# Effect of Self-Initiated Gait Initiation on the Center of Pressure in Older Adults with and without Mild Cognitive Impairment

**Qianhui Sun** [1], Heng-Ju Lee [1]
1 Department of Physical Education and Sport Sciences,
National Taiwan Normal University, Taipei, Taiwan
Email: hjlee@ntnu.edu.tw

## Summary

This study examines gait initiation differences between older adults with mild cognitive impairment (MCI) and cognitively healthy individuals. Participants performed self-initiated gait initiation at normal and fastest speeds. While there were minimal group differences in COP, faster initiation speed significantly influenced anterior-posterior displacement. These results emphasize the importance of gait speed and suggest that more complex tasks, like dual cognitive tasks, may be needed to differentiate MCI from controls, highlighting the need for tailored assessments in aging populations.

## Introduction

The prevalence of mild cognitive impairment (MCI) increases with population aging. In addition to cognitive decline beyond normal aging, individuals with MCI exhibit impaired motor control, particularly during gait initiation, which may pose greater challenges and risks [1]. However, research on this population remains limited. This study primarily aims to compare differences between with and without MCI and secondarily to examine the effect of gait initiation speed under the self-initiated condition.

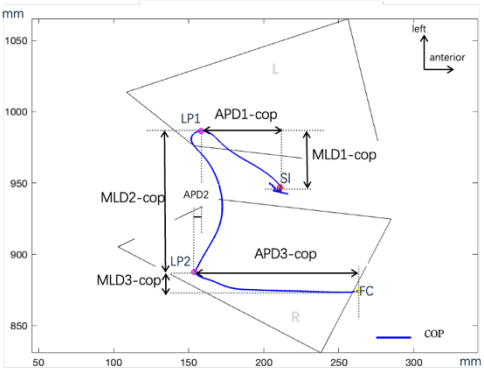


**Figure 1**: Diagram of Movement Phases and Center of Pressure Trajectory. SI, step initiation; LP1, Lateral-posterior1; LP2, Lateral-posterior2; FC, foot contact; phase1, from SI to LP1; phase2, from LP1 TO LP2; phase3, from LP2 to FC.

## Methods

Participants stood barefoot and wore an experimental bodysuit. Upon receiving the start signal, they initiated gait with either foot and walked along a 6-meter walkway at two speeds: normal and fastest. Participants were divided into two groups (MCI: MMSE ≥24, MoCA <26; Control: MMSE ≥24, MoCA ≥26) and performed a self-initiated gait initiation test, mentally counting down three seconds before starting.

COP data were collected using two force plates. The process was divided into three phases based on COP trajectory geometry (Figure 1). Anterior-posterior (AP) and medial-lateral (ML) displacements were calculated for all phases. A 2 × 2 mixed-model repeated measures ANOVA with Bonferroni-adjusted pairwise comparisons was conducted in SPSS. The significance level was set at $p < 0.05$. All participants provided informed consent, and the study was approved by the university IRB.

## Results and Discussion

Thirty participants were recruited, with 11 in the MCI group and 19 in the control group. In the self-initiated condition, COP data showed minimal between-group differences, while faster initiation speed had a significant effect on larger anterior-posterior COP displacement (Table 1). This suggests that more complex tasks, such as dual cognitive tasks, are needed to distinguish between groups [2]. Additionally, gait initiation performance in older adults is more influenced by initiation speed.

## Conclusions

Gait initiation speed plays a crucial role in gait initiation; however, to distinguish individuals with mild cognitive impairment from older adults, more complex gait initiation conditions should be considered.

## References

[1] Mancioppi G. et al. (2021). *Mech. Ageing Dev*, **193**.
[2] Yiou E. et al. (2017). *World J Orthop.* **8**: 815-828.

**Table 1:** Caparison of the COP displacement

| | MCI (N=11) | | Control (N=19) | | P value | | |
|---|---|---|---|---|---|---|---|
| | NS | FS | NS | FS | Groups*speeds | Speeds | Groups |
| APD1-cop | -0.027 ± 0.018 | -0.053 ± 0.019 | -0.025 ± 0.016 | -0.042 ± 0.016 | - | <.001 | - |
| APD2-cop | -0.020 ± 0.021 | -0.012 ± 0.025 | -0.016 ± 0.020* | -0.028 ± 0.025* | .024 | | - |
| APD3-cop | 0.108 ± 0.020 | 0.120 ± 0.014 | 0.097 ± 0.028 | 0.126 ± 0.012 | - | <.001 | - |
| MLD1-cop | 0.029 ± 0.012 | 0.031 ± 0.007 | 0.029 ± 0.012 | 0.032 ± 0.017 | - | | - |
| MLD2-cop | 0.118 ± 0.018 | 0.110 ± 0.018 | 0.114 ± 0.023 | 0.116 ± 0.029 | - | | - |
| MLD3-cop | 0.012 ± 0.002 | 0.015 ± 0.011 | 0.019 ± 0.008 | 0.022 ± 0.007 | - | | .006 |

* indicates a significant difference between normal speed (NS) and fast speed (FS).