





Comparison of the Effectiveness of Transcranial Electrical Brain Stimulation and Cognitive Rehabilitation on Working Memory in Students Aged 7–13 Years with Specific Reading Learning Disorder

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R e v i e w e r s

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1. Round 1

1.1. Reviewer 1

Reviewer:

The paragraph discussing working memory deficits in dyslexia appropriately references executive functioning impairments; however, the theoretical framework remains underdeveloped. The authors should elaborate on the specific working memory model underlying the study (e.g., Baddeley's multicomponent model) and explain which working memory subsystems are expected to be influenced by tDCS and cognitive rehabilitation. Without a stronger conceptual framework, the interpretation of findings remains overly general.

The manuscript repeatedly uses the terms “transcranial electrical brain stimulation,” “transcranial direct current stimulation,” and “electrical neuromodulation” interchangeably. This inconsistency creates conceptual ambiguity. The authors should clearly define whether the intervention was specifically tDCS, tACS, or another stimulation modality and maintain consistent terminology throughout the manuscript.

In the literature review section, the statement “studies have demonstrated that stimulation of the dorsolateral prefrontal cortex may improve executive functions” lacks sufficient detail regarding stimulation polarity, laterality, and neural

mechanisms. Since the present intervention targets the dorsolateral prefrontal cortex, the manuscript should explicitly justify electrode montage selection and discuss why this cortical region was chosen for dyslexic children specifically.

The review of previous studies is largely descriptive and lacks critical synthesis. For example, studies by Rouholamini et al. (2023), Battisti et al. (2024), and Constantino et al. (2025) are summarized independently without discussing methodological differences, inconsistencies in findings, or effect size comparisons. A stronger integrative review would better establish the novelty of the current investigation.

The Results section reports statistically significant findings; however, confidence intervals are entirely absent. Reporting only p-values and eta squared values is insufficient according to contemporary reporting standards. Confidence intervals should be added for mean differences and effect sizes to improve interpretability and statistical rigor.

In Table 3, the eta squared value for reaction time is reported as 0.399, which represents a relatively large effect rather than a “moderate effect size” as interpreted by the authors. The manuscript should apply standardized effect size interpretation guidelines consistently and accurately.

The use of the LSD post hoc test raises methodological concerns because LSD is relatively liberal and increases the risk of Type I error, particularly in studies with multiple comparisons. The authors should justify the use of LSD over more conservative alternatives such as Bonferroni or Tukey corrections.

Authors revised the manuscript and uploaded the document.

1.2. Reviewer 2

Reviewer:

The rationale for comparing transcranial electrical stimulation and cognitive rehabilitation is potentially valuable; however, the manuscript does not sufficiently explain why these two interventions were selected over other evidence-based dyslexia interventions such as phonological awareness training, multisensory instruction, or neurofeedback. A comparative justification is necessary to clarify the clinical significance of the chosen interventions.

The Methods section indicates that 45 participants were selected using “simple random sampling,” yet the recruitment procedure is insufficiently described. It remains unclear how students were identified, how eligibility was verified, and whether recruitment occurred through schools, clinics, or rehabilitation centers. The authors should provide a detailed sampling flow diagram and explain how randomization was implemented.

The manuscript does not report inclusion and exclusion criteria in sufficient detail. Important variables such as IQ level, comorbid ADHD, medication status, neurological disorders, psychiatric history, and previous intervention exposure were not discussed. Given the strong association between dyslexia and attentional difficulties, omission of these criteria substantially limits internal validity.

The description of the N-back task is incomplete from a methodological perspective. The authors should specify whether a 1-back, 2-back, or adaptive N-back paradigm was used. Additionally, information regarding stimulus presentation duration, interstimulus intervals, practice trials, and software platform is absent. These omissions reduce reproducibility and methodological transparency.

The scoring procedure for the N-back task requires clarification. The manuscript states that “each incorrect response received a penalty score of 0.5,” but it is unclear whether this scoring system is standardized or researcher-developed. The authors should justify this scoring approach and explain whether omission and commission errors were analyzed separately.

The description of the transcranial electrical stimulation protocol lacks essential technical information. Critical details such as electrode size, exact electrode placement coordinates (e.g., F3/F4 based on the 10–20 EEG system), current density, ramp-up/ramp-down periods, and sham stimulation procedures are not adequately reported. These details are required for replication and adherence to neuromodulation reporting standards.

The intervention dosage appears inconsistent and insufficiently justified. The cognitive rehabilitation group received 21 sessions of 60 minutes, whereas the stimulation group received only three 15-minute sessions. This creates a substantial

imbalance in intervention intensity and therapeutic exposure. The authors must justify this discrepancy and discuss its implications for comparing intervention effectiveness fairly.

The manuscript does not describe the qualifications or training of individuals administering the interventions. Given that tDCS in pediatric populations requires specialized expertise and safety monitoring, the authors should specify who administered the stimulation, whether medical supervision was present, and how adverse effects were monitored.

The statistical analysis section states that MANCOVA was employed; however, assumptions underlying multivariate analysis are not reported. There is no information regarding normality, homogeneity of covariance matrices, multicollinearity, linearity, or Box's M test. Reporting assumption testing is necessary to validate the appropriateness of MANCOVA.

In Table 1, the descriptive statistics indicate relatively large standard deviations compared with group means, particularly for correct responses. The authors should discuss variability within groups and clarify whether outliers were screened prior to inferential analysis.

Authors revised the manuscript and uploaded the document.

2. Revised

Editor's decision: Accepted.

Editor in Chief's decision: Accepted.