
RSNA Press Release

fMRI Depicts Multisensory Dysfunction in People with Dyslexia

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At A Glance

- For the first time, fMRI has been used to study multisensory processing in people with dyslexia.
- People with dyslexia process auditory and visual sensory cues differently than normal readers do.
- Up to 8 percent of American elementary school children may have dyslexia.

CHICAGO — Sights and sounds cross paths abnormally in the minds of dyslexic readers, according to the first functional magnetic resonance imaging (fMRI) study of multisensory processing in people with the disorder.

"Dyslexic readers appear to process auditory and visual sensory cues differently than do normal readers, and these differences may be the cause of their difficulty in reading," said the study's lead author, Jonathan H. Burdette, M.D., assistant professor of neuroradiology and associate in the department of bioengineering at Wake Forest University in Winston-Salem, N.C. Dr. Burdette presented his research today at the 89th Scientific Assembly and Annual Meeting of the Radiological Society of North America (RSNA).

Dyslexia is a learning disability characterized by difficulty with word recognition. Up to 8 percent of American elementary school children may have the reading disorder, according to the National Institute of Mental Health. While the underlying neurological basis for dyslexia is still unclear, previous studies have shown that people with dyslexia cannot distinguish the sounds in spoken words. However, reading is a complex mental task, requiring a series of interactions among areas of the brain that control auditory, visual, language and memory processing.

"Reading is fundamentally a multisensory task, where the association between sounds and letters is a critical step," Dr. Burdette said.

Dr. Burdette and colleagues administered fMRI exams to 30 dyslexic readers and 30 normal readers as they performed three matching tasks—an auditory task, a visual task and a multisensory task—consisting of consonant-vowel pairs. The researchers found that during the auditory matching task the dyslexic readers showed increased activity in the visual pathway of the brain, while that same region deactivated in the normal readers. The dyslexic readers' increased activation patterns in the visual pathway corresponded to poorer performance on the matching task.

"Currently, there are numerous treatment strategies for dyslexic readers, and many of these strategies have only cursory scientific evidence supporting their potential benefit," Dr. Burdette said. "If abnormal cross-modal sensory processing truly is a fundamental deficit in dyslexia, then it would follow that strategies based on improving the interaction between the senses might help those suffering from this prevalent disorder."

Dr. Burdette's co-authors are Paul J. Laurienti, M.D., Ph.D., Lynn Flowers, Ph.D., Robert Kraft, Ph.D., Joseph Maldjian, M.D., and Frank B. Wood, Ph.D. (J.B. is a GERRAF fellow and receives salary support from General Electric.)

RSNA is an association of more than 35,000 radiologists, radiation oncologists and related scientists committed to promoting excellence in radiology through education and by fostering research, with the ultimate goal of improving patient care. The Society is based in Oak Brook, Ill.

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[Altered Auditory-Visual Interactions in Dyslexia: an fMRI Study](#)

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