



Effect of Dual-Task Walking on Long-Range Correlations in People with Parkinson's Disease

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INTRODUCTION

- Parkinson's disease (PD) impacts executive and motor function¹. Walking requires executive function and attention², but performing a secondary task while walking (i.e., dual-tasking) can impact the performance on one or both tasks³.
- Locomotor function is reflected in stride-to-stride fluctuations, notably by the amplitude (coefficient of variation)⁴ and the temporal organization (scaling exponent α -DFA)⁵ of stride time intervals.
- **Primary aim:** To determine the effect of an attention-demanding task on gait variability in people with PD.

RESULTS

- We have collected so far 19 people with Parkinson's disease (age 68 ± 4.6), and 4 healthy elderly (age 67 ± 5.0). We only report results from PD here.
- When listening to an audiobook:
 - PD participants walked **slower** (-0.02 m/s)
 - Gait variability in PD patients was **more random** (mean difference of DFA values = 0.07 , $p = 0.018$).
 - Gait steadiness did not significantly change (mean difference of CV values = 0.11% , $p = 0.203$).

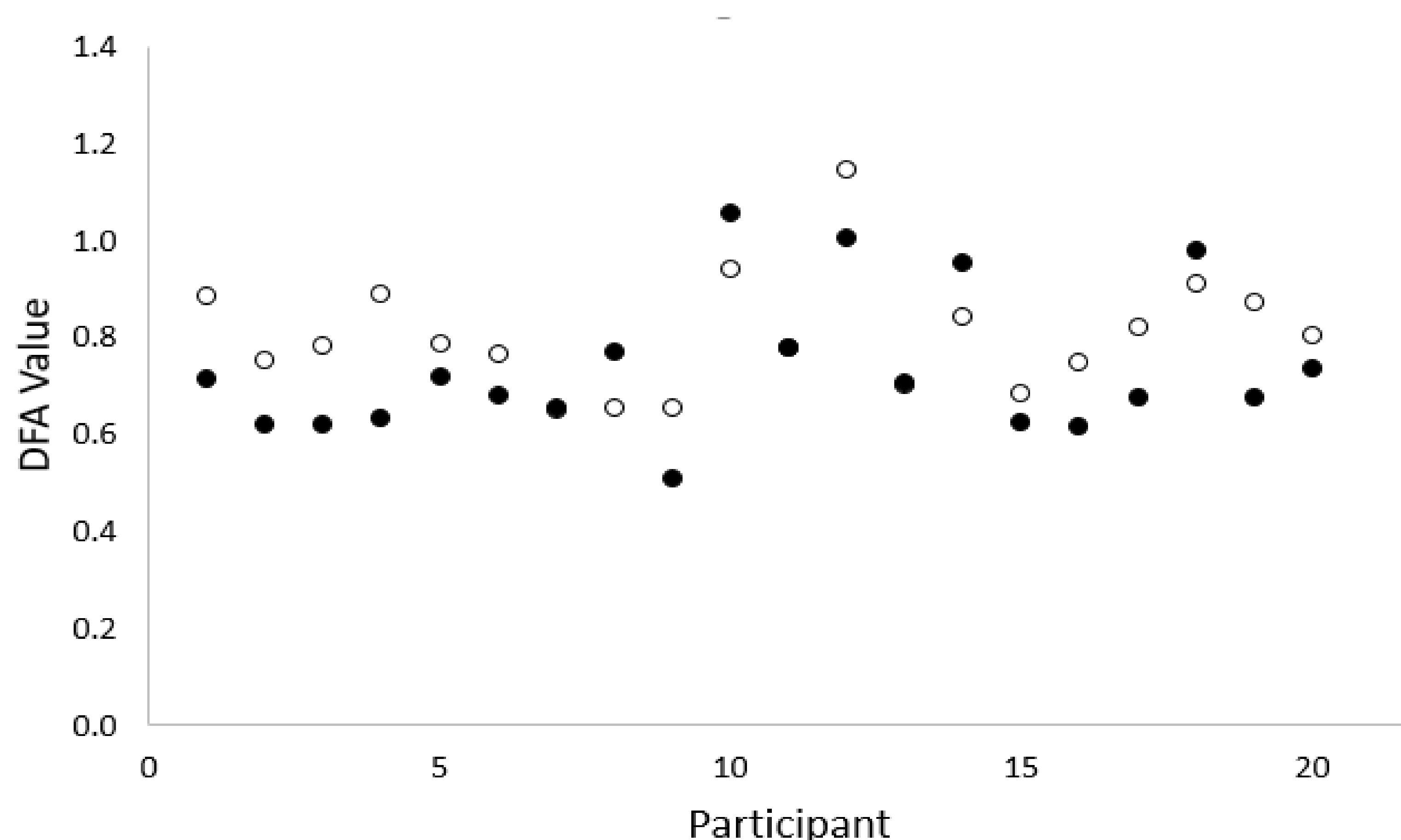
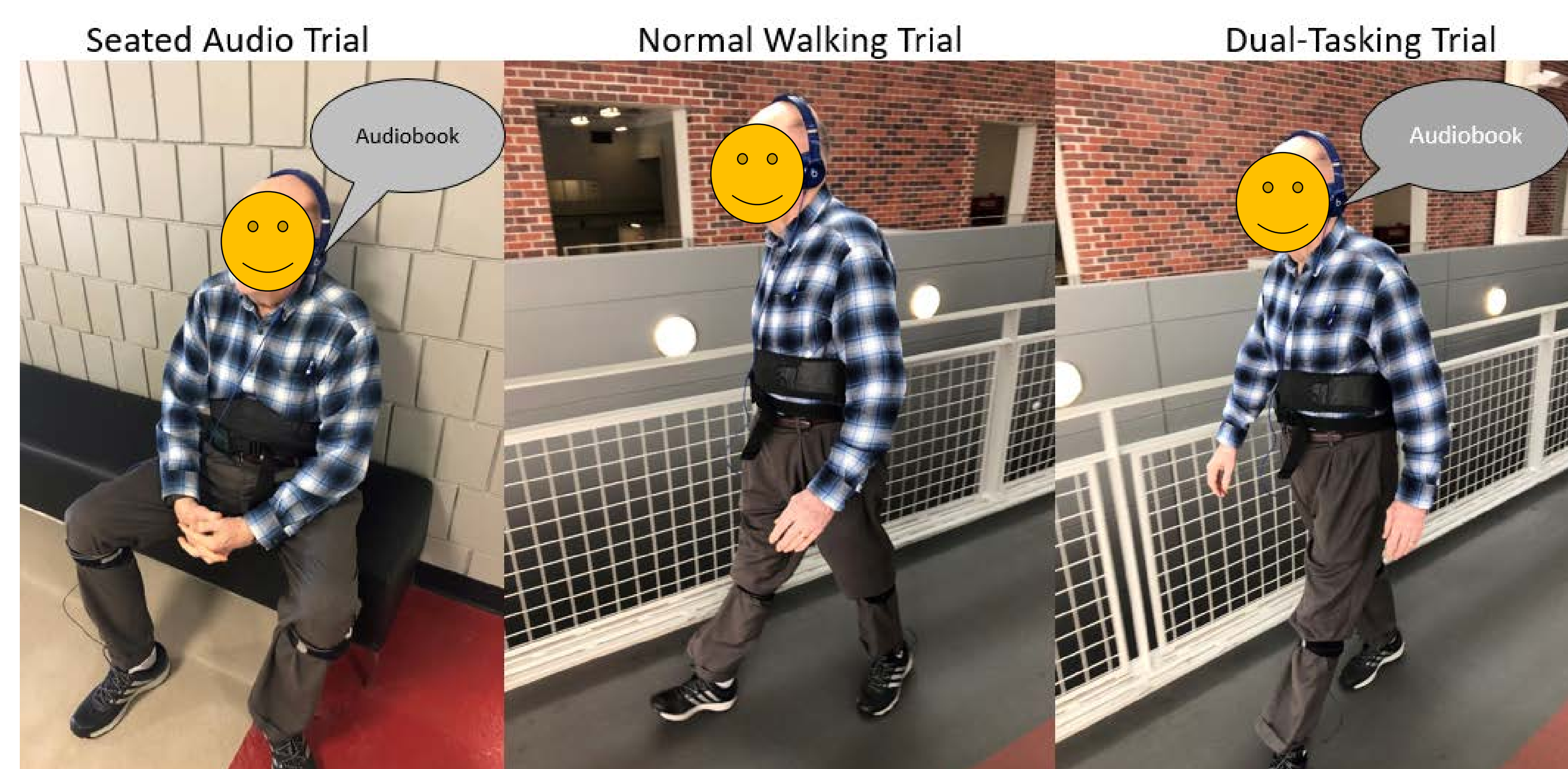


Figure 1: DFA values for the PD participants from single task walking (white circles) to dual-task walking (Black circles). Participant # 20 represents the average for all participants.

METHODS

- 40 people with Parkinson's disease (age >60), and 40 age and gender matched healthy elderly (HE) will participate in the study. All participants will perform three conditions in random order:



- Audio trials involve
 - Listening to an audiobook (different between seated and walking trials)
 - Monitoring 2 predefined words
 - Answering 10 questions about context

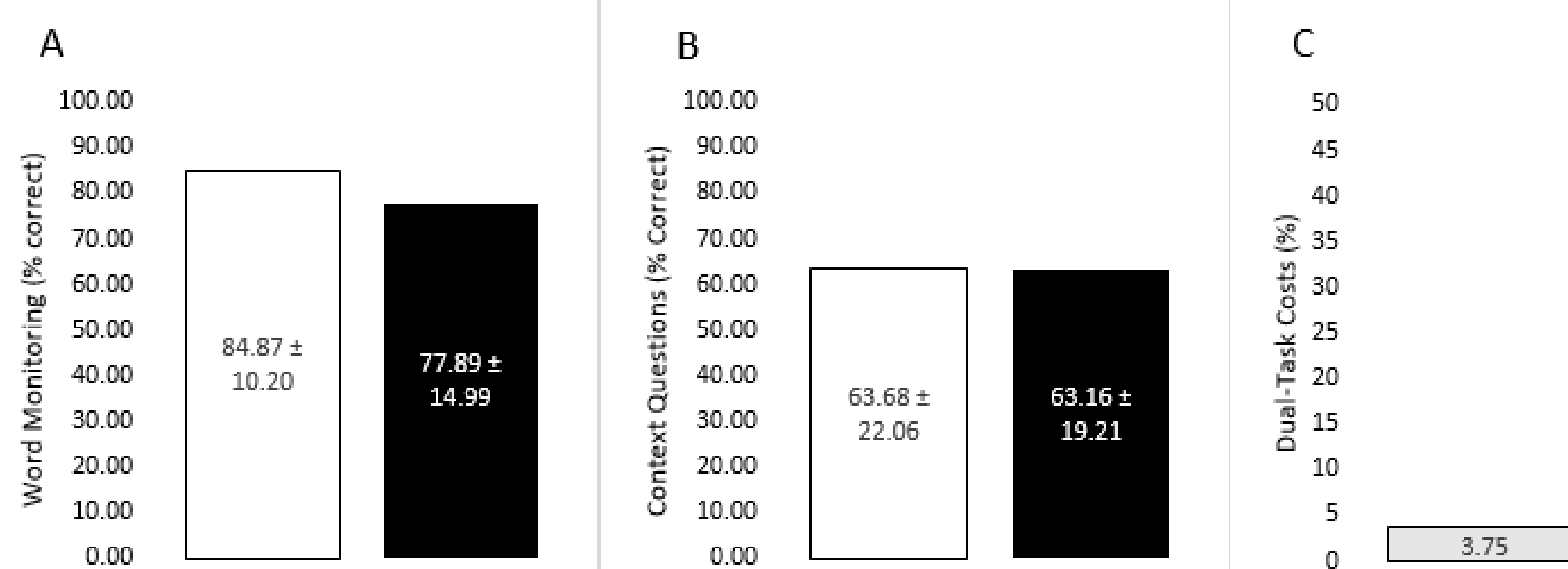


Figure 2: Comparing Cognitive tasks performance for PD group single-task (white) and dual-tasking (Black). Word monitoring task (A), Context questions (B), and dual-task costs (C).

DISCUSSION

- People with PD maintain their walking speed from single to dual-tasking, **at the cost of more random variability**. This potentially reflects increased control of locomotion. In contrast, gait steadiness (CV) is not affected by dual-tasking.
- Walking does not seem to alter patient's performance on the cognitive task. This suggests that they **prioritize the cognitive task**, while controlling more their step-to-step variations.

REFERENCES

1. Roheger M, et al. *J Parkinson's Disease* **8**(2), 183-193, 2018.
2. Chen TY, et al. *J Gerontology Series* **67**(6), 720-728, 2012.
3. Kelly V, et al. *Parkinson's Disease*, 1-14, 2012.

4. Hausdorff J, et al. *J Geriatric Psychiatry Neurology* **16**(1), 53-58, 2003.
5. Marmelat V, et al. *PLoS ONE* **9**(3), 2014.