







Abstract

Non-Invasive Brain Stimulation and Physical Exercises with High Cognitive Demand Delayed the Effects of Mild Cognitive Decline

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Studies have revealed the efficacy of non-pharmacological therapeutic interventions in slowing or delaying the onset and evolution of symptoms. Among them is physical and cognitive stimulation (Ferretti, 2016; Hernandez, Coelho, Gobbi, & Stella, 2010), which, in turn, prevent motor inactivity through the practice of physical and cognitive exercises through the activation of specific neurological functions. So, the non-invasive brain activity modulation associated with the practice of physical exercises may improve elderly's functional autonomy and cognition. The aim of this study was to assess the effect of non-invasive brain activity modulation technique, associated with the practice of physical exercises with high cognitive demand on the functional autonomy and cognitive variables of the elderly with mild cognitive impairments. The study was registered with the Brazilian Registry of Clinical Trials (UTN Number: U1111-1249-0494). One hundred and forty elderly diagnosed with MCI, aged 60 or over, of both sexes, were divided into two groups. A control group (CG, n = 68, \bar{x} = 74.6 \pm 2.3 yrs, and an experimental group (EG, n=70, \bar{x} = 71.4 \pm 3.4yrs) were formed. The cognitive and functional variables of participants were measured. Non-invasive brain stimulation (NIBS) and physical exercises with high cognitive demand were used for intervention. The CG participants remained with their normal activities, which included participation in the memory workshop activities. The EG had sessions once a week, with a mix of NIBS protocol and practice exercises with high cognitive demand. Both groups got a 7-week period between the evaluations. Although we did not find significant differences in all assessed variables (figure 1), the EG

group had better functional development. In our study, there was no strict control as to the intensity of motor tasks and no addition of overload in order to actually stimulate physiological mechanisms responsible for promoting gains in physical variables. The intervention promoted a reduction of dementia effects, despite the lack of statistical significance, the EG obtained more positive results when compared to the CG.

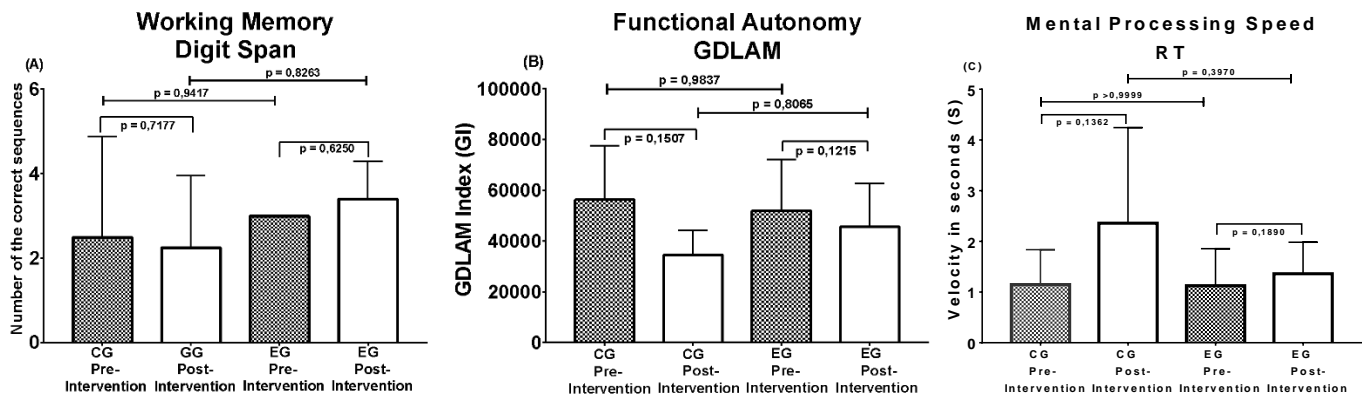


Figure 1. Intra and intergroup analyses of the variables evaluated in the study. In (A), comparisons of working memory are plotted; in (B), comparisons of the results of functional autonomy are presented; finally, in (C), the comparisons made with the data of mental processing speed are exposed.

Keywords: Mild Cognitive Impairment, Brain Stimulation, Aging; Dual Task, Physical Exercises

References

- Ferretti, F. (2016). Effects of an exercise program on mobility, balance and cognition in elderly people with Alzheimer's disease. *Physiotherapy Brazil*, *15*(2). <https://doi.org/10.33233/fb.v15i2.325>
- Henskens, M., Nauta, I., Drost, K., & Scherder, E. (2018). The effects of movement stimulation on activities of daily living performance and quality of life in nursing home residents with dementia: a randomized controlled trial. *Clinical Interventions in Aging*, *Volume 13*, 805–817. <https://doi.org/10.2147/CIA.S160031>
- Hernandez, S. S. S., Coelho, F. G. M., Gobbi, S., & Stella, F. (2010). Effects of a physical activity program on cognitive functions, balance and risk of falls in elderly people with Alzheimer's dementia. *Brazilian Journal of Physiotherapy*. <https://doi.org/10.1590/s1413-35552010000100011>
- Okamura, H., Otani, M., Shimoyama, N., & Fujii, T. (2018). Combined Exercise and Cognitive Training System for Dementia Patients: A Randomized Controlled Trial. *Dementia and Geriatric Cognitive Disorders*, *45*(5-6), 318–325 <https://doi.org/10.1159/000490613>