

## Study of language use in children suggests sex influences how brain processes words

November 27 2006

---

Boys and girls tend to use different parts of their brains to process some basic aspects of grammar, according to the first study of its kind, suggesting that sex is an important factor in the acquisition and use of language.

Two neuroscientists from Georgetown University Medical Center discovered that boys and girls use different brain systems when they make mistakes like “Yesterday I holded the bunny”. Girls mainly use a system that is for memorizing words and associations between them, whereas boys rely primarily on a system that governs the rules of language.

“Sex has been virtually ignored in studies of the learning, representation, processing and neural bases of language. This study shows that differences between males and females may be an important factor in these cognitive processes,” said the lead author, Michael Ullman, PhD, professor of neuroscience, psychology, neurology and linguistics.

He added that since the brain systems tested in this study are responsible for more than just language use, the study supports the notion that “men and women may tend to process various skills differently from one another.” One potential underlying reason, suggested by other research, is that the hormone estrogen, found primarily in females, affects brain processing, Ullman said.

The study, whose co-author is Joshua Hartshorne, was published earlier

this year in the journal *Developmental Science*.

Researchers know that women tend to be better than men at verbal memory tasks, such as remembering word lists, and that this ability depends on declarative memory. Included within declarative memory is a “mental lexicon” in which word forms are memorized and remembered. The grammatical rules that allow us to combine words in sentences depend on “procedural” memory. Researchers have found that both boys and girls may be equally adept at this process, which depends on a different part of the brain than declarative memory.

In this study, Ullman and Hartshorne hypothesized that girls would be better than boys at remembering irregular past-tenses of verbs, like “held”, since these words are memorized in declarative memory. And if girls remember “held” better than boys, they should make fewer errors like “holded”, since these “over-regularization” errors are made when children can’t remember irregular past-tenses, and so resort to combing the verb with an –ed ending, just as they do for regular verbs like “walked”.

So they studied how a group of 10 boys and 15 girls, age 2 to 5, used regular and irregular past-tense forms in their normal speech. To their surprise, and contrary to their predictions, the researchers discovered that the girls over-regularized far more than boys.

They then investigated which verbs the girls made the mistakes on, and found an association between the number of similar sounding regular past-tense verbs, and the particular verb that was over-regularized. For example, girls tended to say “holded” or “blowed” because many other rhyming verbs use the regular past-tense form (such as folded, molded, and flowed, rowed, stowed, respectively).

The researchers say this kind analogy-based processing suggests the girls

were relying on their declarative memory to create the past tense. “This memory is not just a rote list of words, but underlies common patterns between words, and can be used to generalize these patterns,” Ullman said. “In this case, the girls had memorized the regular past tenses of rhyming words, and were generalizing these patterns to new words, resulting in over-regularization errors” such as “holded” and “blowed”.

In contrast, for the boys there was no association between the number of similar sounding regular past-tense verbs, and the particular verbs that were over-regularized. So the boys did not make more over-regularizations on verbs like “holded” or “blowed” that have many rhyming regular past-tenses. This suggests, Ullman said, that the boys were not forming these words in declarative memory, but were probably using the rule-governed system to combine verbs with –ed endings.

Other types of evidence also suggest that adult women tend use declarative memory more than adult men do in their use of language, Ullman said. “Although the two sexes seem to be doing the same thing, and doing it equally well, they are using two different neurocognitive brain processes to do it,” Ullman said. “This is a novel and exciting finding.”

Source: Georgetown University Medical Center

Citation: Study of language use in children suggests sex influences how brain processes words (2006, November 27) retrieved 27 April 2024 from <https://medicalxpress.com/news/2006-11-language-children-sex-brain-words.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.