

Notification Number: F.NO.COE/Ph.D./(Notification)/560/2024

Notification Date:14/06/2024

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Topic of the Ph.D. Thesis: Age associated cognitive impairment: Role of neuromodulation and physical activity.

Keywords: aging, depression, cognitive impairment, neuromodulation, physical activity.

Abstract

Background: Depressive symptoms and cognitive impairment (CI) are almost invariably associated with aging and mutually affect each other in bidirectional manner. Both are responsible for impaired balance functions and postural stability and are also the known risk factors for many other complications, such as sleep disturbance, poor quality of life (QoL) and impaired autonomic function etc. Considering the importance of non-invasive brain stimulation (NIBS) treatments in initiating and modulating the neuroplasticity in human brain, we investigated the effects of NIBS interventions, i.e., neuromodulation and physical activity on different outcomes of neuropsychological, neurophysiological and neuromuscular functions. Changes in the sleep functions, QoL measures and cardiac autonomic profile associated to both depression and CI were also evaluated in response to neuromodulation and physical activity.

Methods: Sixty (n=60) older adults from 74 prospective participants were randomly allocated into four groups: neuromodulation group (n=15), physical activity group (n=15), combined neuromodulation and physical activity group (n=15) and control group (n=15). Assessment was done both pre and post 8 weeks of intervention for neuropsychological functions, neurophysiological health measures, neuromuscular functions parameters, sleep functions, QoL measures and cardiac autonomic profile.

Results: Eight weeks of neuromodulation, physical activity or combined intervention (neuromodulation along with physical activity) significantly improved the neuropsychological functions parameters as well as positively modulate the neurophysiological correlates of cognition. Though physical activity or combined intervention for 8 weeks significantly enhances the performances on neuromuscular functions measures, neuromodulation treatment

alone for 8 weeks fails to improve some of the neuromuscular function's parameters. For improving sleep functions, neuromodulation, physical activity or combination of both were found to be almost equally effective. Further, physical activity or combined intervention were found to be beneficial for improving majority of autonomic functions variables, whereas neuromodulation treatment alone was found to be effective only for some of the autonomic variables. Similarly, for improving the QoL, physical activity or combined intervention were found to be beneficial and not the neuromodulation treatment alone.

Conclusion: Both NIBS interventions lasting 8 weeks significantly improved the variety of outcome measures, however, combined neuromodulation and physical activity produced a slightly better results than either neuromodulation or physical activity alone. Further, neuromodulation demonstrated slightly superior neuropsychological, neurophysiological and sleep outcomes than physical activity, whereas, physical activity showed better response on neuromuscular functions, QoL measures and cardiac autonomic profile.