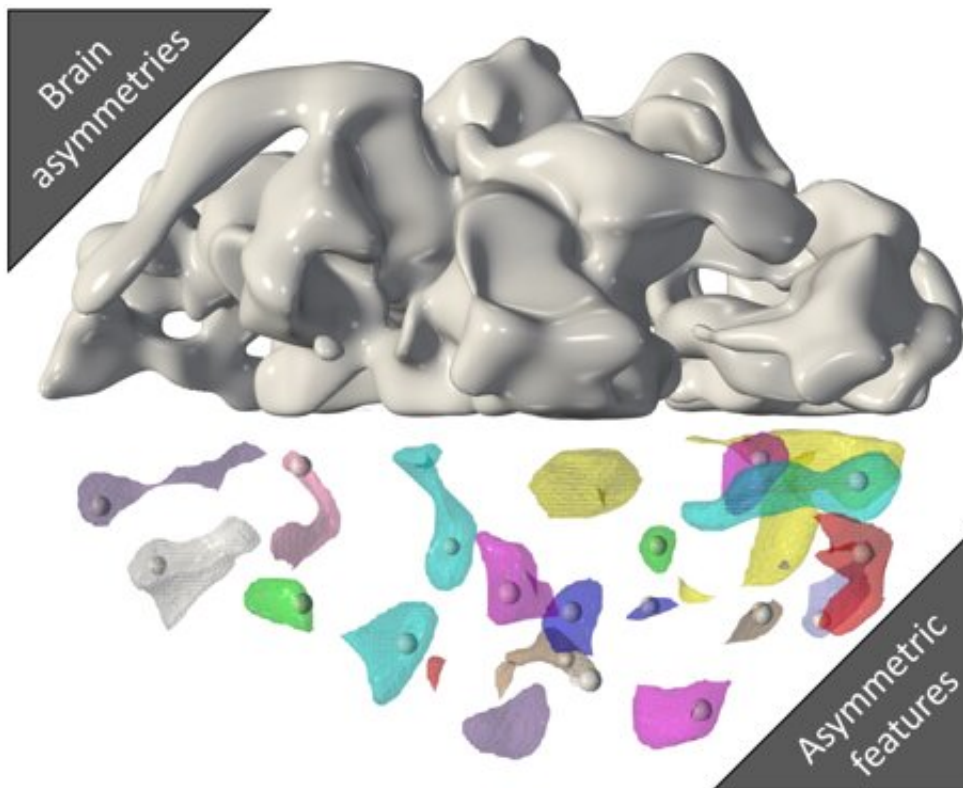


How left brain asymmetry is related to reading ability

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Brain structure asymmetries are shown, as defined with a novel topological approach that identifies relevant features (left) from noise within asymmetric structures (right). Credit: Federico Iuricich (CC-BY 4.0, creativecommons.org/licenses/by/4.0/)

Researchers led by Mark Eckert at the Medical University of South Carolina, United States, report that two seemingly opposing theories of

language processing are both correct. Publishing in the open-access journal *PLOS Biology* on April 5th, the study shows that greater left-brain asymmetry can predict both better performance and average performance on a foundational measure of reading ability, depending on whether analysis is conducted over the whole brain or in specific regions.

Being able to fluently convert written symbols into [speech sounds](#) is a basic aspect of reading that varies from person to person and is difficult for individuals with conditions like dyslexia. While structural asymmetries between the right and left sides of the [brain](#) seem to be related to this ability, exactly how remains a mystery. Using structural MRI from over 700 children and adults, along with a reading test of pseudo-words and a mathematical method called persistent homology, the new study tested two opposing theories of how brain asymmetries should affect phonological processing.

The researchers developed a way to determine levels of brain asymmetry from the MRI images using persistent homology. They found that when the location of each individual's most asymmetric region was considered, greater left-brain asymmetry was related to better pseudo-word reading ability. This supports a cerebral lateralization hypothesis. At the same time, they found that greater left-asymmetry in specific regions—including a motor planning region called Brodmann Area 8, and a performance monitoring region called the dorsal cingulate—were associated with average reading ability, which supports a canalization hypothesis.

Of note was that pseudo-word reading ability was not consistently related to asymmetries in [brain regions](#) known to be important for specific language functions. How left/right structural asymmetries affect other types of reading abilities and influence the functions of a left language network remains to be studied.

Eckert adds, "Our findings indicate that, at a [population level](#), structural brain asymmetries are related to the normal development of a speech sound processing ability that is important for establishing proficient reading."

More information: Eckert MA, Vaden KI Jr, Iuricich F, Dyslexia Data Consortium (2022) Cortical asymmetries at different spatial hierarchies relate to phonological processing ability. *PLoS Biol* 20(4): e3001591. doi.org/10.1371/journal.pbio.3001591

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