Lefty, righty brains count on same area for numbers

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Credit: CC0 Public Domain

Lefties and righties may put pen to paper from different sides of the page, but when it comes to numbers, everything adds up using the same point in the brain, according to a recent Western study. The findings offer one more clue in toward helping kids who struggle with numerical and math skills.

In a recently released registered report titled "Does writing handedness

affect neural representation of symbolic number? An fMRI Adaptation Study," researchers showed that the brain's location for processing numbers is the same for both right- and left-handed individuals.

For their study supported by BrainsCAN, Western researchers Celia Goffin, Moriah Sokolowski, Michael Slipenkyj and Daniel Ansari compared the brain activity of both left-handed and right-handed participants during a task involving numbers, explained Goffin, a developmental psychology Ph.D. student and first author of the study.

With only 10 percent of the world's population identified as left-handed, previous studies typically relied on right-handed participants to learn how the brain processes numbers. For this study, however, researchers focused on left-handers to determine if they learned to use a different area of their brain to process numbers.

"The study replicated previous results from only right-handers showing a left-lateralized response to symbolic numbers in the brain," said Ansari, an Education and Psychology professor and senior author of the study. "In this study, we thought we might find that right-handers recruit the left side of their brain while left-handers use the right side of their brain for numbers—but this was not the case."

Celia Goffin, a Western PhD student in Developmental Psychology, found the brains of left-handed and right-handed people process numbers in the same way. Credit: University of Western Ontario

The brain's ability to understand that a number represents a quantity is processed in a specific region of the brain known as the intraparietal sulcus (IPS). When a person is viewing numbers, the left IPS becomes activated. Understanding why it's activated on the left side of the brain, as opposed to the right or a combination of both, is an area that researchers are still investigating.

"When you are a kid learning numbers, you are practicing them, tracing them and drawing numbers over and over again," Goffin said. "Our hypothesis was, through the process of this practice with writing

numbers, that this in some way shapes how numbers are represented in the brain."

For the study, Goffin used functional magnetic resonance imaging (fMRI) to compare brain activation of right- and left-handed participants while they observed numbers.

"We did not find differences between the left- and right-handers when they were compared," Ansari said. "These data suggest that handwriting experience cannot explain why symbolic numbers are processed in the brain's left hemisphere."

"It's a big question in our field of how the brain is able to take arbitrary symbols and assign meaning to them in the form of numbers," Goffin said. "If we understand this better, it could eventually help in developing interventions for children who have difficulties forming these representations of numbers."

This study is the first registered report by Ansari's team; the full paper will be published in the journal *Cortex* later this year.

Numerous journals across psychology, psychiatry and neuroscience have launched an initiative called registered reports, a process where studies are peer-reviewed before the study is conducted and data collected, with the goal of improving the methodology and analysis plan of the proposed study and reducing so-called publication bias.

More information: Celia Goffin et al. Does writing handedness affect neural representation of symbolic number? An fMRI Adaptation Study, *Cortex* (2019). DOI: 10.1016/j.cortex.2019.07.017

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