Debate

SEX DIFFERENCES IN INTELLIGENCE: A REJOINDER TO MACKINTOSH

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Summary. The author's theory that among adults men have a higher mean IQ than women has been critized by Mackintosh. His criticisms are examined and found wanting. New evidence is adduced that men obtain higher means than women on Raven's Progressive Matrices.

For many decades it has been believed that there is no sex difference in general intelligence. As Brody (1992, p. 323) puts it: 'gender differences in general intellectual ability are small and virtually non-existent'. In 1994 I challenged this position and argued that from the age of around 16 years males begin to develop a higher mean IQ than females and that this advantage reaches approximately 4 IQ points by early adulthood; up to the age of 16 the sex difference is minimal; these age differences are due to the faster maturation of girls which, it was proposed, are present for mental as well as physical development. This theory has been criticized by Mackintosh (1996), who reasserts the traditional view that there is no sex difference in general intelligence. In this paper I reply to Mackintosh's criticisms and present new evidence in support of my theory.

The question of whether there is a sex difference in general intelligence depends crucially on the definition of that term. In my paper (Lynn, 1994) I presented two definitions. The first was that general intelligence can be equated with the full-scale IQ on the Wechsler tests of abilities. The Wechsler tests measure a wide range of abilities including verbal and non-verbal reasoning, verbal comprehension, and numerical, perceptual, spatial and memory abilities which are combined to give a full-scale IQ. It has generally been asserted that there is no sex difference on the Wechsler full-scale IQ, e.g. 'the Wechsler overall IQ does not show sex differences' (Halpern, 1992, p. 64). However, I was able to show that in 14 samples drawn from the United States, Greece, China, the Netherlands, Scotland and Israel males obtain higher mean full-scale IQs than females by an average of 3·08 IQ points among adults and 2·28 IQ points among children.

These results are dismissed by Mackintosh on the grounds that the Wechsler tests measure an arbitrary collection of abilities and could have included other tests on

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which females show an advantage. The weakness of his point is that he does not specify what other tests could be included to counterbalance the advantage at present registered by males.

The second definition of general intelligence I proposed consisted of the hierarchical model of Gustafsson (1984) which begins with a number of tests of different abilities, aggregates them into three second-order abilities which he identifies as crystallized ability, fluid ability and visualization and which are in turn combined to form general intelligence. I showed that when data are fitted to this model, among adults males out-perform females in a number of countries by approximately 4 IQ points. Mackintosh rejects this model of general intelligence on the same grounds as he rejects the Wechsler full-scale IQ, namely that this is also an arbitrary collection of tests and that a different collection could be assembled to produce no sex difference. However, he is unable to produce a credible alternative collection. He suggests adding perceptual speed to the three second-order factor and says that this would tilt the balance in favour of females. This is incorrect conceptually because it adds a first-order factor to second-order factors, and empirically because the male advantage on visualization is greater than the female on perceptual speed and would not achieve the desired result. He also suggests using the average of the eight tests of the DAT as a measure of general intelligence. This would entail giving the same weight to minor cognitive skills like spelling and clerical accuracy as to major cognitive abilities like spatial and abstract reasoning. It cannot be regarded as a serious proposal.

Mackintosh now proposes his own definition of general intelligence as abstract reasoning ability. He says that the Raven's Progressive Matrices is 'the paradigm test of non-verbal abstract reasoning ability', that there is no sex difference on the Progressive Matrices; and therefore, he concludes, there is no sex difference in general intelligence.

It may well be considered that Mackintosh's definition of general intelligence as abstract reasoning ability is too narrow to command assent. Nevertheless, even on this definition his assertion that there is no sex difference on this ability does not stand up to examination. He presents three sources of evidence to substantiate his case that there is no sex difference on the Progressive Matrices. First, he cites a literature review by Court (1983) which lists a number of studies, some of which have found higher means by males, others of which have found higher means by females, while yet others have found no difference. The weakness of this citation is that it does not analyse the sex differences by age and therefore fails to address the crucial component of my theory that it is only at the age of about 16 that the male advantage in abstract reasoning begins to appear.

Secondly, Mackintosh cites a study of 15- to 16-year-old deaf children by Conrad (1979) in which he says there was no sex difference on the Progressive Matrices. This study does not give the mean scores of the males and females nor the results of any statistical test of the differences, but even if it did it would not provide a strong refutation of my theory which states that the sex difference only begins to appear at this age.

Thirdly, Mackintosh cites some unpublished data from Israel apparently showing that there is no sex difference on the Progressive Matrices on 17-18 year olds conscripted into the military. He provides no information regarding numbers or means.

Table 1. Raw score differences between males and females on
Raven's Standard Progressive Matrices

Location	*N*	Age	M–F diff.	Reference
Belgium	2104	20–80	3·2	Deltour (1993)
England	600	20–79	2·8	Heron & Chown (1967)
Hawaii	2353	18–55	1·9	Wilson *et al.* (1975)

If he had done so it would have been apparent that the ratio of females to males in this sample is 68:100. It is evident that there are a lot of missing females in what is presented as a representative sample. The explanation for these missing females is that they are married and are excused military service on this account or that they belong to orthodox families of Eastern origin who are excused military service on religious grounds.

Both of these groups are likely to have lower average IQs than unmarried and Western young women. There are data showing that more intelligent women tend to marry at a later age than less intelligent women (e.g. Marini, 1978), probably because they are occupied in pursuing their education and careers. Furthermore, there is considerable evidence that in Israel there is a lower average IQ in Eastern Jews than those of Western origin. Lieblich, Ninio & Kugelmass (1992) report a 12 IQ point difference between the two groups and this has been corroborated by studies by Burg & Belmont (1990) and Zeidner (1987). The verdict is clear. The missing females were virtually certainly of lower average IQ than the conscripted females. The Israeli data compare a selective sample of high IQ females with all males. The fact that they obtain the same means on the Matrices suggests that in representative samples males would score higher but strictly speaking it is not known what sex difference there might be in a representative sample of Israeli 17–18 year olds. There is only one thing to do with the Israeli evidence on sex differences in intelligence and that is to trash it.

Nevertheless, there have been three published and easily accessible studies on sex differences in the general adult population on Raven's Matrices. These are summarized in Table 1. The male–female differences given in column four are all in favour of males. The differences are statistically significant at the 1% level in all three studies. The unweighted average of the studies is a male advantage of 2·6 raw score points. This is the approximate equivalent of 5·2 IQ points.

The conclusion to be drawn from these data is that, on Mackintosh's definition of general intelligence as abstract reasoning ability operationally defined as measured by the Matrices, among adults males out-perform females by approximately 5 IQ points, a result closely similar to the conclusion reached in my 1994 paper that the male advantage is 4 IQ points.

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