

Gender differences in language appear biological

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Although researchers have long agreed that girls have superior language abilities than boys, until now no one has clearly provided a biological basis that may account for their differences.

For the first time -- and in unambiguous findings -- researchers from Northwestern University and the University of Haifa show both that areas of the brain associated with language work harder in girls than in boys during language tasks, and that boys and girls rely on different parts of the brain when performing these tasks.

“Our findings – which suggest that language processing is more sensory in boys and more abstract in girls -- could have major implications for teaching children and even provide support for advocates of single sex classrooms,” said Douglas D. Burman, research associate in Northwestern’s Roxelyn and Richard Pepper Department of Communication Sciences and Disorders.

Burman is primary author of “Sex Differences in Neural Processing of Language Among Children.” Co-authored by James R. Booth (Northwestern University) and Tali Bitan (University of Haifa), the article will be published in the March issue of the journal *Neuropsychologia* and now is available online at dx.doi.org/10.1016/j.neuropsychologia.2007.12.021 .

Using functional magnetic resonance imaging (fMRI), the researchers measured brain activity in 31 boys and in 31 girls aged 9 to 15 as they

performed spelling and writing language tasks.

The tasks were delivered in two sensory modalities -- visual and auditory. When visually presented, the children read certain words without hearing them. Presented in an auditory mode, they heard words aloud but did not see them.

Using a complex statistical model, the researchers accounted for differences associated with age, gender, type of linguistic judgment, performance accuracy and the method -- written or spoken -- in which words were presented.

The researchers found that girls still showed significantly greater activation in language areas of the brain than boys. The information in the tasks got through to girls' language areas of the brain -- areas associated with abstract thinking through language. And their performance accuracy correlated with the degree of activation in some of these language areas.

To their astonishment, however, this was not at all the case for boys. In boys, accurate performance depended -- when reading words -- on how hard visual areas of the brain worked. In hearing words, boys' performance depended on how hard auditory areas of the brain worked.

If that pattern extends to language processing that occurs in the classroom, it could inform teaching and testing methods.

Given boys' sensory approach, boys might be more effectively evaluated on knowledge gained from lectures via oral tests and on knowledge gained by reading via written tests. For girls, whose language processing appears more abstract in approach, these different testing methods would appear unnecessary.

“One possibility is that boys have some kind of bottleneck in their sensory processes that can hold up visual or auditory information and keep it from being fed into the language areas of the brain,” Burman said. This could result simply from girls developing faster than boys, in which case the differences between the sexes might disappear by adulthood.

Or, an alternative explanation is that boys create visual and auditory associations such that meanings associated with a word are brought to mind simply from seeing or hearing the word.

While the second explanation puts males at a disadvantage in more abstract language function, those kinds of sensory associations may have provided an evolutionary advantage for primitive men whose survival required them to quickly recognize danger-associated sights and sounds.

If the pattern of females relying on an abstract language network and of males relying on sensory areas of the brain extends into adulthood -- a still unresolved question -- it could explain why women often provide more context and abstract representation than men.

Ask a woman for directions and you may hear something like: “Turn left on Main Street, go one block past the drug store, and then turn right, where there’s a flower shop on one corner and a cafe across the street.”

Such information-laden directions may be helpful for women because all information is relevant to the abstract concept of where to turn; however, men may require only one cue and be distracted by additional information.

Source: Northwestern University

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