

# Investigating the Strength of Placebo Effects of Transcranial Direct Current Stimulation (tDCS) on Motor Training

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## Abstract

Transcranial direct current stimulation (tDCS) is a form of non-invasive brain stimulation that is thought to enhance cortical excitability that can affect motor learning during training. While tDCS can provide potential benefits to motor training, the extent to which placebo effects are responsible for these benefits is unknown. By comparing the amount of improvement in a motor task associated with sham (inert) stimulation from two different tDCS devices, I investigated whether the placebo effects varied based on device type.

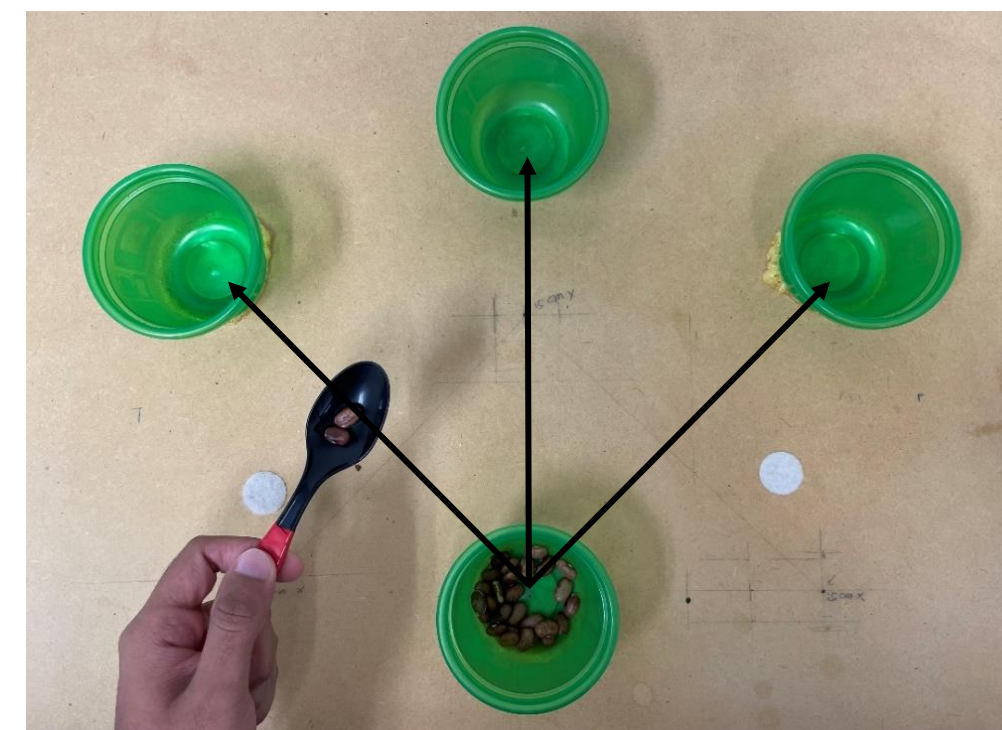
## Introduction

- In motor rehabilitation, tDCS is emerging as a complementary form of treatment that may improve the rate of motor learning.
- We are among the first to show a significant placebo effect associated with sham tDCS, when delivered via the traditional 1x1 device, such that more motor improvement is observed in a sham group than a control group.
- There are types of tDCS systems that are used clinically and in research: the more novel High-definition (HD) tDCS and the traditional 1x1 tDCS.



- We hypothesized that the placebo effect of HD-tDCS would be larger than that of the 1x1 device (i.e., more improvement with motor training).

## Materials & Methods



Performance on each trial was measured as trial time (faster times = better performance).

Participants completed 30 trials, 15 rotations.

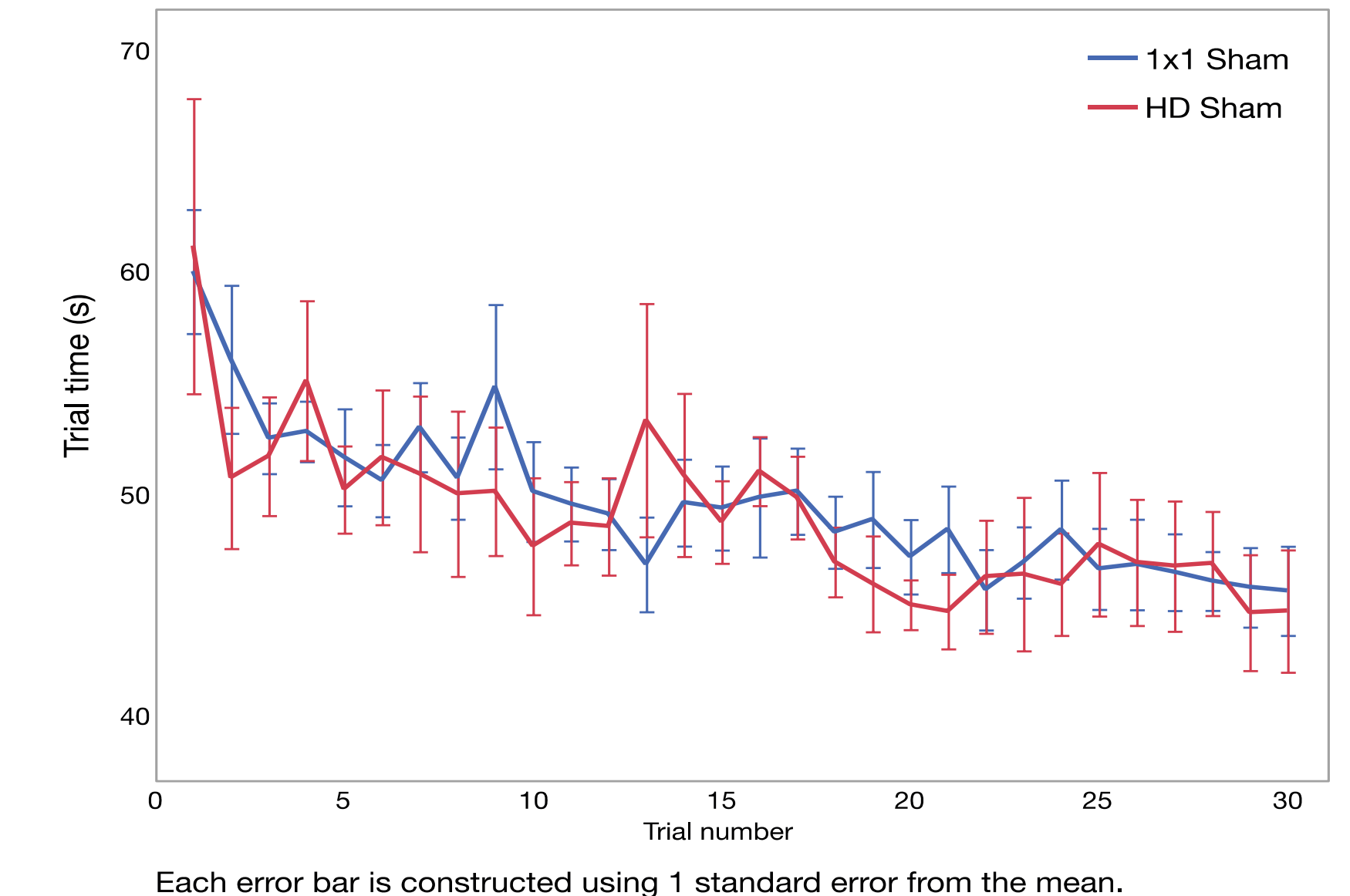
Participants were assigned to one of 2 groups:

- Sham stimulation with the 1x1 tDCS device (n=20)
- Sham stimulation with the HD-tDCS device (n=6)

Anode was placed over the hand region of the right (contralateral) primary motor cortex.

## Results

A linear mixed model showed no observable significant differences between the two sham groups, indicating that the placebo effect is not significantly different based on device type.



## Conclusion

Preliminary data suggests no significant difference between the magnitude of the placebo effect associated with the HD-tDCS and 1x1 tDCS devices. We acknowledge the small sample size in this FURI project, and we are continuing to collect data to further test this hypothesis.

## References

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# FURI

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