

# Dyslexia Research on Fast ForWord

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[Neural correlates of rapid auditory processing are disrupted in children with developmental dyslexia and ameliorated with training: An fMRI study \\*](#)

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Children with developmental dyslexia underwent remediation using Fast ForWord Language (Scientific Learning Corporation, Oakland, CA). Four children used the program at home, and 18 used the program at their school.

**Abstract.** Purpose: Developmental dyslexia, characterized by unexpected difficulty in reading, may involve a fundamental deficit in processing rapid acoustic stimuli. Using functional magnetic resonance imaging (fMRI) we previously reported that adults with developmental dyslexia have a disruption in neural response to rapid acoustic stimuli in left prefrontal cortex. Here we examined the neural correlates of rapid auditory processing in children.

**Methods:** Whole-brain fMRI was performed on twenty-two children with developmental dyslexia and twenty-three typical reading children while they listened to non-linguistic acoustic stimuli, with either rapid or slow transitions, designed to mimic the spectro-temporal structure of consonant-vowel-consonant speech syllables.

**Results:** Typical-reading children showed activation for rapid compared to slow transitions in left prefrontal cortex. Children with developmental dyslexia did not show any differential response in these regions to rapid versus slow transitions. After eight weeks of remediation focused primarily on rapid auditory processing, phonological and linguistic training the children with developmental dyslexia showed significant improvements in language and reading skills, and exhibited activation for rapid relative to slow transitions in left prefrontal cortex.

**Conclusion:** The presence of a disruption in the neural response to rapid stimuli in children with developmental dyslexia prior to remediation, coupled with significant improvement in language and reading scores and increased brain activation after remediation, gives further support to the importance of rapid auditory processing in reading development and disorders.

\* Paula Tallal is a co-founder of Scientific Learning Corporation, the company that developed the Fast ForWord training program used in this study. While she contributed to the conceptualization and experimental design of the study, she did not participate in any aspect of data collection, subject training, or data analysis

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[Neural deficits in children with dyslexia ameliorated by behavioral remediation: Evidence from functional MRI](#)

**Behavioral Results. The children with dyslexia improved significantly in reading ability,** as measured by tests of real word reading (Word Identification), pseudo-word decoding (a measure of phonological awareness) (Word Attack), and passage comprehension (Table 2). **The improvements on these three tests raised the dyslexic group's scores into the normal range (>85).** Children with dyslexia also improved in oral language ability and rapid naming. The extent of improvement was significant as measured by paired t tests for each test (Table 2).

**Conclusions:** This study demonstrates several important findings. These results demonstrate, first, that it is possible to visualize changes in brain function after reading remediation. Second, these results showed that the specific remediation program, **Fast ForWord Language, resulted in changes in brain function that include left hemisphere language regions, right hemisphere homologues, and a number of other brain areas.** Some of the changes brought the brain function of children with dyslexia closer to that seen in normal-reading children, whereas other changes seemed to be compensatory in nature. Finally, these results demonstrated that the commonly observed dysfunction in dyslexics' left temporo-parietal brain function (5) can be at least partly ameliorated through behavioral remediation. Children between 8 and 12 years old with dyslexia can show increased activity in this region after training, and the extent of the increases seen in this region correlated with the extent of improvement in language ability.....