Peer Community In Registered Reports

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No evidence that transcranial random noise stimulation influences motion processing

*A recommendation by **Chris Chambers** based on peer reviews by **Samuel Westwood** of the STAGE 2 REPORT:*

Grace Edwards, Ryan Ruhde, Mica B. Carroll, Chris I. Baker (2025) No facilitatory effects of transcranial random noise stimulation on motion processing: A registered report. bioRxiv, ver. 3, peer-reviewed and recommended by Peer Community in Registered Reports.
https://www.biorxiv.org/content/10.1101/2025.03.18.643903v3

Submitted: 19 March 2025, Recommended: 20 May 2025

Cite this recommendation as:
Chambers, C. (2025) No evidence that transcranial random noise stimulation influences motion processing. *Peer Community in Registered Reports*, 101017. https://doi.org/10.24072/pci.rr.101017

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High frequency transcranial random noise stimulation (hf-tRNS) is a relatively new form of non-invasive brain stimulation thought to enhance neural excitability and facilitate processing in targeted brain areas. The evidence for the efficacy of hf-tRNS is mixed, so a high-powered test of the proposed facilitatory effects is of high value to the field. In the current study, Edwards et al. (2025) targeted the human middle temporal complex (hMT+), an area with a well-established critical role in global motion processing. The protocol was adapted from a study by Ghin et al. (2018) and focused on a sub-set of the original experimental conditions using a fully within-subjects design (n=42). Global motion processing was operationalised in terms of the coherence threshold for identification of the dominant direction of random-dot motion. The experiment tested the predicted facilitation of contralateral motion processing (reduced coherence threshold) during hf-tRNS to the left hMT+. In particular, the specificity of this effect was tested by comparison to a sham stimulation control condition and an active stimulation control condition (left forehead). By targeting a brain area with a well-established critical role in behaviour, the authors aimed to evaluate the replicability and specificity of the facilitatory effects of hf-tRNS. The results provided no evidence that hf-tRNS improves motion discrimination, with no significant facilitation of contralateral global motion processing following hf-tRNS to hM+, and no significant difference between hf-tRNS to hMT+ in comparison to either sham stimulation or forehead stimulation. These findings question the reliability and generalisability of tRNS as a neurocognitive intervention and call for a coordinated programme of high-powered research to establish the parameters under which such effects arise – ideally using the Registered Reports format to eliminate reporting bias. Following one round of in-depth review,

the recommender judged that the manuscript met the Stage 2 criteria and awarded a positive recommendation.

URL to the preregistered Stage 1 protocol: https://osf.io/bce7u **Level of bias control achieved:** Level 6. *No part of the data or evidence that was used to answer the research question was generated until after IPA.* **List of eligible PCI RR-friendly journals:**

- Advances in Cognitive Psychology
- Brain and Neuroscience Advances
- Cortex
- F1000Research
- In&Vertebrates
- Journal for Reproducibility in Neuroscience
- NeuroImage: Reports
- Peer Community Journal
- PeerJ
- Royal Society Open Science
- Studia Psychologica

References:

1. Ghin, F., Pavan, A., Contillo, A., & Mather, G. (2018). The effects of high-frequency transcranial random noise stimulation (hf-tRNS) on global motion processing: an equivalent noise approach. Brain Stimulation, 11, 1263–75.

2. Edwards, G., Ruhde, R., Carroll, M. B., & Baker, C. I. (2025). No facilitatory effects of transcranial random noise stimulation on motion processing: A registered report [Stage 2]. Acceptance of Version 3 by Peer Community in Registered Reports. https://doi.org/10.1101/2025.03.18.643903 https://doi.org/10.1101/2025.03.18.643903 https://doi.org/10.1101/2025.03.18.643903 https://doi.org/10.1101/2025.03.18.643903

Reviews

Evaluation round #1

DOI or URL of the preprint: https://www.biorxiv.org/content/10.1101/2025.03.18.643903v1.full.pdf

Version of the preprint: 1

Authors' reply, 13 May 2025

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Decision by Chris Chambers, posted 09 May 2025, validated 09 May 2025

Minor Revision

I have now obtained one evaluation of your Stage 2 submission from one of the reviewers who was involved at Stage 1, and I have decided that we can proceed on the basis of this review and my own reading of your manuscript.

I would like to commend you for an excellent study and an exemplary Stage 2 submission. There are only two minor issues to address: the first is a comment from the reviewer regarding consideration of limitations in the Discussion. The second is a request of my own: if you could please add a column to the right of the study design table that includes a simple description of observed outcome for each row (i.e. hypothesis confirmed or disconfirmed) – this will be a useful addition for readers.

Once these small issues are addressed I will issue a final Stage 2 recommendation.

Reviewed by Samuel Westwood, 23 April 2025

This is a robust and well-executed replication study that provides a valuable contribution to the literature on non-invasive brain stimulation (NIBS), particularly regarding the effects of high-frequency transcranial random noise stimulation (hf-tRNS) on visual motion processing. The clarity of the experimental rationale, adherence to preregistration principles, and overall transparency of reporting are refreshing.

I am broadly satisfied with the manuscript in its current form. However, I encourage the authors to reflect more deeply on the limitations of their design in the discussion. In particular, although the sample size (n = 42) was justified based on the available evidence and preregistered criteria, it may still be underpowered to detect potentially small effect sizes typical of tRNS interventions. This limitation does not undermine the study but rather highlights the need for further large-scale replications and meta-analyses to better estimate the true effect size of hf-tRNS. Additionally, this underscores the broader challenge in the field: whether the variability in tRNS outcomes is due to small, context-dependent effects or insufficient methodological sensitivity.

Overall, this is a strong and necessary replication that raises important questions about the robustness and generalisability of previously reported effects.

I always sign my reviews,

Samuel Westwood, PhD