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# From Scanner to Sound Bite: Issues in Interpreting and Reporting Sex Differences in the Brain

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## Abstract

Neuroimaging research is yielding reports of sex differences in the brain. Yet the likelihood of spurious findings of sex differences, the teething problems of new technology, the obscurity of the relation between brain structure and psychological function, and difficulties inferring mental states from neuroimaging data all require us to be considerably cautious in interpreting such results. Unfortunately, these issues are often overlooked in popular accounts. Together with a tendency for people to regard neuroscientific information as more scientific than behavioral data, and as indicative of male and female “nature,” these issues point to the worrisome possibility of public misunderstanding of what contemporary neuroscience tells us about gender.

## Keywords

neuroimaging, gender, science communication, neuroethics

For as long as there has been brain science there has been both scientific and popular interest in male–female differences and their psychological consequences. For example, 19th-century scientific opinion held that women’s intellectual inferiority could be attributed to their smaller and lighter brains—a fact that was widely known among the Victorian public as the “missing five ounces” of female brain (see Russett, 1989). Today, the weighing scales and other crude methodologies of the Victorian brain scientists have been supplanted by sophisticated neuroimaging techniques that give unprecedented access to structural details of the brain and patterns of neural activity. Yet there remains cause for skepticism regarding neuroscientific claims about sex differences and concern over the way such information is reported to, and interpreted by, the public. In this article, I lay out four scientific issues arising from the production and interpretation of “facts” about sex differences in the brain, then discuss how these issues are overlooked and exacerbated when neuroscience findings are disseminated in the popular media and digested by the public.

To illustrate these points, I use as an example a long-standing and influential claim about male–female brain difference. The greater male lateralization (GML) hypothesis proposes that males, compared with females, are more strongly left hemisphere dominant for language processing and right hemisphere dominant for visuospatial processing. Females, by contrast, tend to engage both hemispheres for these tasks

and, in keeping with the female brain’s supposedly more interhemispheric functioning, are claimed to have a relatively larger corpus callosum (the bundle of neurons that connects the two hemispheres). In both academic and especially popular work, these structural differences are proposed to have psychological implications.

## Production: The Problem of Spurious Results

When neuroscientists, in a single experiment, establish a “significant difference” between the sexes, does this reflect a real and reliable sex difference? Because sex is a primary and ubiquitous social category, classifying participants by sex is obvious, easy, and may be done by default (Kaiser, Haller, Schmitz, & Nitsch, 2009). However, since by convention researchers declare a difference to be “significant” if there is no more than a one in 20 probability that it occurred by chance, if 20 researchers routinely test for sex differences, then even if there is no real difference between the populations, one

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