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Acute Effect of Single Bout Exercise Modalities (Open-skills vs Closed-skills) on Trail-Making Task in Recreationally Active Older Adults



Syed Murshid Syed Zubir, Raja Nurul Jannat Raja Hussain, Adam Linoby*, Aqil Zulkhairi, and Azwa Suraya Mohd Dan.

Abstract | This study investigates the cognitive benefits of acute exercise modalities in elderly individuals, focusing on engagement in badminton (open-skills) versus closed-skill (e.g., swimming, cycling and running) exercises, compared to sedentary activity. A total of 67 participants aged 60 and above were divided into three groups: badminton (open-skills) (BAD, $n = 21$), closed-skill exercise (CSP, $n = 22$), and a sedentary control (CON, $n = 24$) group. The study evaluated the cognitive impact of a single exercise bout on these tasks. Results revealed that participation in badminton exercises significantly improved executive function and working memory compared to closed-skill and passive activities. Specifically, in the N-Back Task, the BAD group showed a reaction time of 810.4 ms and 75.2% accuracy, outperforming the CSP (reaction time: 826.2 ms, accuracy: 70.8%) and CON groups (reaction time: 840.8 ms, accuracy: 56.2%). Similarly, in the TMT-B, the BAD group (46.7 seconds) outperformed the CON group (64.0 seconds). Accurately, the BAD group showed notable cognitive enhancements post-exercise, particularly in working memory and executive functions. For instance, the BAD group improved in TMT-B from 46.7 seconds to 45.4 seconds post-exercise, while the CSP and CON groups did not exhibit similar improvements. These findings suggest that the type of physical activity plays a critical role in cognitive health, with badminton offering superior benefits. The study highlights the importance of exercise modality in cognitive function enhancement among the elderly, challenging the notion that all forms of physical activity are equally beneficial for cognitive health.

Keywords: *Cognitive function, exercise, open-skills, close-skills, older adults.*

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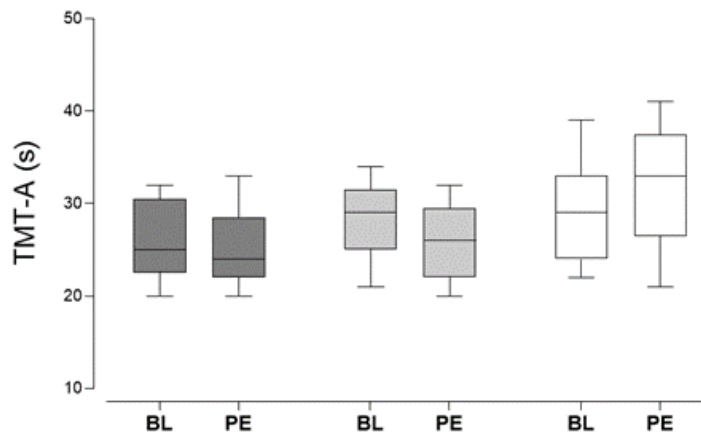
I. INTRODUCTION

The relationship between physical exercise and cognitive function throughout the lifespan has been extensively documented, particularly in the context of aging [1]. Over the past two decades, research has emphasized the positive impact of exercise on cognitive health, with evidence indicating that physical activity can enhance executive function, as measured by the Trail-Making Test (TMT) [2] [3]. However, despite some studies that have demonstrated a positive correlation between exercise and TMT performance, the broader effects of physical activity on cognitive health are not yet fully understood.

II. METHODS

Ninety-nine elderly (> 60 years) participated in this quasi-experimental study and were divided into RBP (65.7 ± 4.7), CSP (65 ± 4.4) and CON (64.2 ± 2.6) groups. Following baseline (BL) assessments, each group was assigned an acute exercise session to achieve equivalent MET value. After an acute exercise session, subjects were required to complete all the questionnaire and cognitive assessment using TMT [4].

III. RESULTS AND DISCUSSION



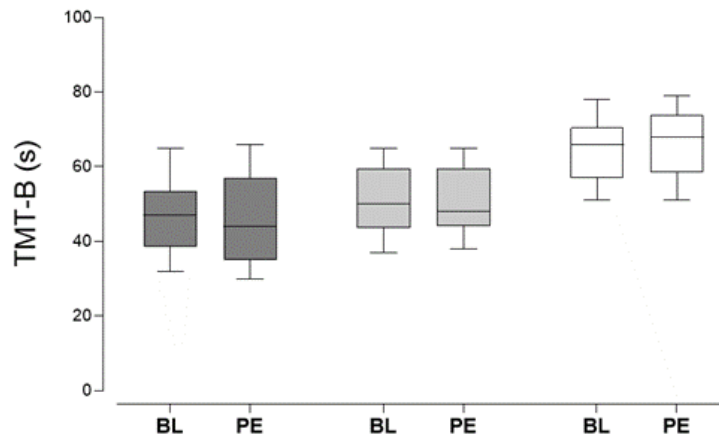


Fig. 1 Differences Δ in TMT-A and TMT-B performance in BL and PE

TMT-A revealed a significant difference in BAD vs CON (25.1 ± 3.8 vs 32.3 ± 5.9 ; $p < 0.05$) in PE as compared performance in BL. However, no significant differences were found for BAD vs CSE (25.1 ± 3.8 vs 26.1 ± 3.9 ; $p < 0.05$) and CSE vs CON (26.1 ± 3.9 vs 32.3 ± 5.9 ; $p < 0.05$) in BL and PE. (Fig 1). The analysis of TMT-B showed no significant differences were found between all the groups, from BL to PE. The current finding is contrary to previous studies that have suggested that a structured acute exercise program improved frontal lobe functions, including attention and working memory [5]. Accordingly, [6] indicated that exercise had a detrimental effect on cognitive performance during exercise but improved cognitive performance after exercise.

IV. CONCLUSIONS

Acute exercise provides slight improvement in Trail-making tasks. Future research should investigate the underlying mechanism, as well as the acute effects and potential benefits across different populations and exercise types.

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