Variation of height and BMI within school classes in 14-year-old children

Slawomir Koziel* and Aleksandra Gomula

1 Hirszfeld Institute of Immunology and Experimental Therapy Polish Academy of Sciences, Department of Anthropology, Podwale 75, 50-449 Wrocław, Poland
* Corresponding author: slawomir.koziel@iitd.pan.wroc.pl

With 1 figure and 2 tables

Abstract: The aim of the study was to analyze the variation of height and weight of 14-year-old children within classes of primary schools in Wrocław. All children were attending the 7th grade of primary schools in Wrocław, and underwent a medical examination as part of a project (the Health Card of the Child) of the city of Wrocław. The data were collected between January and December of 1997. The present study included height and weight of 1810 children (917 boys and 893 girls). For analyses, individual height and BMI [kg m⁻²] were standardized based on mean and SD of the whole population separately for boys and girls. The SDs of height and BMI in each class were tested by Student-t test for one sample to check the difference in comparison to population with SD equal 1. Additionally, the nested analysis of variance was used, where height and BMI were dependent variables, and classes were nested into schools. SDs of height and BMI within classes are significantly lower than for the whole population in boys and girls, whereas the means did not differ significantly from the whole population. Nested analysis of variance showed a significant effect of class for girls (for height and BMI) but not for boys. Also variation of height significantly differed between schools in girls but not in boys. It is hypothesized that decrease of variation within classes might be caused by the community effect.

Keywords: BMI; height; schoolchildren; variation

Introduction

It is generally believed that body height is regulated by genes, as well as by an individual’s environment (e.g., nutrition and health status). Worldwide a secular trend of increasing height is considered an effect of improving living conditions, in which individuals’ full genetic potential may be realized. Recently, however, a universal phenomenon of convergence of adolescents’ height toward population’s average has been reported, and this cannot be explained by better living conditions (compare: Ipsen et al. 2016; Mumm et al. 2016; Nowak Szczepanska et al. 2016; Pospisil et al. 2017). A new approach suggests another factor that influences body height: community-based target in height (Aßman & Hermanussen 2013; see also: Hermanussen & Scheffler 2016). This approach postulates that adolescents adjust their growth rate towards average height of their peers. In the case of constant variation of height, in given age categories, in tall populations children tend to be taller, while in short populations children tend to be shorter, clustering around means. Evidence indicate that social network may play a role in the regulation of adolescent growth, resulting in people living in a neighborhood reaching similar stature (Hermanussen et al. 2014a; Hermanussen et al. 2014b). This additional mechanism could regulate growth in adolescence regardless of socioeconomic conditions, and lead to the narrowing in height variation in a population.

Physiological support for this hypothesis was offered by Bogin et al. (2015) who revealed that IGF-1 level, which affects the final height, highly depends on bio-social and psychological stimuli coming from social network, in which the individual lives. All these assumptions and evidence related to the hypothesis of a community effect on height led us to consider whether in smaller populations, that is among a group of peers growing up together, this phenomenon would be manifested, too. Different groups of schoolchildren attending a class in the same and different schools provide an adequate research sample study whether body height clusters within small group of peers (i.e., whether variation in height is smaller within these groups compared to the overall population of children). We investigated 14-year-old children attending different primary schools in the area of one city. Since there is some evidence that obesity spreads through social networks (Christiakis & Fowler...