

New insights into gendered brain wiring, or a perfect case study in neurosexism?

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Male brains are, on average, larger than females but this doesn't mean men are better at reading maps. Flickr/pedrosimoos7

The latest neuroscience study of sex differences to hit the popular press has inspired some familiar headlines. [The Independent](#), for example, proclaims that:

The hardwired difference between male and female brains could explain why men are “better at map reading” (And why women are “better at remembering a conversation”).

[The study in question](#), published in PNAS, used a technology called [diffusion tensor imaging](#) to model the structural connectivity of the brains of nearly a thousand young people, ranging in age from eight to 22.

It reports greater connectivity within the hemispheres in males, but greater connectivity between the hemispheres in females. These findings, the authors conclude in their scientific paper, “*suggest that male brains are structured to facilitate connectivity between perception and coordinated action, whereas female brains are designed to facilitate communication between analytical and intuitive processing modes.*”

One important possibility the authors don't consider is that their results have more to do with brain size than brain sex. Male brains are, on average, larger than females and a large brain is not simply a smaller brain scaled up.

Larger brains create different sorts of engineering problems and so – to minimize energy demands, wiring costs, and communication times – there may physical reasons for different arrangements in differently sized brains. The results may reflect the different wiring solutions of larger versus smaller brains, rather than sex differences *per se*. But also, popular references to women's brains being designed for social skills and remembering conversations, or male brains for map reading, are utterly misleading.

In an larger earlier study (from which the participants of the PNAS study were a subset), the same research team compellingly demonstrated that the sex differences in the psychological skills they measured – executive control, memory, reasoning, spatial processing, sensorimotor skills, and social cognition – are almost all trivially small.



Biological sex is a dismal guide to psychological ability. To give a sense of the huge overlap in behaviour between males and females, of the twenty-six possible comparisons, eleven sex differences were either non-existent, or so small that if you were to select a boy and girl at random and compare their scores on a task, the “right” sex would be superior less than 53% of the time.

Even the much-vaunted female advantage in social cognition, and male advantage in spatial processing, was so modest that a randomly chosen boy would outscore a randomly chosen girl on social cognition – and the girl would outscore the boy on spatial processing – over 40% of the time.

As for map-reading and remembering conversations, these weren't measured at all.

Yet the authors describe these differences as “pronounced” and as reflecting “behavioural complementarity” – scientific jargon-speak for “men are from Mars, women are from Venus”. Rather than drawing on their impressively rich data-set to empirically test questions about how brain connectivity characteristics relate to behaviour, the authors instead offer untested stereotype-based speculation. Even though, with such considerable overlap in male/female distributions, biological sex is a dismal guide to psychological ability.

Also missing from the study is any mention of **experience-dependent brain plasticity**. Why?

As prominent feminist neuroscientists have noted, the social phenomenon of gender means that a person's biological sex has a significant impact on the experiences (including social, material, physical, and mental) she or he encounters which will, in turn, leave neurological traces.

Yet the researchers do not pay any attention to the gendered experiences (such as hobbies, subjects studied at school or higher education, or participation in sporting activities) of the young males and females in their sample.

This absence has two consequences. First, the researchers miss an opportunity to investigate whether gendered experiences **might influence** brain development and enhance the acquisition of important skills valuable to all. The second consequence is that, by failing to look at gendered social influences, the authors guarantee that no data will be produced that challenge the notion of “hardwired” male/female neural signatures.

These characteristics of the PNAS study are **very common** in neuroscientific investigations of male/female sex differences, and represent two important ways in which scientific research can be subtly “neurosexist”, reinforcing and legitimating gender stereotypes in ways that are not scientifically justified. And, when researchers are “blinded” by sex, they can overlook potentially informative research strategies.



The study did not find evidence that women’s brain wiring was linked to their ability to nurture. Returning to the popular representations, we can now see a striking disconnect with the actual data. **The research provides strong evidence for behavioural similarities between the sexes. It provides no evidence that those modest behavioural sex differences are associated with brain connectivity differences.** And, it offers no information about the developmental origins of either behavioural or brain differences.

Yet, the popular press presents it as evidence that “hardwired” sex differences explain why men are from Mars and women are from Venus. While this is tediously predictable, what is more surprising is for a study author to push along such misinterpretations, **claiming to have found evidence** for “hardwired” sex differences, and suggesting that this might explain behavioural sex differences not actually measured in the study, such as in “intuition” skills “linked with being good mothers”.

In the latest issue of Trends in Cognitive Sciences, co-authors Rebecca Jordan-Young, Anelis Kaiser and Gina Rippon and I **argued** that scientists investigating sex differences have a responsibility to realise “how social assumptions influence their research and, indeed, public understanding of it.” We then called on scientists working in this area to:

recognise that there are important and exciting opportunities to change these social assumptions through rigorous, reflective scientific inquiry and debate.

The continuing importance of this message is only reinforced by this latest case study in how easily scientific “neurosexism” can, with a little stereotype-inspired imagination, contribute to **inaccurate** and **harmful** lay misunderstanding of what neuroscience tells us about the sexes.