

Brain stimulation reduces dyslexia deficits

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Illustration of dyslexia. Credit: Silvia Marchesotti

Restoring normal patterns of rhythmic neural activity through non-invasive electrical stimulation of the brain alleviates sound-processing deficits and improves reading accuracy in adults with dyslexia, according to a study published September 8, 2020 in the open-access journal *PLOS Biology* by Silvia Marchesotti and Anne-Lise Giraud of the University of Geneva, and colleagues.

Dyslexia is a frequent disorder of reading acquisition that affects up to 10% of the population, and is characterized by lifelong difficulties with written material. Although several possible causes have been proposed for [dyslexia](#), the predominant one is a phonological deficit, i.e., a difficulty in processing language sounds. The phonological deficit in dyslexia is associated with changes in rhythmic or repetitive patterns of neural activity, specifically the so-called "low-gamma" (30-Hz) oscillations, in a sound-processing region of the brain called left auditory cortex. But a [causal relationship](#) between these oscillations and the ability to process phonemes had not been established in previous studies.

To address this question, the researchers applied transcranial alternating current stimulation (tACS) over left auditory cortex in 15 adults with dyslexia and 15 fluent readers for a period of 20 minutes. This intervention immediately improved phonological processing and reading accuracy in the dyslexia group, specifically when 30 Hz (but not 60 Hz) stimulation was used. Interestingly, the beneficial effect on phonological processing was most pronounced in those individuals who had poor reading skills, whereas a slightly disruptive effect was observed in very good readers.

According to the authors, the results demonstrate for the first time the causal role of low-gamma oscillatory activity in phonemic processing. The findings may pave the way to non-invasive therapeutic interventions

aimed at normalizing oscillatory function in [auditory cortex](#) and improving phonological processing in individuals with dyslexia.

Dr. Marchesotti adds "The next steps for us are to investigate whether normalizing oscillatory function in very young children could have a long-lasting effect on the organization of the reading system, but also to explore even less invasive means of correcting oscillatory activity for instance using neurofeedback training".

More information: Marchesotti S, Nicolle J, Merlet I, Arnal LH, Donoghue JP, Giraud A-L (2020) Selective enhancement of low-gamma activity by tACS improves phonemic processing and reading accuracy in dyslexia. *PLoS Biol* 18(9): e3000833.
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