



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

Shane Meltz<sup>1</sup>, Danish Bhatti<sup>2</sup>, John Bertoni<sup>2</sup>, Vivien Marmelat<sup>1</sup>

<sup>1</sup>University of Nebraska at Omaha, Omaha, Nebraska

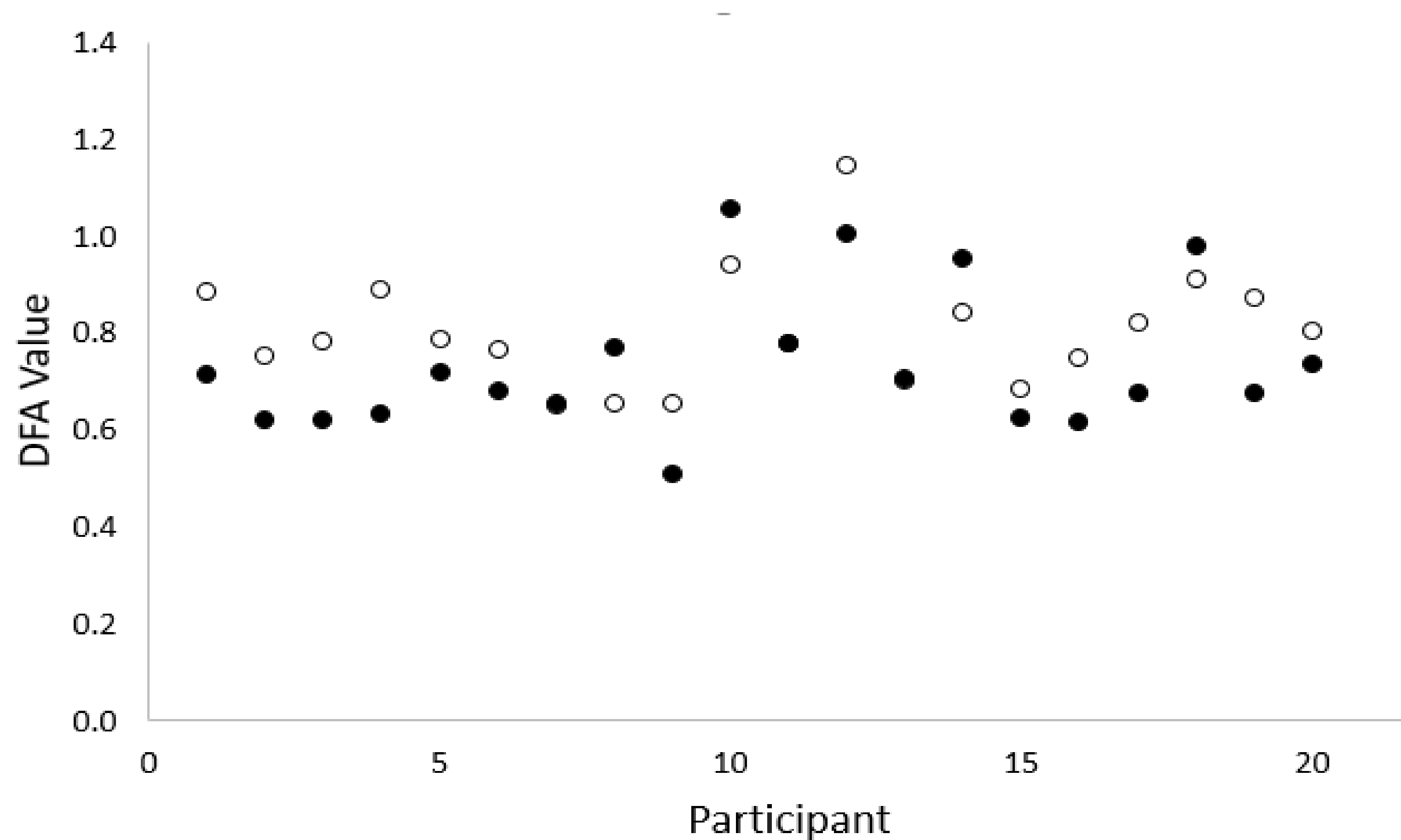
<sup>2</sup>University of Nebraska Medical Center, Omaha, Nebraska

### INTRODUCTION

- Parkinson's disease (PD) impacts executive and motor function<sup>1</sup>. Walking requires executive function and attention<sup>2</sup>, but performing a secondary task while walking (i.e., dual-tasking) can impact the performance on one or both tasks<sup>3</sup>.
- Locomotor function is reflected in stride-to-stride fluctuations, notably by the amplitude (coefficient of variation)<sup>4</sup> and the temporal organization (scaling exponent  $\alpha$ -DFA)<sup>5</sup> of stride time intervals.
- **Primary aim:** To determine the effect of an attention-demanding task on gait variability in people with PD.

### RESULTS

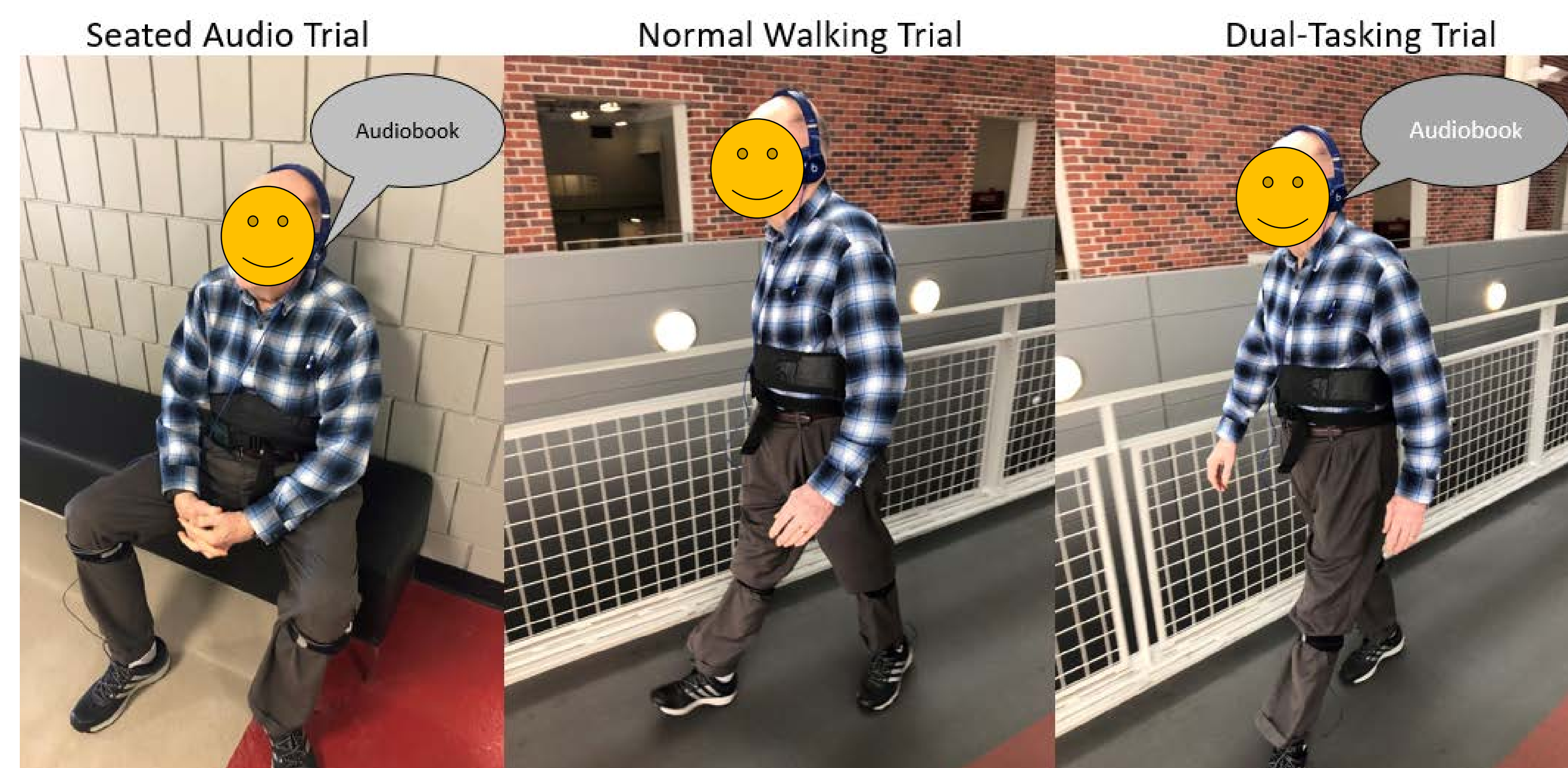
- We have collected so far 19 people with Parkinson's disease (age  $68 \pm 4.6$ ), and 4 healthy elderly (age  $67 \pm 5.0$ ). We only report results from PD here.
- When listening to an audiobook:
  - PD participants walked **slower** (- 0.02 m/s)
  - Gait variability in PD patients was **more random**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



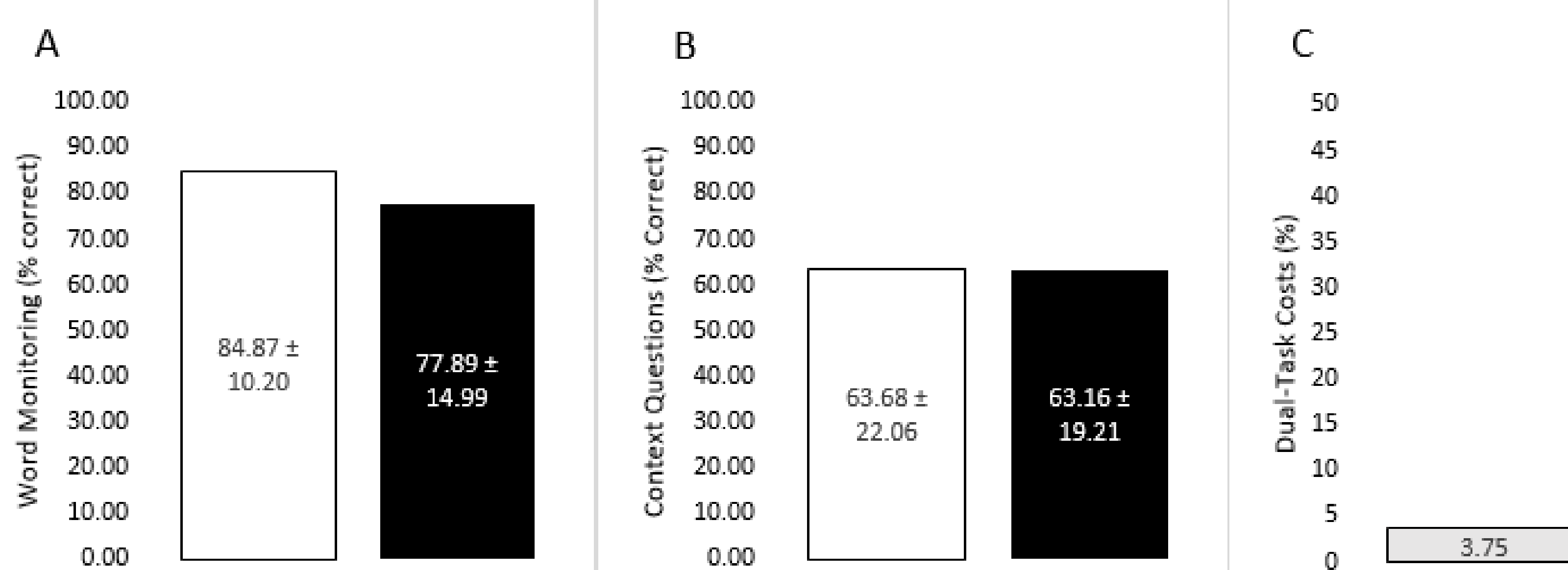
**Figure 1:** DFA values for the PD participants from single task walking (white circles) to dual-task walking (Black circles). Participant # 20 represents the average for all participants.

### 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.