Reading in the brain

The brain uses many different areas to be able to read. Each area has a different job:

- **Language & Speech**
- **Frontal**
- **Parietal**
- **Temporal**
- **Lesion & Test**

In dyslexia, these parts of the brain are less engaged than usual during reading.

Brain plasticity in dyslexia

We discovered that there is a systemic, whole-brain difference in how dyslexic brains learn (called "adaptation").

We find this difference in neural plasticity everywhere, not just in reading areas.

Dysfunction of neural adaptation is a core biological difference that may explain why some children struggle to learn to read.

Tyler Perrachione, PhD, is an assistant professor at Boston University. His laboratory studies how brain systems for language and speech are impacted in learning disorders. His doctoral training was supported by a Graduate Research Fellowship from the NSF.

Neuroscience Discoveries in Reading and Dyslexia

Reading difficulty is not a matter of intelligence

Some students are highly intelligent, but do not display strong reading skills.

Could such students have undiagnosed reading difficulty?

These students' brain scans reveal that their brains look like those of students with dyslexia.

Reading intervention changes the dyslexic brain

How does reading intervention help children with dyslexia?

Parts of the brain responsible for reading become more active after reading intervention.

After interventions, the brains of children with dyslexia look more like the brains of typical readers.

Brain scans can predict reading improvement

Why do some children show progress while others continue to struggle with reading?

Using fMRI brain scans, we can predict with up to 92% accuracy which children with dyslexia will show gains in reading skills.

Why Do Students Struggle with Reading and Math?

Affecting 1 in 10 children, dyslexia is the most common type of learning disability of reading development.

Many students with dyslexia also exhibit dyscalculia, or math disability.

Science education needs both...

Science, Technology, Engineering, and Math (STEM) education demands both strong math and strong reading skills.

Difficulties in math and reading prevent many students from being successful in STEM education.

...But many struggle with both

Our new NSF research project uses brain scans to discover how math and reading happen in the brains of children with dyslexia, dyscalculia, or both disorders.

John Gabrieli, PhD, is a professor at the Massachusetts Institute of Technology, and faculty at Harvard Medical School and Harvard Graduate School of Education. His laboratory studies neural mechanisms of memory, cognition, and emotion in the human brain, and how those mechanisms are disrupted in neurological and psychiatric disorders. His research has been supported by numerous research grants from the NSF.

Joanna Christodoulou, EdD, is an assistant professor at MGH Institute of Health Professions. Her laboratory studies risk factors and optimizes interventions for struggling students. Her research is supported by the NSF EHR Core Research (ECR) program.