not explain the improvement in IQ. Growth hormone might have a direct effect on cerebral function, unrelated to its influence on height. Others have suggested that children’s height might have an indirect effect on their cognitive development by influencing the way adults and peers treat them. Years of cumulative height-biased expectations may explain the association.

Height and intelligence, in common with other traits that show a continuous distribution, are likely to have multiple determinants, both genetic and environmental, many of which might have only a small individual effect. Secular trends over the last century clearly demonstrate the sensitivity of both traits to environmental influences. Numerous countries have reported continuous and regular increases in height and IQ. Many of these increases have been sizeable and have occurred with striking rapidity, far too rapidly to be explained by genetics. For example, 18-year-olds from the Netherlands tested in 1982 scored 20 IQ points higher than an equivalent group of 18-year-olds tested in 1952, an increase of more than 1 SD, similar in magnitude to the increase in height that occurred in the country over the same period.

The secular trends suggest that the association found between height and intelligence may be due to common influences in the childhood environment. Children’s height and IQ have frequently been shown to increase with their parents’ socioeconomic status or level of education. But social background itself does not seem to explain the association. In the British 1946 cohort, height was associated with cognitive test scores, after controlling for father’s social class and mother’s education. Evidence from the National Health Examination Survey suggests that the link between height and IQ is not due to family size or income. Information on childhood circumstances in the paper by Pearce and colleagues is limited to social class, mother’s age and parity, but an earlier report on the Newcastle Thousand Families Study by FJW Miller and colleagues suggests that characteristics of the neighbourhood where the children lived had an influence on their height and intelligence, independent of social class. The districts with ‘the oldest and most derelict housing, the most polluted air, the most depressing appearance’ were consistently at the lower end of the ranking for both height and intelligence.

Diet, disease, psychosocial stress and inadequate cognitive stimulation have all been suggested as factors that might underlie the association between height and IQ. Evidence that nutrition and cognitive stimulation are at least partially responsible comes from a randomized controlled trial of growth-retarded children aged 9–24 months in Jamaica. Improvements in both growth and cognitive function were produced after 2 years of nutritional supplementation and cognitive stimulation. Only those children who received both interventions caught up with the non-growth retarded control group. Cognitive stimulation, but not nutritional supplementation, had a long-lasting effect on intelligence, as shown by test results at age 11 years.

Studies in developing countries suggest that whatever mechanisms underlie the association between height and intelligence, their effects may be particularly important in very early childhood as this is a period of rapid growth and cognitive development. It is a pity that Pearce and colleagues decided to include only the data on height at ages 9 and 13 years and IQ at age 11 years in their analyses. In their book on this Newcastle cohort, FJW Miller and colleagues describe strong associations between height at age 3 and 5 years and scores on tests of cognitive function at age 11 and 12 years. Miller’s analyses are not adjusted for potential confounding factors but their findings and the exclusion of these data from Pearce and colleagues’ paper make it hard to interpret these new results in relation to height at ages 9 and 13 years.

The Newcastle cohort was born at a time when height may have been a more powerful indicator of childhood environment than it is for children growing up in today’s economically developed countries. In a study of 9-year-olds born in 1992—who were on average 3 cm taller than the Newcastle 9-year-olds—height was not a significant predictor of intelligence, though height was related to IQ in their mothers. Evidence from Denmark suggests that the association between height and IQ
has weakened in successive birth cohorts.\textsuperscript{11} Perhaps as standards of living increase and variations in height between social groups diminish, similar trends will be evident in other populations.

References
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