New Hampshire
Department of Education
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A Resource Guide for Dyslexia and Other Related Disorders

PREFACE

The New Hampshire Department of Education recognizes the importance of learning to read and write for all students. Through the passing of House Bill 1644 and New Hampshire Revised Statutes Annotated (RSA) 200:62, the New Hampshire Department of Education, in conjunction stakeholders, has developed this resource guide for dyslexia and other related disorders. This handbook includes information about neurological research facts, academic interventions, evidenced-based strategies, classroom accommodations, and technology tools to assist teachers and specialists with providing supplemental assistance and instruction for children who exhibit characteristics of dyslexia or dysgraphia. The intention of this guide is to serve as a resource for administrators, teachers, specialists, and families to access information and gain knowledge to support learning experiences for children in literacy.

RSA 200:62
Section 20062 Dyslexia Resource Guide_.htm

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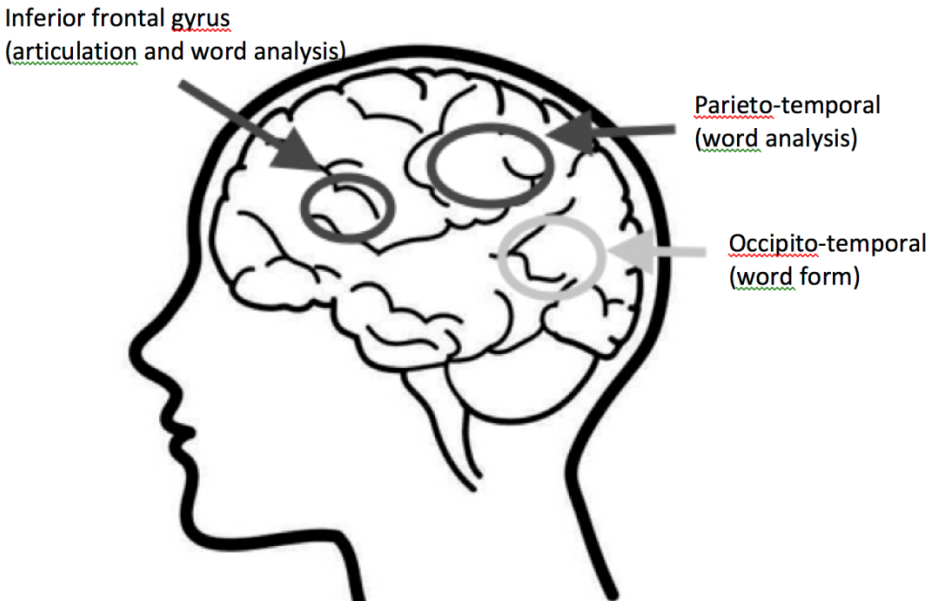
The Neural Basis of Dyslexia

Researchers across the country have been able to study the neural systems of the reading brain by using functional magnetic resonance imaging (fMRI). Studies have compared the brain activity while reading of typically developing readers with those of individuals with a reading disability. Results have consistently shown that there are disruptions in the activity in the left hemisphere of the brain. Reading is mapped onto the language areas of the brain. Our brain puts those systems to work for reading, and our brains adapt to reading tasks. The primary areas of the brain used for reading are the occipito-temporal system, the parieto-temporal system, and the inferior frontal gyrus.



While reading, the brains of impaired readers are not as activated in the parieto-temporal area of the brain, which is the area where phonemic processing occurs. There is increased activity in the inferior frontal gyrus in the front of the brain, which is not an efficient area for decoding, and not an area used by typically developing readers for decoding.

Our brain systems rely on efficient connectivity between the different areas of the brain in order to read fluently. Connectivity analysis has revealed that the brains of individuals with dyslexia do not form the varied and extensive connections between the brain's reading systems we see in the brains of typically developing readers.

Connecting Research to Practice

Numerous studies around the country and around the world have shown that explicit instruction in the alphabetic principle for reading and spelling, including phonemic awareness and phonics, results in gains in reading skills. A comparison of fMRIs before and after such interventions shows increased activation in the reading systems of the brain.

With instructional treatment, early elementary children through grade three with reading impairments were more likely to increase brain activity in the same areas of the left hemisphere as typically developing readers (Aylward et al., 2003; Berninger, 2013; Pugh et al., 2013; Richards et al., 2013; Shaywitz et al., 2006).

All ages of individuals with reading impairments showed a difference in brain activation after reading intervention. Upper elementary and middle school children showed some increases in activity similar to typically developing readers and also showed some compensation in the right hemisphere (Pugh et al., 2013; Richards et al., 2013). Adult individuals with dyslexia, after instructional treatment, showed increased activity in compensatory areas in the right hemisphere.

Dr. Sally Shaywitz and Dr. Bennett Shaywitz of Yale University have been pioneers in research regarding struggling readers. Shaywitz et al. (2004) conducted a study that compared pre and post brain imaging results of students who had a reading disability. The experimental group of students received an explicit, systematic phonological intervention for 50 min. per day for eight months. The intervention had a lasting influence on the reading systems of the brain. In particular, the occipito-temporal region, which is responsible for fluent reading, had continued to develop a year after the intervention ended.

Research done by Gebauer, D. et al. (2013) at the Medical University of Graz in Austria found increased activation in the reading centers of the brain in the left hemisphere following five weeks of intervention using a morpheme-based strategy.

Current research has begun to examine the connectivity between the reading systems of the brain. Strong connections help individuals read more fluently and efficiently. Koyama et al. (2013) examined changes in connectivity among the reading systems in the brain after reading intervention. MRI data was gathered at the New York University Center for Brain Imaging. The researchers found increased connectivity between the parietal and frontal regions of the brain in students with dyslexia who received intervention.

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