BEYOND STRAIGHT-LINE WALKING: GAIT PERFORMANCE IN MILD COGNITIVE IMPAIRED AND HEALTHY ELDERLY UNDER SINGLE AND DUAL-TASK CONDITIONS

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Summary

This study compared gait performance in healthy older adults (HC) and those with mild cognitive impairment (MCI) during a Timed Up and Go (TUG) test that included turning and sit-to-stand transitions. Under the dual-task (DT) condition (adding an animal-naming task), gait worsened in both groups. Notably, an upcoming demanding task such as turning did not further impair overall gait in the MCI group compared to HC, suggesting that this anticipatory challenge does not further exacerbate gait for individuals with MCI.

Introduction

In various populations, reduced gait velocity is linked to adverse outcomes, including increased mortality [1], highlighting the importance of evaluating human gait. Numerous studies compare gait in HC versus those with MCI, showing gait deficits in the latter group. However, only a few protocols incorporated directional changes during gait [2,3]. Since daily activities often involve turning and transitions, this study investigated gait in a pathway that included upcoming turning and sit-to-stand transitions. We hypothesized impaired performance in MCI patients compared to age-matched HC.

Methods

Forty-nine individuals (>65 yrs) without significant mobility restrictions voluntarily participated in the study. Cognitive status was assessed using the Montreal Cognitive Assessment (MoCA) [4]. Demographically adjusted MoCA cut-offs classified participants into two groups: HC (n=31, 71.9±6.3 yrs) and MCI (n=18, 73.4±5.7 yrs) [5].

All participants completed the TUG test, which involved rising from a chair, walking 3 m to a marker, turning, walking back, and sitting in the initial chair. This sequence constituted the ST condition, always performed first. In the DT condition, participants repeated the TUG test while naming random animals. Gait parameters (velocity, cadence, stride time, and stride length) were measured using a pressure plate (Zebris FDM 1.5, Zebris Medical GmbH, 1.5 m in length) embedded at the midpoint of the 3 m pathway, just closely before (0.75m) the turning marker.

A linear mixed model (α=0.05) was used to evaluate the effects of task condition (ST vs. DT), group (HC vs. MCI), and their interaction on gait parameters, accounting for between-subject variability.

Results and Discussion

Analysis revealed a significant main effect of task condition, indicating that gait performance declined in the DT condition compared to the ST condition across both groups. The main effect of the group (MCI vs. HC) was not significant. However, a trend toward an interaction effect suggested that individuals with MCI experienced a more pronounced decline in gait performance under DT conditions than HC (see exemplary Figure 1).

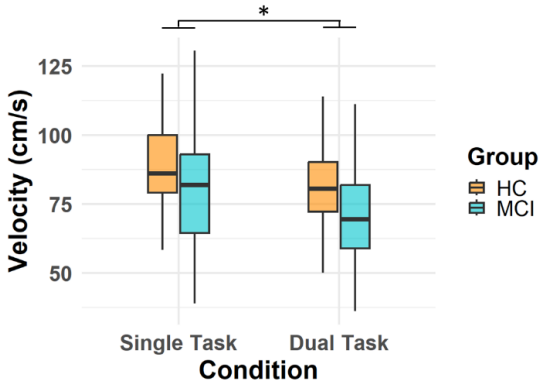

Figure 1: Boxplot of gait velocity by condition (ST & DT) and Group (HC & MCI) ($^*p < 0.05$)

This study showed a detrimental effect of DT on gait in both HC and MCI, with a non-significant trend toward a more pronounced DT impact in MCI. These findings align with previous research showing that DT impairs gait in both groups [6]. However, prior evidence suggests that significant between-group differences emerge primarily under higher cognitive load (e.g., serial subtraction) rather than with the less demanding task of our protocol [6]. Moreover, previous studies showed that MCI individuals exhibit more pronounced gait impairments under ST conditions requiring greater cognitive involvement, such as walking on an oval pathway [2] or during turns [3]. Thus, walking in a straight line—even with upcoming turns—may not sufficiently challenge cognition to reveal group differences. Instead, motor-cognitive interference is more evident during specific, cognitively demanding moments rather than affecting overall gait.

Conclusions

This study confirmed the negative impact of DT on gait in older adults, particularly in MCI individuals. It seems that the load and demands of both the DT and the gait protocol affect the performance of older adults. Future studies should identify critical scenarios where (cognitively impaired) elderly individuals may exhibit an increased risk of falls.

References

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