International Journal of Sport Studies for Health

Journal Homepage

Transcranial Direct Current Stimulation Combined with Practical Blood Flow Restriction Training Enhances Efficiency in the Eccentric Phase of the Dumbbell Curl Movement, not the Concentric

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1. Round 1

1.1 Reviewer 1

Reviewer:

The transition from describing tDCS to blood flow restriction (BFR) training feels abrupt. Consider providing a smoother transition to explain how both techniques could synergistically affect neuromuscular adaptations.

The randomization method is described well, but it would benefit from further clarification on how the randomization was carried out. For example, did the researchers use block randomization to ensure balance between groups? The term "illegible packets" might be misleading and should be rephrased for clarity.

The presentation of descriptive statistics (e.g., age, height, BMI) in Table 1 is clear. However, the p-values associated with these variables are quite high ($p > 0.05$), which could suggest that these variables were not balanced between groups at baseline. Consider adding a brief statement to highlight that the groups were well-matched despite the lack of significant differences.

The covariance analysis in Table 2 shows that the difference in electrical activity between groups is not significant for the concentric and full range of motion phases. It would be helpful to mention the practical significance of these findings despite the lack of statistical significance, particularly in light of the small sample size.

The claim that "the TP group's muscles were able to recruit muscle fibers more efficiently" during the eccentric phase is an interesting finding. However, the term "efficiency" could be more precisely defined. Does this refer to lower muscle activation for the same load, or does it indicate better motor unit recruitment patterns? Clarifying this could strengthen the argument.

The comparison with previous studies that have observed greater cortical activity during eccentric movements is valid. However, this comparison could be further enriched by more direct connections to how tDCS might modulate this cortical response. Adding more recent studies on the impact of tDCS on eccentric muscle contractions could improve this section.

Author revised the manuscript and uploaded the updated document.

1.2 Reviewer 2

Reviewer:

The inclusion criteria of participants specify the need for participants to "lack prior experience with tDCS and BFR or resistance training." It would be useful to specify whether this also included any prior experience with exercise modalities involving lower-intensity training, as this could influence the outcomes.

The method of applying tDCS over the M1 is clear, but the duration of stimulation (15 minutes) seems relatively short for a significant neuromodulatory effect. It might be beneficial to justify the choice of duration based on previous studies that report the efficacy of shorter stimulation durations.

The pBFR protocol is outlined, but the use of "30% 1RM" as the intensity could be better explained. Specifically, how was this value determined for each participant, and why is this intensity preferred over higher intensities for this type of training?

The description of how EMG data were collected is detailed. However, the choice of using a 10-500 Hz filter range might warrant further discussion. Why were these particular frequencies chosen, and how do they relate to the specific muscle activity being measured?

The figures showing the biceps normalized RMS in the full range of motion and concentric phase provide valuable insight. However, the lack of significant difference is noted but not sufficiently discussed. Consider adding a brief interpretation of why the TP group did not show significant changes despite expected neuroplastic effects.

The discussion of the ceiling effect as a potential reason for the lack of significant difference in 1RM strength is plausible. However, it would be beneficial to explore this further by considering whether baseline strength could have been a limiting factor for further gains in strength in the TP group.

The claim that "no research has explored the combined impact of tDCS and pBFR on distinct motor phases" could be strengthened by discussing how this gap in literature might impact both practical applications and future research directions. Providing more detailed suggestions for future studies would be helpful.

Author revised the manuscript and uploaded the updated document.

2. Revised

Editor’s decision after revisions: Accepted.
Editor in Chief’s decision: Accepted.