Effects of Transcranial Direct Current Stimulation (tDCS) on Cortical Processing of Speech

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Introduction

Noninvasive brain stimulation is a promising tool for ameliorating various brain functions. However, it is largely unknown how noninvasive stimulation modulates brain plasticity even in the healthy brain.

Study Objective/Aim/ Contribution

To examine possible neurophysiological changes as a result of transcranial direct current stimulation (tDCS).
The overarching goal is to examine the potential of using tDCS to treat various disorders related to auditory processing and communication.

Methods:

Participants:
17 adolescents and young adults ages 19-27.

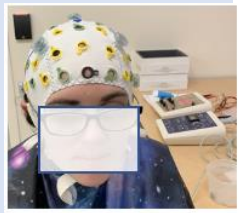
Methods:

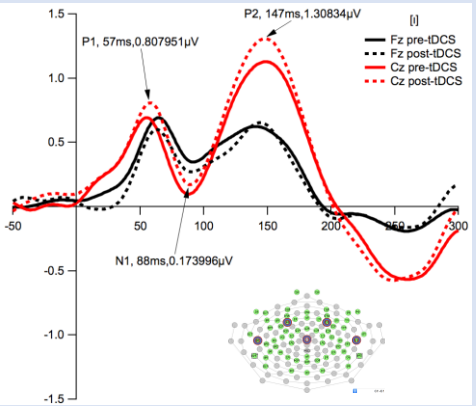
Stimuli : English vowels /ɪ/ (as in the word bit) and /ɛ/ (as in the word bet) in an oddball paradigm.
In one block, /ɪ/ was the frequent/standard and presented 1000 times, /ɛ/ was the deviant and presented 200 times. In the other block, /ɛ/ and /ɪ/ were switched.

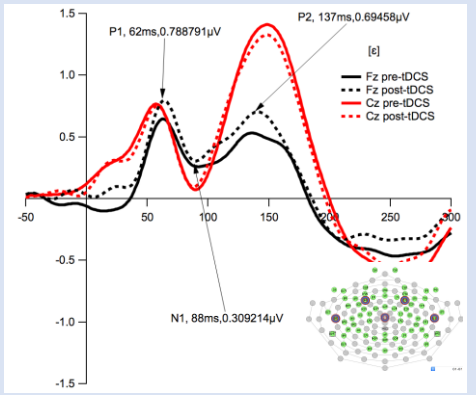
Event-related potentials (ERPs): The ERPs were time-locked at the onset of each trial and recorded before and after the tDCS session using a 65-channel system.

High-Definition Transcranial Direct Current Stimulation Four fronto-central scalp region electrodes (F3, F4, T7, T8 as anodes and Cz as the cathode)
Intensity: 0.25 mA each anode electrode, return at Cathode (Cz): 1mA
Duration of stimulation: 10 minutes

Results







Results

We found a main effect of tDCS in P2 amplitude. The amplitude of P2 was larger at Fz for /i/, and at Cz for /ɛ/ post stimulation.
The interaction between stimulus and tDCS suggests that presentation order or the phonetic features of the speech (e.g., underspecification) may also play a role in neural plasticity.

Conclusion

Our findings suggest the possibility of utilizing anodal tDCS as a treatment within populations characterized by phonological processing deficits and other auditory processing disorders.
Future studies need to examine the efficacy of multiple tDCS sessions and the long-term effect of tDCS treatment.

Reference upon request:
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