in brief...
Gender differences in test scores

Do boys and girls differ in their intellectual and cognitive abilities and, if so, in what way? **Stephen Machin** and **Tuomas Pekkarinen** investigate the phenomenon of 'higher variance' in boys' educational performance.

There is considerable debate about possible differences between boys and girls in terms of both their average educational performance and variability around the average.

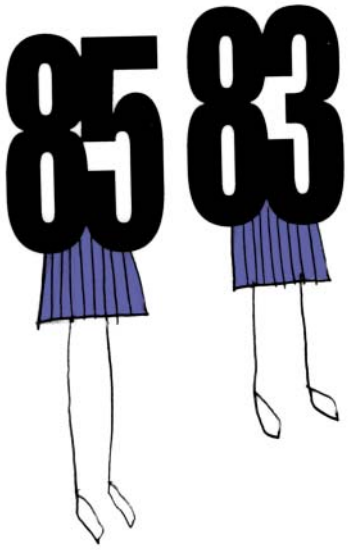
Recent cross-country research has shown that there are no systematic gender differences in average (mean) test scores (Guiso et al, 2008). But what about gender differences in the variance of test scores?

A new study by Stephen Machin and Tuomas Pekkarinen investigates whether the phenomenon of 'higher variance' is an accurate characterisation of boys' educational performance relative to girls, using data from the OECD's Programme for International Student Assessment (PISA), a survey of 15 year olds enrolled in full or part-time education in 41 industrialised countries.

The researchers analyse test scores in maths and reading by country, focusing on differences in the mean and variance of the scores. For reading, they find that the boy-girl mean difference is negative in all 41 countries, indicating that girls generally outscore boys. In 35 out of 41 countries, the boy-girl variance ratio indicates that boys' scores have greater variance than girls' scores.

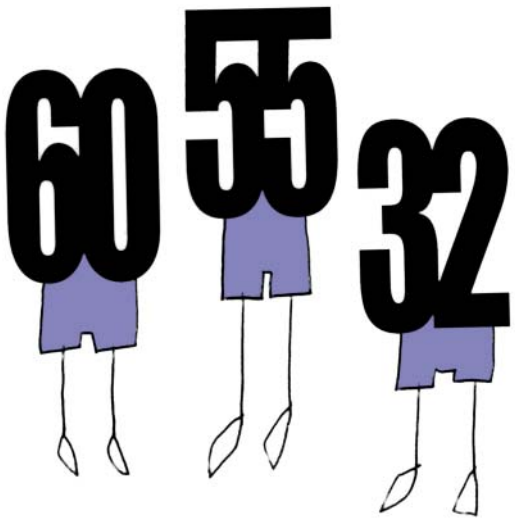
For maths, the boy-girl mean difference is positive, which indicates that boys generally outscore girls. In 37 of 41 countries, the boy-girl variance ratio indicates that boys' scores have greater variance than girls' scores.

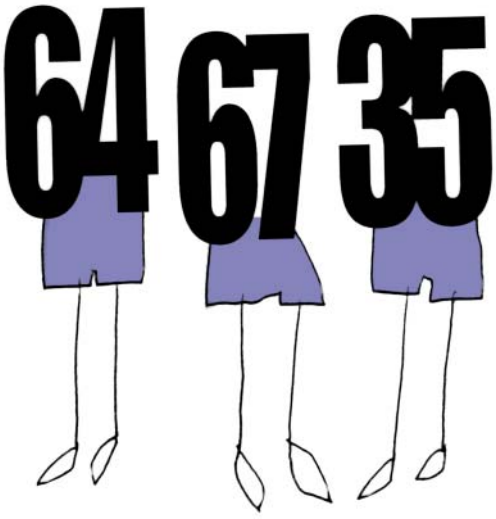
International testing results show greater variance in boys' scores than in girls' scores



There are differences for the two tests. On both the maths and reading tests, boys predominate in two of the four extreme scoring categories – low reading, high maths – while girls predominate in the high reading and low maths categories. For maths, in 35 of the 41 countries, there are more boys than girls in the top 5%. For reading, 36 of 41 countries have more girls than boys in the top 5% of scores, and 39 of 41 countries have more boys than girls in the bottom 5% of scores.

For both reading and maths tests in all 41 countries, the





The gender difference in variance is higher in countries with higher levels of test score performance

boy-girl variance ratio is positively correlated with the mean test score performance. In countries with better test score performance, the boy-girl variance ratio is significantly higher than in countries where the children score more poorly.

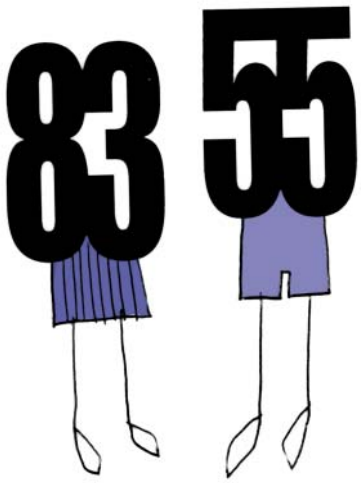
But unlike the relationship between a country's gender gap in average test scores and its outcome on an index of women's emancipation, the Gender Gap Index of the World Economic Forum (detected by Guiso et al), this study finds no relationship between the Gender Gap Index and the variance ratios for either maths or reading.

So this analysis of international test score data shows a higher variance in boys' than girls' results on maths and reading tests in most OECD countries. How this translates into educational achievement is a matter open for discussion.

Higher variability among boys is a salient feature of reading and maths test performance across the world. This difference in variance is higher in countries that have higher levels of test score performance.

Gender differences in means are easier to characterise: it is evident from the PISA data that boys do better in maths and girls do better in reading. This has a compositional effect on the variance differences. The higher boy-girl variance ratio in maths comes about because of an increased prevalence of boys in the upper part of the distribution. But the higher variance in reading is due to a greater preponderance of boys in the bottom part of the test score distribution.

Because literacy and numeracy skills are important determinants of later success in life – for example, in terms of earning higher wages or getting better jobs – these differing variances have important economic and social implications.



This article summarises 'Global Sex Differences in Test Score Variability' by Stephen Machin and Tuomas Pekkarinen, *Science* 28 November 2008: Volume 322(5906): 1331-2 (http://www.sciencemag.org/cgi/content/full/322/5906/1331/DC1).

The other study mentioned is: 'Culture, Gender and Math' by Luigi Guiso, Ferdinando Monte, Paola Sapienza and Luigi Zingales, *Science* 30 May 2008: Volume 320(5880): 1164-5.

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