LETTER

Gender, biology, and mathematics performance

In their analyses of gender and cultural disparity in mathematical performance, Hyde and Mertz (1) focus on tests for differences between females and males, first in overall variance in scores for primary and secondary students, and second in participation and outcome for students with exceptionally high ability. A third crucial line of evidence is sex differences in mathematical disability, defined and categorized by DSM-IV as developmental dyscalculia—performance in mathematics substantially, selectively lower than expected for age, intelligence, and educational level, which has been reported in 3–6% of school-age children (2, 3). Remarkably, developmental dyscalculia shows no difference in prevalence between females and males (2, 3), in contrast to the notable male bias found in most other forms of attentional and learning-disability conditions. These findings provide further, convergent support for the hypothesis that males and females do not differ demonstrably in overall mathematical abilities.

Interpretation of such patterns, however, is a fundamentally different issue. Hyde and Mertz (1) explain their results as indicating the effects of "changeable sociocultural factors" contrasted with a lack of "immutable, innate biological differences between the sexes," inferences that conflate biology and genetics with determinism, falsely separate nature from nurture, and de-emphasize analyses of the population-dependent interactions between genetic and environmental factors that underlie the development of all cognitive and other phenotypic traits to some degree. Indeed, developmental dyscalculia, as well as overall skills in relatively simple mathematics, show evidence of substantial heritability (4), neural substrates of numerical operations have been well established for the intraparietal sulcus, and sex differences have been described in the impact of transcranial magnetic stimulation of this brain region on number-processing skills (5). These considerations suggest that analyzing the genetic and neurodevelopmental underpinnings of mathematical abilities may be extremely useful in the design of optimal environments for learning such skills and that a lack of sex difference in overall mathematics performance need not indicate a lack of differences in how females and males learn and apply mathematical concepts, which involves complex interplay between visual-spatial and verbal cognition. Approaches that combine the facilitatation of socioculturally mediated gender equality in perception and opportunity with accelerated research into the integrated genetic, neurological, and environmental causes of inter-individual variation in mathematical skills may offer the most hope for societal and economic progress.

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