Commentary: Proportion not the cause of beauty but of health?

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Body proportions have come of age in the medical and epidemiological research communities. The article in this issue by Ferrie et al.1 examines the association between leg length and trunk length to coronary heart disease (CHD) in the latest phase of the Whitehall II study, a prospective survey of the health of British civil servants. This is one of many studies published in the last decade to focus on the length of body segments in relation to health.2,3 Decomposing stature into its major components is proving to be a useful strategy to assess the antecedents of disease, morbidity, and death in adulthood. A concern with body proportion has deep roots in European history. In the 15th Century, Leonardo da Vinci developed
canons (rules) for the representation of the human body proportion in art and Albrecht Dürer devised technology to draw both the canonical forms and many variations as observed in nature. Edmund Burke, the British statesman and philosopher, published in 1756 the essay, *The Philosophical Inquiry into the Origin of Our Ideas on the Sublime and Beautiful*. One part of this is titled, ‘Proportion not the Cause of Beauty in the Human Species.’ Burke argued that people with body proportions outside the canon might still be considered beautiful. He held the human leg to be especially handsome, ‘I believe nobody will think the form of a man’s leg so well adapted to running, as those of a horse, a dog, a deer, and several other creatures; at least they have not that appearance: yet, I believe, a well-fashioned human leg will be allowed to far exceed all these in beauty.’ One is left to wonder which human legs are ‘well-fashioned.’ Perhaps Burke meant those that are relatively straight and long—contraindicating rickets, suggesting good health and nutrition in childhood, and predicting fecundity in adult women.

Ferrie and colleagues report that leg length is inversely associated with CHD risk factors in middle-aged men and women. The strength of this finding would likely be increased had the authors used the sitting height ratio (SHR), calculated as (sitting height/stature × 100). The SHR provides a better account of body proportion variation standardized against total stature. In our research using data from the United States National Health and Examination Survey (1988–94) we find stronger correlations for SHR than leg length with body mass index and sum of skinfolds.

Leitch was, perhaps, the first medical researcher to propose that a ratio of leg length to total stature might be a good indicator of nutritional history and history. Noting the well-known cephalo-caudal gradient in growth, Leitch (p. 145) wrote, ‘...it would be expected on general principles that children continuously underfed would grow into underdeveloped adults…with normal or nearly normal size head, moderately retarded trunk and relatively short legs.’ Reviewing the literature available at the time, Leitch found that improved nutrition during infancy and childhood did indeed result in a greater increase in leg length than in total height or weight. Longer-legged children were also less susceptible to bronchitis, which was then a scourge of poorly fed children.

A recent spate of research on body proportions and health finds that poor nutrition and health during pregnancy and during the first 6 years of life post-partum result in fetuses, newborns, infants, and children of reduced body length, mostly due to reduced leg length. High risk behaviours, such as smoking during pregnancy, also reduce height and especially leg length of offspring. The alterations in body proportions are due to competition between body segments, such as trunk versus limbs, and organs for the limited nutrients during growth.

There is good evidence that adults with skeletal disproportions, especially high SHR (short legs), are at greater risk for CHD via hypercholesterolaemia, impaired glucose and insulin regulation, increases pulse pressure and systolic blood pressure, and higher fibrinogen levels. Prenatal and postnatal undernutrition and disease account for relatively short legs in adults, but still does not explain why they are at greater risk for CHD than the longer-legged adults. An association between childhood stunting and adult overweight is becoming well known. A prospective 3 year study of stunted Brazilian boys and girls, 11–15 years old, finds that they gain more fat mass and less lean body mass compared with non-stunted peers. The reason for this seems to be tied to impaired fat oxidation in the stunted children. Fasting respiratory quotient (RQ = the ratio of the volume of carbon dioxide produced by an organism to the volume of oxygen consumed) is significantly higher, and hence fat oxidation is lower leading to greater body fat stores in the stunted group. Other contributors may be impairment of appetite control associated with early malnutrition.

These findings may provide entrée toward an explanation for the leg length-fatness-CHD risk relationship. Early life undernutrition and disease may alter human physiology toward a phenotype with a deranged lipid metabolism or a metabolism that preferentially stores fat. Burke may have found relatively short legs to be capable of beauty, but the epidemiological evidence finds them to be a risk for health.

**Conflict of interest**

None declared.

**References**


