No effects of cerebellar and spinal DC stimulation on P300 component during auditory oddball task

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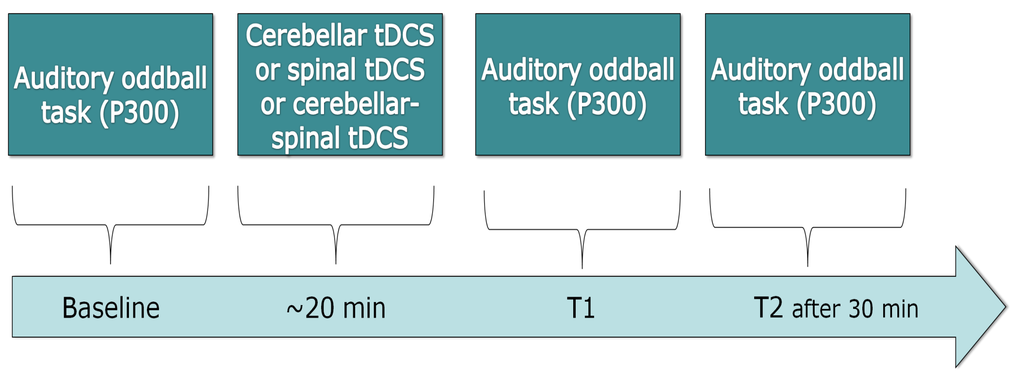
Objective

To investigate the effects of cerebellar and spinal direct current stimulation (tDCS) on the P300 component elicited by the auditory oddball task.

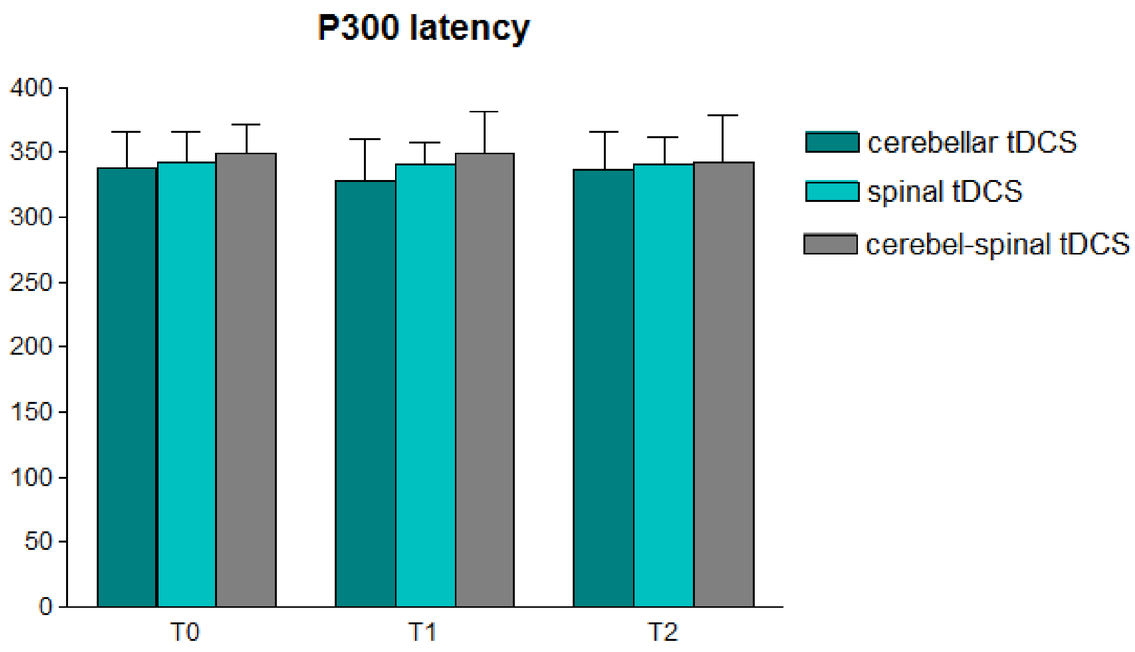
Material

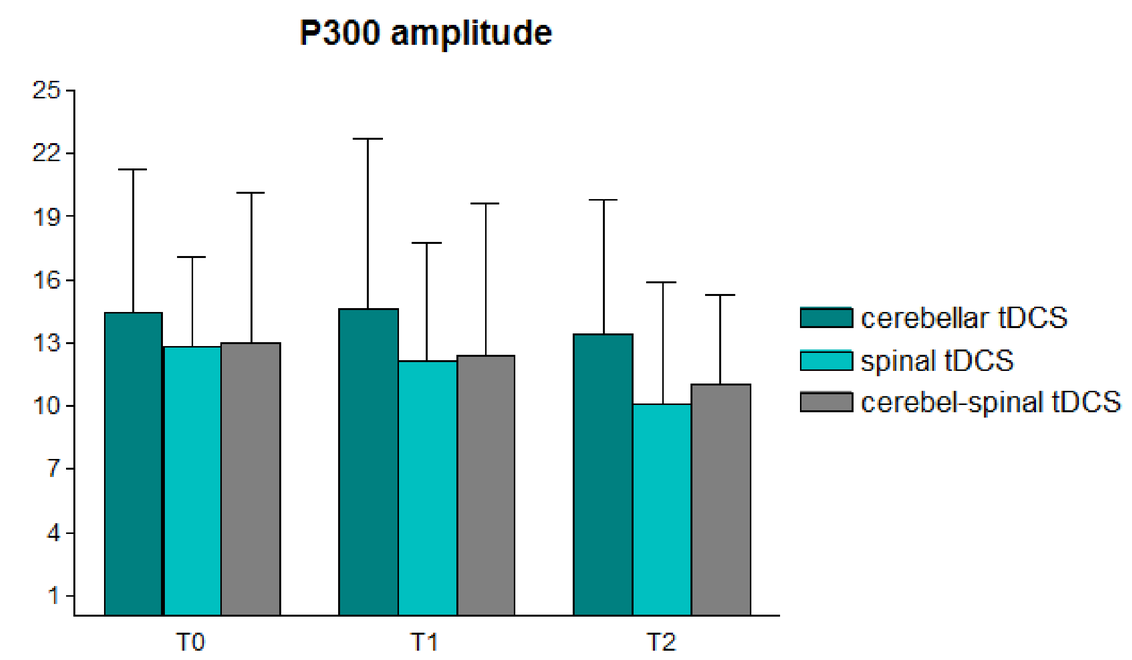
The oddball discrimination paradigm consisted of the presentation (binaurally through headphones) of discrete stimulus tones at an intensity of 75 dB and duration of 100 milliseconds. Two blocks of 100 stimuli were presented, 25 target tones (2000 Hz) and 75 non-target tones (1000 Hz) with a fixed ISI of 1 second. Participants were required to count only to the target stimuli.



Methods

Forty healthy subjects (15 M and 25 F, aged 20-50 years) were enrolled and randomly assigned to one of four stimulation conditions. First group (n=10) received anodal cerebellar tDCS with the reference electrode over the right shoulder; second group (n=10) anodal spinal tDCS with the reference electrode over the right shoulder; third group (n=10) anodal spinal with cathodal cerebellar tDCS; forth group (n=10) sham stimulation. Stimulation intensity was set at 2mA and delivered for 20 minutes. Before (T0) and after five (T1) and thirty minutes tDCS (T2), P300 were measured by attaching an electrode to Cz area according to the International 10-20 System.





Results

We found that tDCS failed to induced significant differences in P300 latency [(mean±SD) cerebellar tDCS: T0 337.88±28.49 vs T1 328.46±30.91 vs T2 335.92±29.31 p>.05; spinal tDCS: T0 342.30±22.96 vs T1 340.30±17.08 vs T2 339.84±22.09 p>.05; cerebellar-spinal tDCS: T0 348.59±22.73 vs T1 349.22±31.65 vs T2 341.77±36.08 p>.05] and P300 amplitude (cerebellar tDCS: T0 14.46±6.8 vs T1 14.6±8.14 vs T2 13.45±6.38 p>.05; spinal tDCS: T0 12.79±4.33 vs T1 12.14±5.65 vs T2 10.08±5.83 p>.05; cerebellar-spinal tDCS: T0 12.95±7.16 vs T1 12.37±7.29 vs T2 11.03±4.29 p>.05).

Discussion

Data from our study showed that tDCS had no significant effects on P300 component probably because competing mechanisms of inhibitory and executory mechanisms in several brain region may be at play when tDCS is operational, thus not allowing for a consistent outcome.

Conclusion

Further research should test the recent computational models combined with different stimulation parameters in order to better understand tDCS impact on EEG.