Eletrophysiological Performance on Visuo-Spatial Attention Task Between Older Adults with Different Levels of Physical Activity

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Several studies have demonstrated that physical activity may have facilitating effects on cognitive function in older adults. For neurobiological assessment of cognitive function, the reaction times (RTs) of the behavioral performance and the P3 component of the event-related potentials (ERPs) are the most sensitive to aging.

PURPOSE: In the present study, we investigated the RT and P3 indices measured in the elderly adults with different levels of physical activity when performing a visuo-spatial attention task. METHODS: Fourteen high-active and 14 low-active age-matched elderly participants were recruited from senior community centers. All participants were: 1) identified from the Mini-Mental State Examination (MMSE), and eligible participants were then differentiated into two groups on the basis of their physical activity level from the seven-day physical activity recall questionnaire; 2) tested on the visuo-spatial attention paradigm by central cues appeared at the center of the screen with the stimulus onset asynchrony (SOA) of 500ms; 3) detected and responded to laterally presented reaction signals via stepping pedals with their bilateral lower limbs as soon as possible when performing the task while recorded brain ERPs simultaneously. The results of the behavioral (i.e., RTs) and ERP (i.e., P3 component) performance were subjected separately to repeated measures ANOVA. The level of significance was set at .05. RESULTS: In the behavioral data, there was no significant difference between the high-active and low-active elderly group (F₁,26 = 1.94, p = .663). However, in terms of electrophysiological characteristics, the high-active elderly group exhibited larger P3 amplitude (F₁,26 = 6.128, p = .02, partial \( \eta^2 = 0.191 \)) than the low-active elderly group. CONCLUSION: Although the behavioral result did not show significant difference between the high and low levels of physically active group, the electrophysiological signals revealed better brain activation performance on the occipital and parietal lobe in the high-active elderly. Our findings suggested that, when performing the visuo-spatial attention task, the older adults with highly physical activity exhibited superior attentional abilities compared to the low-active counterparts.

Keywords: physical activity, elderly, event-related potentials