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# On Dump the “dimorphism”: Comprehensive synthesis of human brain studies reveals few male-female differences beyond size

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Males and females have different bodies. While differences between males and females aren't as pronounced as they are in some other species, humans are mildly sexually dimorphic. Few would argue otherwise. But how different and where those differences lie is hotly debated within the general population and within the academic community. Some research has suggested that brains show sexual dimorphism. However, in *Dump the “dimorphism”: Comprehensive synthesis of human brain studies reveals few male-female differences beyond size*, authors Lise Eliot, Adnan Ahmed, Hiba Khan, and Julie Patel argue that apparent differences in male and female brains can be attributed to difference in brain size, not actual sexual dimorphism[2]. Unfortunately, the very process that the authors used admits that their conclusion is wrong.

The study in question is a review of other studies which look for various forms of sexual dimorphism in human brains. While analysis indicated that there was some dimorphism, the authors then adjusted for brain size, as brain size correlates with body size. The issue there is that body size is recognized to be bimodally distributed along sexual morphs, and therefore is a dimorphic parameter controlling brain size. Therefore, from the beginning of the process, the authors attempted to remove a neurobiological parameter which shows dimorphism from the analysis, and only then are able to conclude that sexual dimorphism in the brain does not occur.

The authors themselves admit that brain size effects parameters, such as the proportion of white matter to grey matter. By this own admission we then have that the proportion of white matter to grey matter is effected by the sex of the individual. Other parameters similarly correlate. The authors try to justify dampening the brain size parameter by arguing that the only parameters of interest when determining the existence of sexual dimorphism in human brains are the potential differences in neurological structures that influence sex based differences in commonly seen behaviors.

While these simplifications are convenient, the authors assert rather than justify that differences in fine brain structure is the only kind of sexual dimorphism of the brain that is of interest and assumes that we fully understand the

form and function of all regions in the brain involved with such behavior. It also assumes that mere differences in brain size do not alter behavior. These issues need to be addressed before the argument presented in aforementioned paper can be considered finalized and reasonably argued. Moreover, there is at least some reason to doubt the assumptions made in the paper.

One problem is that the authors assume that only structures influence behavior. However, behavior is influenced by more than structure. It is influenced by physiology as well. While there is still much to learn, it is recognized that hormone levels influence behavior. One can then ask whether brain size changes the rate of total diffusion of a hormone throughout the brain or the rate at which it is removed from the brain. For instance, serotonin, a hormone which influences almost all areas of behavior, is produced almost entirely in the brain stem[1]. A larger brain will result in a longer path from the brain stem to the cerebral cortex and other areas of the brain.

I admit that I do not know if brain size does indeed alter the distribution and reclamation of hormones like serotonin, or if the ratio of white matter to grey matter influences behavior. I don't know if gross brain structure has any effects on behavior. That is not the issue here. The issue is that the assumptions made in the paper were simply not justified to any sufficient degree. And there seems to be insufficient research to answer these questions. The validity of this paper rests on the results of any future research that helps answer these questions. Until then, the conclusion of the paper cannot be taken as valid.

## References

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