Can topical application of numbing cream improve the efficacy of sham TDCS?

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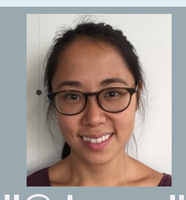

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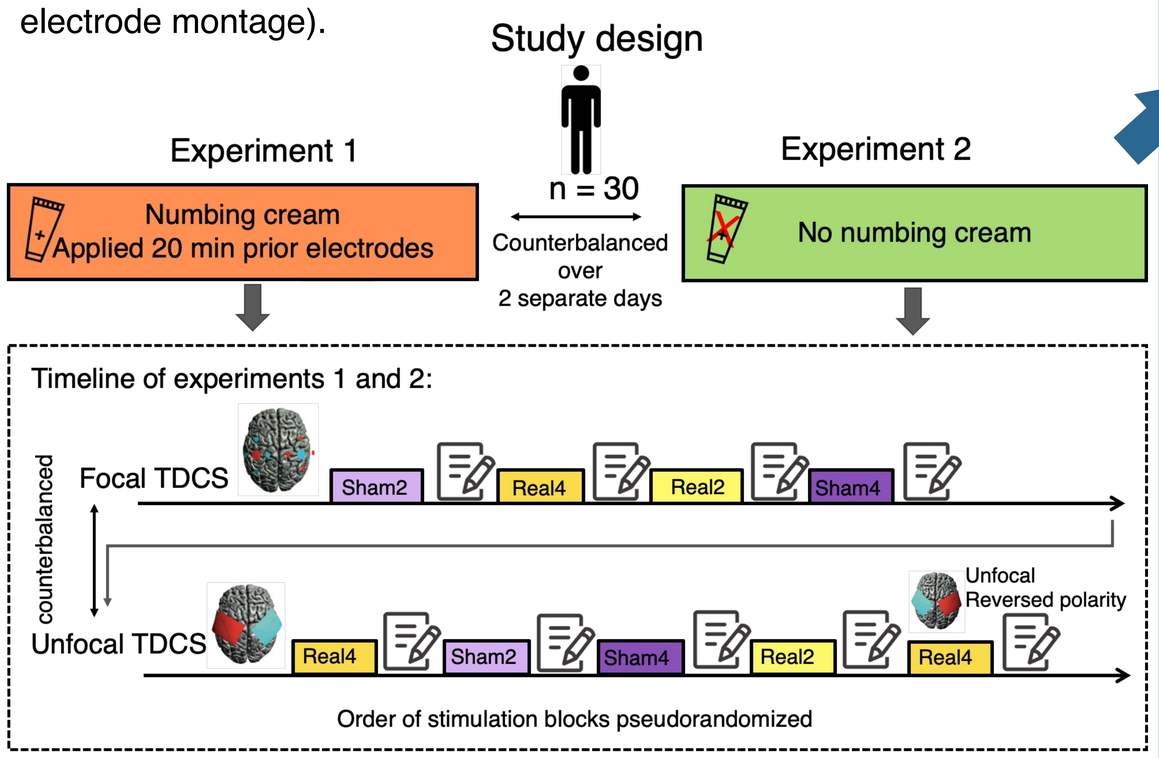
Introduction

Transcranial Direct Current Stimulation (TDCS) can be used to modulate intrinsic cortical activity by stimulating specific brain areas. However, TDCS also produces **peripheral somatosensory co-stimulation** that may contribute to the neuro-modulatory effects and hamper effective blinding.

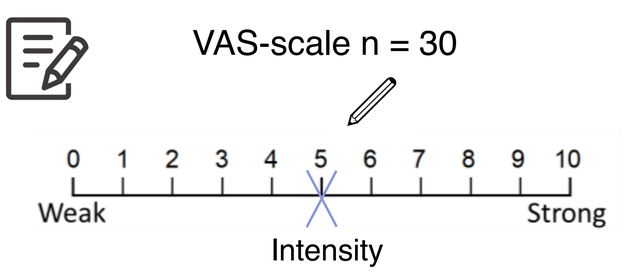
Aim: To assess how topical administration of numbing cream modifies the subjective tingling experience during sham relative to real TDCS in focal vs. non-focal and high- versus low-intensity stimulation settings.

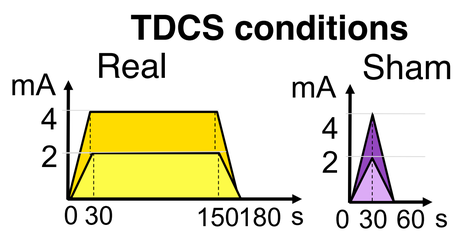
Methods

30 healthy participants received bihemispheric TDCS at 4 mA and 2 mA in blocks of 3 min. We compared "focal" TDCS (multi-electrode center-surround montage) with "standard" TDCS (7x5 cm square electrode montage).



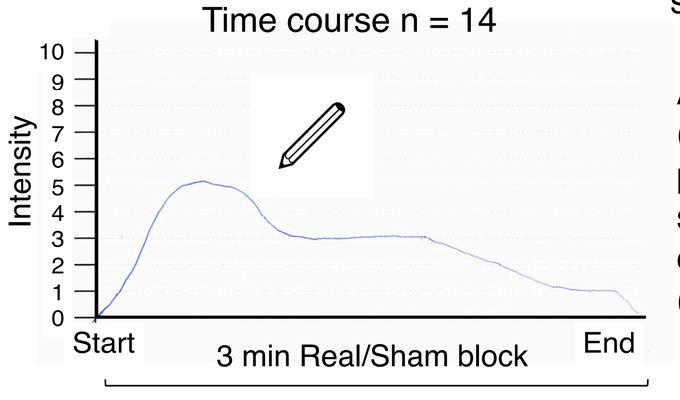
Psychometric assessment of sensory effects after each TDCS block:





Participants rated their sensation of tingling following each stimulation block with a 10-level VAS-scale.

Time course n = 14



A subset of the participants (n = 14) also indicated the progression of the sensation throughout the entire stimulation periods (180 s).

Statistical analysis:

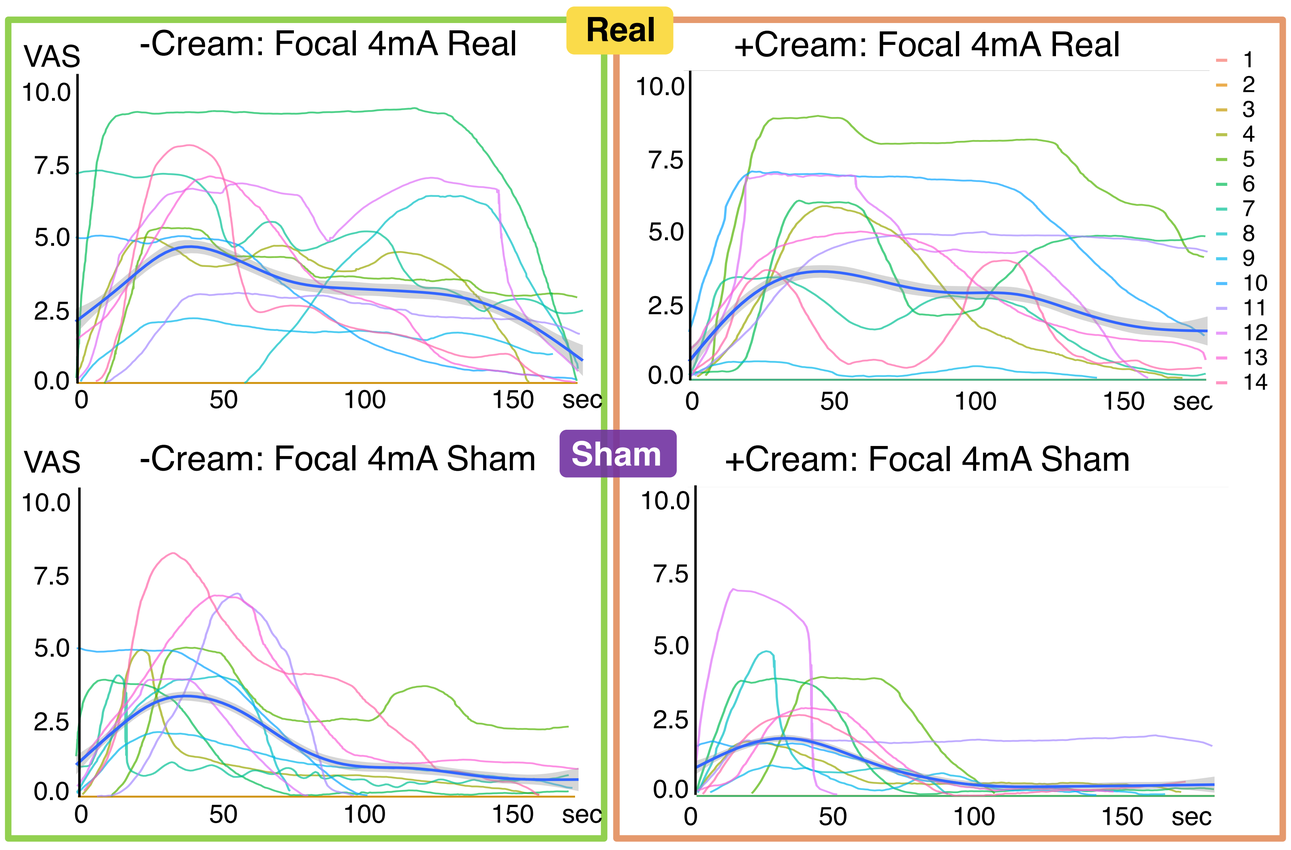
We used repeated measures ANOVA and non-parametric permutation tests ($p < 0.05$) to test for effect on VAS-score for following factors:

- Numbing cream
- Focality of stimulation
- Intensity of stimulation
- Sham/Real stimulation

Results

Topical application of numbing cream generally reduced VAS-ratings, but did not alter the relationship between focal vs. unfocal and real vs sham TDCS:

Tingling was more intense during real vs. sham, and focal vs. unfocal TDCS, when applying high-intensity stimulation



Temporal dynamics of tingling during 4mA focal TDCS, drawn by 14 participants: Thick blue line (smoothness estimation of data using "gam" +/- se) shows that the most marked tingling was during ramp-up for both real and sham. Patterns are similar regardless of application of numbing cream.

Conclusion

Numbing cream induces an overall attenuation of tingling experience but does not improve the matching of tingling sensation between corresponding sham and real TDCS conditions.

Acknowledgements
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