

Distinguished Fellowship Award Brief

An interdisciplinary approach to improving reading comprehension in high-functioning individuals with autism (2015-2017)

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Research Question: Can brain stimulation improve the outcomes of a reading comprehension training intervention in high-functioning individuals with autism?

Interdisciplinary Approach: This fellowship project bridges education and cognitive neuroscience interventions to improve reading comprehension in individuals with autism.

Potential Implications of Research: This project will inform the development of future literacy interventions and how they can better target the underlying neurobiology in autism.

You are sitting in a quiet room with hundreds of other students. The next section in the SAT is reading comprehension: your worst subject. You read the first text passage carefully, trying to remember the important details. But the first comprehension question asks about something you don't remember reading, so you go back and reread more slowly. By now 10 minutes have passed and you're still on the first question. You're running out of time, and if you don't do well on this test, your chances of getting into a good college are shot.

Reading comprehension is a complicated task, requiring not just understanding individual words and sentences but also rapidly assimilating concepts together. For individuals with autism, this process is even more difficult. In this project we are attempting to improve reading comprehension for these individuals via a unique reading intervention that combines empirical research from the fields of education and cognitive neuroscience.

Autism spectrum disorder (ASD) affects one in every 68 children. Comprehension deficits are thought to arise from difficulties with integrating the meanings of various pieces of information, a process called *semantic integration*. We will attempt to improve semantic integration in readers with ASD by developing an intervention based on *The Reading Edge*, a literacy program embedded in the Success for All education model. The Reading Edge is shown to improve literacy outcomes in disadvantaged students. More importantly, it emphasizes semantic integration skills such as using background knowledge to provide context. And because it targets the very skills that readers with ASD struggle with, it may help improve their comprehension.

We will develop a 5-day intervention based on The Reading Edge for readers with ASD. This intervention will be paired with concurrent *transcranial direct current stimulation (tDCS)* – a brain stimulation technique in which a weak electrical current is applied to the scalp – to boost reading outcomes even further. tDCS will be used to stimulate the brain areas involved in semantic integration while readers practice this skill. Half of the participants will receive tDCS and half will receive no stimulation. We expect improved comprehension post-intervention in both groups, but larger gains in the tDCS group. By recording brain activity pre- and post-training, we will examine how neural function is modulated by learning and tDCS.

If tDCS can improve literacy training outcomes, therapies combining training with tDCS could easily adapt to individualized tutoring sessions. Characterizing how literacy training and tDCS affect the brain in students with ASD – who may not learn or respond to tDCS in “typical” ways – could also inform future interventions. Improving reading comprehension in students with ASD would have carry-over effects on school, work, and everyday life. Not to mention making the reading comprehension section of the SATs that much less anxiety-provoking.

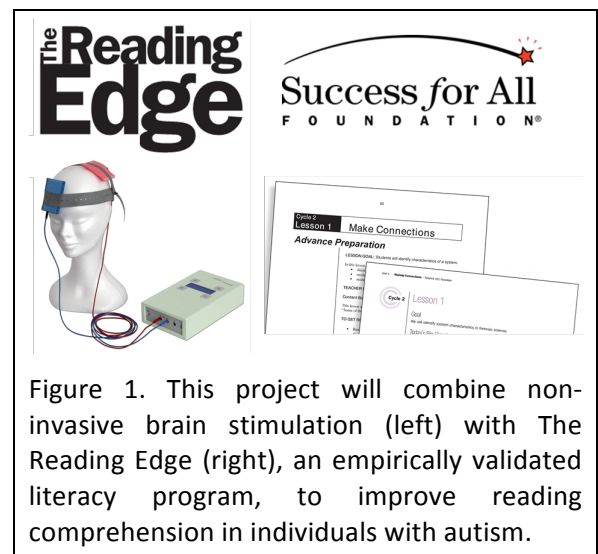


Figure 1. This project will combine non-invasive brain stimulation (left) with The Reading Edge (right), an empirically validated literacy program, to improve reading comprehension in individuals with autism.