

# Investigation of the Effect of Transcranial Direct Current Stimulation on Inhibitory Control Deficits and Tendency Toward Stimulant Substance Use in Students

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## 1. Round 1

### 1.1. Reviewer 1

Reviewer:

In the opening paragraph, the definition of "substance use disorder" is appropriate but can benefit from further precision. The phrase, "substance use disorder is a major social concern", could be expanded to include the global and societal implications of substance abuse. Consider providing more statistical or epidemiological data on the scope of the problem to help contextualize the social impact and justify the importance of the study (e.g., prevalence rates in adolescents). Adding specific references from global databases or studies would strengthen the argument and improve the overall context.

The citation, "Momeni et al., 2021", appears without a specific detail regarding what exactly this study contributes to the introduction. It would be beneficial to clarify the findings or claims made by Momeni et al. (2021) in this context, perhaps by specifying how it informs the current study. For instance, does Momeni et al. discuss the neurological aspects of substance use disorder, or is their focus on psychological and social dimensions? The same applies to other citations like "Farhadi-Nasab et

al., 2007” and “Bari et al., 2018”. A clearer link between these studies and the introduction’s discussion would solidify the foundation of the argument.

You mention that “the prevalence of substance use among adolescents remains high”, but this statement would be stronger with specific statistical evidence. For example, you could reference studies showing trends in adolescent substance use in different regions or countries, or perhaps studies identifying risk factors for this age group.

The sample description in section 2.1 mentions that 40 individuals were selected based on inclusion and exclusion criteria. However, it would be beneficial to describe how these 40 participants were selected from the total of 100 students. Was this a random selection, or did it rely on another form of sampling method? Clarifying the selection process will help readers understand the representativeness of the sample.

You mention that the “Wilks' Lambda test’s significance value is less than 0.05,” which indicates statistical significance. However, it would be beneficial to clarify which specific variables this test was applied to. Was it applied to each dimension of inhibitory control (e.g., emotional inhibition, aggression inhibition)? A table summarizing the results of these tests would help readers quickly assess the magnitude of the effects.

Authors uploaded the revised manuscript.

## 1.2. Reviewer 2

Reviewer:

In the second paragraph, the concept of “craving and inhibitory control deficits” is introduced. The explanation could benefit from expanding on the neurobiological mechanisms involved. Specifically, mention how these deficits manifest in the brain's neural circuitry, particularly the prefrontal cortex. You have stated that “brain imaging findings have demonstrated that dysfunction of the prefrontal cortex leads to impaired inhibitory control”, but a brief elaboration of these brain areas (e.g., the role of the dorsolateral prefrontal cortex) would provide a clearer scientific foundation for the hypothesis.

In the fourth paragraph, the introduction mentions that “the treatment options for stimulant substance use disorder are very limited”. This sentence could be enhanced by specifying what treatments are currently available and why they are inadequate (e.g., relapse rates, efficacy issues). Moreover, a comparison of stimulant addiction treatment efficacy in adolescents versus adults might add depth, especially since the current study focuses on adolescents.

The inclusion criteria state that participants should be diagnosed with stimulant substance use disorder. However, it might be useful to specify how the diagnosis was made. Was this diagnosis conducted by a clinician using DSM-5 criteria or another validated tool? Furthermore, consider including information about whether participants were excluded based on other factors, such as psychiatric comorbidities that could confound results.

The intervention protocol could benefit from more specific details on the tDCS treatment. You mention that “each session lasted 30 minutes,” but what parameters were used (e.g., intensity, frequency, electrode placement)? These details are important for replication purposes and help readers assess the validity of the intervention.

The Inhibitory Control Questionnaire and the Relapse Prediction Scale (RPS) are cited as the primary outcome measures. While this is useful, it would be beneficial to briefly describe these tools, including their validity and reliability in measuring the constructs of interest. Furthermore, how were these tools scored, and did you control for any potential biases in the interpretation of the results?

While statistical significance is discussed, the absence of effect sizes is a limitation. Including the effect size (e.g., Cohen’s  $d$ ) would provide a clearer understanding of the magnitude of the differences between the experimental and control groups. This is particularly important when interpreting the practical significance of the findings.

In discussing the mechanism of tDCS, the statement “transcranial stimulation influences the reduction of inhibitory control deficits by altering neuronal excitability” is valid, but could benefit from more specific discussion of how tDCS modulates brain activity. For instance, what is known about the anodal and cathodal stimulation's specific effects on the prefrontal cortex in addiction contexts? Consider including more details on the neural circuits involved.

Authors uploaded the revised manuscript.

## 2. Revised

Editor's decision after revisions: Accepted.

Editor in Chief's decision: Accepted.