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McGlone J. Sex differences in human brain asymmetry: a critical survey.
Behav. Brain Sci. 3:215-27, 1980.

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After reviewing anatomical, neurological, radiological, and neuropsychological sources prior to 1980, evidence was accumulating for sex differences in the left-right organization of the adult human brain. The model proposed that, for right-handers, the male brain might be more asymmetrically organized than the female brain, both for verbal and spatial representation. [The SSC® and the SCI® indicate that this paper has been cited in more than 370 publications.]

Sex Differences in Human Brain Organization

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Contrary to prevailing academic wisdom, remaining in the same geographic location, guidance by the same advisor, and retaining a job in the same hospital helped focus my line of research. As an assistant to Doreen Kimura in the late 1960s, I learned that normative studies of human brain asymmetry were not "sex-neutral." Yet most publications ignored this possibility.

Later employment in a behavioral neurology ward fostered these ideas, even though my collaborator at the time expressed skepticism when a retrospective review of his unilateral stroke cases yielded nonsignificant sex-linked trends. My dissertation years at the University of Western Ontario and newly opened University Hospital in London, Ontario, were fueled by the hope that a well-controlled, prospective clinical study would clarify the issue. While new and unexpected findings emerged from the study, their controversial nature presented problems in the publication phase.

Discouraging rejections arrived in turn from two prominent scientific journals that judged the first paper from the thesis to be unsuitable for their readership. Presentations of the data at neuropsychological meetings struck a nerve, provoking heated debates, both from scientific and political viewpoints. My reporting was considered by most as equivalent to advocating a biological explanation for sexual variation in the

cognitive abilities of normals.

Perhaps scientific acknowledgment of the *Behavioral and Brain Sciences (BBS)* review has accrued because it tied together evidence from diverse sources and created a unitary, simple heuristic that was easy to remember and possible to test. The article probably begat guilt in those scientists who had built theories of brain organization on predominantly male samples. Such citations emphasized the controversial aspect of the *BBS* article and allowed behavioral neuroscientists to acknowledge limitations of their results while continuing to exclude one sex from the investigations. The article also engendered publication opportunities for retrospective studies of data that had been collected for purposes other than sex-related issues. I feel that the *BBS* review prompted some researchers to balance the sex composition of their groups and, at least in preliminary analyses, rule out possible sex difference in the data. Most encouraging of all are the neuroscientists who, searching for gender-related outcomes in basic neuroanatomy, were rewarded by exciting new discoveries.^{1,2}

Over the past decade, few rigorous prospective clinical neuropsychological studies that control for referral bias have been conducted either to replicate or expand the original findings.³ I am told by my American colleagues that studies on biologically based sex differences in cognitive abilities were difficult to publish in the 1980s, though the pendulum may be swinging. Empirical work on acute and temporary drug-induced lesions has demanded significant modifications to the original model.⁴

My entry into academia, in July 1990, was a deliberate attempt to reengage in this debate, by encouraging doctoral psychology students to investigate which verbal and spatial skills, controlled by what underlying neural mechanism, may be sex-related.^{5,6} Currently, this seems like an insurmountable ambition given the poor funding climate, expensive localization technologies, and the need for large samples (i.e., international collaboration). We still know so very little about how genetics, hormones, and sex-linked environmental experiences alter human brain anatomy and higher cognitive functioning. However, it is possible that working on this for the next 20 years might inspire another *Citation Classic*.

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2. Allen L, Richey M, Chai Y & Gorski R. Sex differences in the corpus callosum of the living human being. *J. Neurosci.* 11:933-42, 1991.
3. Yeo R, Turkheimer E & Bigler E. The influence of sex and age on unilateral cerebral lesion sequelae. *Int. J. Neurosci.* 24:299-301, 1984.
4. McGlone J. The neuropsychology of sex differences in human brain organization. (Goldstein G & Taner R E. eds.) *Advances in clinical neuropsychology*. New York: Plenum Press, 1986. Vol. 3. p. 1-30.
5. Memory complaints before and after temporal lobectomy. *J. Clin. Exp. Neuropsychol.* 13:42, 1991.
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