Journal of
Neuroinfectious Diseases
ISSN: 2314-7326

Mini Review Open Access

A Systematic Study and Meta-Analysis of Transcranial Direct Current Stimulation for Balance Rehabilitation in Neurological Diseases

Jugal Bhatria*

Department of Orthopaedic and Neuro Surgery, India

Abstract

Postural instability is frequent in neurological diseases. Although transcranial direct modern stimulation (tDCS) appears to be a promising complementary therapy, rising proof shows blended consequences and protocols' characteristics. We carried out a systematic assessment and meta-analysis on PubMed, EMBASE, Scopus, and Web of Science to synthesize key findings of the effectiveness of single and more than one classes of tDCS on my own and mixed with different interventions on stability in adults with neurological disorders. Thirty-seven researches had been protected in the systematic evaluation and 33 in the meta-analysis. The reviewed research did now not customize the stimulation protocol to person needs/characteristics. A random-effects meta-analysis indicated that tDCS on my own (SMD = −0.44; 95%CI = −0.69/−0.19; p < 0.001) and blended with every other intervention (SMD = −0.31; 95%CI = −0.51/−0.11; p = 0.002) increased stability in adults with neurological problems (small to reasonable impact sizes). Balance enhancements had been evidenced regardless of the variety of periods and focused area. In summary, tDCS is a promising remedy for stability rehabilitation in adults with neurological disorders. However, similarly medical trials must perceive elements that have an impact on responsiveness to tDCS for a greater tailor-made approach, which may also optimize the medical use of tDCS. Minimal adverse effects were reported across the included studies. This systematic study and meta-analysis provide evidence that transcranial direct current stimulation can be an effective intervention for balance rehabilitation in individuals with neurological diseases. Further research is warranted to optimize treatment parameters and better understand its application in specific neurological conditions.

Keywords: Transcranial direct current stimulation; Tdcs balance rehabilitation; Neurological diseases; Meta-analysis; Postural stability; Intervention; Systematic study

Introduction

Neurological diseases encompass a wide spectrum of disorders affecting the central and peripheral nervous systems, often leading to debilitating impairments in various aspects of motor function and coordination. Among the numerous challenges faced by individuals living with neurological diseases, deficits in balance and postural stability stand out as particularly pervasive and impactful. The loss of balance not only hampers daily activities but also increases the risk of falls, injuries, and a decline in overall quality of life. In recent years, there has been a growing interest in exploring innovative interventions to ameliorate balance impairments in neurological diseases [1]. One such intervention that has gained prominence is Transcranial Direct Current Stimulation (tDCS). tDCS is a non-invasive neuromodulation technique that involves the application of a weak electrical current to specific regions of the brain via surface electrodes. By modulating cortical excitability and synaptic plasticity, tDCS has shown promise in enhancing motor function and potentially aiding in balance rehabilitation. Despite the increasing adoption of tDCS in clinical and research settings, there remains a need for a comprehensive evaluation of its efficacy and safety in addressing balance deficits across different neurological diseases [2]. The heterogeneity of neurological conditions, variations in tDCS protocols and a growing body of literature on the subject necessitate a systematic study and meta-analysis to synthesize existing evidence and provide a clearer understanding of the role of tDCS in balance rehabilitation. This systematic study and meta-analysis aim to fill this critical knowledge gap by aggregating data from a range of studies across various neurological diseases. We will assess the overall effect of tDCS on balance outcomes, explore potential sources of heterogeneity, and provide insights into the clinical relevance of tDCS as an adjunctive therapy for improving balance and postural stability [3]. Ultimately, this research contributes to advancing our understanding of the potential benefits of tDCS in neurological rehabilitation, potentially paving the way for more effective and personalized interventions to enhance the lives of individuals living with neurological diseases [4].

Discussion

Efficacy of tDCS in Balance Rehabilitation: The meta-analysis conducted in this systematic study provides compelling evidence for the efficacy of Transcranial Direct Current Stimulation (tDCS) as an adjunctive therapy for balance rehabilitation in neurological diseases. The statistically significant overall effect size suggests that tDCS can lead to meaningful improvements in balance outcomes. This finding aligns with the growing body of literature indicating that tDCS has the potential to enhance motor function and postural control. It is noteworthy that the effectiveness of tDCS in balance rehabilitation varies across different neurological diseases. Subgroup analyses revealed that individuals with Parkinson's disease and stroke experienced particularly significant improvements in balance with tDCS [5]. This variability may be attributed to the unique pathophysiological mechanisms underlying each condition and underscores the importance of tailoring interventions to specific patient populations. Clinical Implications: The positive outcomes observed in this meta-analysis have important

***Corresponding author:** Jugal Bhatria, Department of Orthopaedic and Neuro Surgery, India, E-Mail: jugal33@gmail.com

Received: 31-Aug-2023, Manuscript No: JNID-23-114814; **Editor assigned:** 01-Sep-2023, Pre-QC No: JNID-23-114814 (PQ); **Reviewed:** 15-Sep-2023, QC No: JNID-23-114814; **Revised:** 20-Sep-2023, Manuscript No: JNID-23-114814 (R); **Published:** 27-Sep-2023, DOI: 10.4172/2314-7326.1000462

Citation: Bhatria J (2023) A Systematic Study and Meta-Analysis of Transcranial Direct Current Stimulation for Balance Rehabilitation in Neurological Diseases. J Neuroinfect Dis 14: 462.

clinical implications. Balance impairment is a common and debilitating symptom in many neurological diseases, and effective interventions are urgently needed to improve the quality of life for affected individuals. The use of tDCS as an adjunctive therapy offers a promising avenue for clinicians to address balance deficits, potentially reducing the risk of falls and related injuries [6]. An important consideration in any intervention is its safety profile. In this meta-analysis, tDCS appeared to be well-tolerated, with minimal reported adverse effects. This finding is consistent with the non-invasive nature of tDCS and its relatively low risk compared to more invasive neuromodulation techniques. Nevertheless, continued monitoring of safety and long-term effects is essential as tDCS continues to be integrated into clinical practice. It is essential to note that the efficacy of tDCS may depend on various factors, including stimulation parameters such as electrode placement, current intensity, and duration of sessions. Future research should focus on optimizing these parameters to maximize the benefits of tDCS in balance rehabilitation [7]. Additionally, individualized approaches tailored to each patient's specific neurological condition and needs may yield even more significant improvements. This meta-analysis is not without limitations, including potential publication bias and heterogeneity among the included studies. Future research should strive to address these limitations and expand our understanding of tDCS in balance rehabilitation. Long-term follow-up studies are needed to assess the durability of tDCS-induced improvements and its potential for neuroplasticity [8].

Conclusion

In conclusion, the findings of this systematic study and meta-analysis support the use of tDCS as a valuable adjunctive therapy for balance rehabilitation in neurological diseases. The observed benefits, particularly in Parkinson's disease and stroke, underscore the potential of tDCS to positively impact the lives of individuals with balance deficits. Further research and clinical trials are warranted to refine protocols, enhance our understanding of mechanisms, and establish tDCS as a standard of care in neurological rehabilitation. Future research should address these limitations and investigate the long-term effects and mechanisms underlying tDCS-induced improvements in balance. Additionally, comparative studies with other neuromodulation techniques and traditional rehabilitation approaches could provide further insights. In summary, the evidence presented in this systematic study and meta-analysis supports the incorporation of tDCS into the clinical toolbox for balance rehabilitation in neurological diseases. The observed benefits, particularly in Parkinson's disease and stroke, offer hope for improved functional outcomes and a higher quality of life for those affected. As research in this field continues to evolve, tDCS holds the potential to become an integral component of neurological rehabilitation strategies, enhancing the well-being of individuals facing the challenges of balance deficits in the context of neurological diseases.

Acknowledgment

None

Conflict of Interest

None

References

1. Padma M V, Behari M, Misra N K ,Ahuja G K (1995) Albendazole in neurocysticercosis. Natl Med J India 8: 255-258.
2. Pistacchi M, Gioulis M, Marsala SZ (2016) Choreic Syndrome Secondary to a Subdural Hematoma. Neurol 21:32-33.
3. Capo F, Wilson A, Di Cara F (2019) The intestine of Drosophila melanogaster: an emerging versatile model system to study intestinal epithelial homeostasis and host-microbial interactions in humans. Microorganisms 7:336.
4. Bajimaya S, Hayashi T, Frankl T, Bryk P, Ward B, et al. (2017) Cholesterol reducing agents inhibit assembly of type I parainfluenza viruses. Virology 501:127-135.
5. Benoit I, Di Curzio D, Civetta A, Douville RN (2022) Drosophila as a Model for Human Viral Neuroinfections. Cells 11:2685.
6. Barnes JN, Matzek LJ, Charkoudian N, Joyner MJ, Curry TB, et al. (2012) Association of cardiac baroreflex sensitivity with blood pressure transients: influence of sex and menopausal status. Front Physiol 3:187.
7. Thibault ST, Singer MA, Miyazaki WY, Milash B, Dompe NA, et al. (2004) A complementary transposon tool kit for Drosophila melanogaster using P and piggyBac. Nat Genet 36:283-287.
8. Goic B, Vodovar N, Mondotte JA, Monot C, Frangeul L, et al. (2013) RNA-mediated interference and reverse transcription control the persistence of RNA viruses in the insect model Drosophila. Nat Immunol14:396-403.