Researchers discover a biological marker of dyslexia

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(Medical Xpress)—Though learning to read proceeds smoothly for most children, as many as one in 10 is estimated to suffer from dyslexia, a constellation of impairments unrelated to intelligence, hearing or vision that make learning to read a struggle. Now, Northwestern University researchers report they have found a biological mechanism that appears to play an important role in the reading process.

"We discovered a systematic relationship between reading ability and the consistency with which the brain encodes sounds," says Nina Kraus, Hugh Knowles Professor of Neurobiology, Physiology and Communication. "Unstable Representation of Sound: A Biological Marker of Dyslexia," co-authored by Jane Hornickel, will appear in the Feb. 20 issue of *The Journal of Neuroscience*.

Recording the automatic brain wave responses of 100 school-aged children to speech sounds, the Northwestern researchers found that the very best readers encoded the sound most consistently while the poorest readers encoded it with the greatest inconsistency. Presumably, the brain's response to sound stabilizes when children learn to successfully connect sounds with their meanings.

Happily biology is not destiny. In prior work in Northwestern's Auditory Neuroscience Laboratory, Kraus and her colleagues found that the inconsistency with which the poorest readers encode sound could be "fixed" through training.

In that study, children with reading impairments were fitted for a year with assistive listening devices that transmitted their teacher's voice directly into their ears. After a year, the children showed improvement not only in reading but also in the consistency with which their brains encoded speech sounds, particularly consonants.

"Use of the devices focused youngsters' brains on the "meaningful" sounds coming from their teacher, diminishing other, extraneous distractions," said Kraus. "After a year of use, the students had honed their auditory systems and no longer required the assistive devices to keep their reading and encoding advantage."

People rarely have difficulty encoding vowel sounds, which are relatively simple and long, according to Kraus. It is consonant sounds—sounds which are shorter and more acoustically complex—that are most likely to be incorrectly categorized by the brain.

"Understanding the biological mechanisms of reading puts us in a better position to both understand how normal reading works and to ameliorate it where it goes awry," says Kraus.

"Our results suggest that good readers profit from a stable neural representation of sound, and that children with inconsistent neural responses are likely at a disadvantage when learning to read," Kraus adds. "The good news is that response consistency can be improved with auditory training."

Decades of research from laboratories worldwide have shown that reading ability is associated with auditory skills, including auditory memory and attention, the ability to rhyme sounds and the ability to categorize rapidly occurring sounds.