A recommendation of 'Interlimb coordination in Parkinson's Disease is minimally affected by a visuospatial dual task'

Deepak Ravi 🆔 *based on peer reviews by **Nicholas D'Cruz** 🆔 and 1 anonymous reviewer*

Effective gait fundamentally requires spatial and temporal coordination of upper and lower limbs. Individuals with Parkinson's disease (PD) often exhibit impaired coordination, leading to adverse events such as freezing of gait and falls (Plotnik et al. 2008). Despite their significance, the current literature lacks depth in our understanding of this characteristic, especially their adaptation to changing task demands and symptom laterality. Exploring these relationships may provide new insights into PD gait and facilitate the evaluation of potential treatments. With these objectives in mind, the present study conducted by Hill & Nantel (2024) includes 17 participants with mild to moderate PD and focuses on coordination within and between the more and less affected sides during both single and dual gait tasks. In the study, spatial coordination, assessed by range of motion, range of motion variability, and peak flexion for the shoulder and hip joints, was examined alongside temporal coordination, which was evaluated using the phase coordination index and variability of continuous relative phase.

Their analysis reveals that, due to dual tasking, only the shoulder range of motion and peak flexion decreased within the least affected side, adding to the existing knowledge on arm swing impairments in early-stage PD (Navarro-López et al. 2022). However, no significant difference was observed between the more and less affected sides. Hip range of motion showed dual task-related differences between sides, while lower intralimb phase variability did not. The primary strength of the article lies in its attempt to systematically explore these differences in PD. As the authors pointed out, to interpret the clinical significance of these differences as well as the

null findings on temporal coordination, it may be necessary to include a healthy control group or other comparison groups, such as individuals with severe PD. When interpreting these results, readers may also pay attention to the methodological choices, such as the patient-reported most affected side and the choice of dual task. Overall, the study will be of interest to researchers studying intra- and inter-limb coordination during gait in PD.

References:

Plotnik, M., & Hausdorff, J. M. (2008). The role of gait rhythmicity and bilateral coordination of stepping in the pathophysiology of freezing of gait in Parkinson's disease. Movement disorders: official journal of the Movement Disorder Society, 23(S2), S444-S450. https://doi.org/10.1002/mds.21984

Hill, A., & Nantel, J. (2024). Interlimb coordination in Parkinson's Disease is minimally affected by a visuospatial dual task. bioRxiv, ver. 3 peer-reviewed and recommended by Peer Community in Health and Movement Science. https://doi.org/10.1101/2022.07.15.500215

Navarro-Lopez, V., Fernandez-Vazquez, D., Molina-Rueda, F., Cuesta-Gomez, A., Garcia-Prados, P., del-Valle-Gratacos, M., & Carratala-Tejada, M. (2022). Arm-swing kinematics in Parkinson's disease: a systematic review and meta-analysis. Gait & Posture, 98, 85-95. https://doi.org/10.1016/j.gaitpost.2022.08.017

Reviews

Evaluation round #1

DOI or URL of the preprint: https://doi.org/10.1101/2022.07.15.500215
Version of the preprint: 2

Authors' reply, 01 February 2024

Download author's reply
Download tracked changes file

Decision by Deepak Ravi ⓘ, posted 12 December 2023, validated 12 December 2023

Dear Authors,

I am pleased to inform you that the review process for your manuscript has been completed by two reviewers. The feedback received from the reviewers was generally positive regarding the significance of your work. However, in the interest of ensuring rigor and clarity, a few specific points have been raised that require your attention before proceeding with a recommendation. I trust that you will find these suggestions valuable in refining your manuscript further.

Best regards,

Deepak Ravi

Reviewed by anonymous reviewer 1, 16 November 2023

Download the review

Reviewed by Nicholas D'Cruz ⬤, 23 November 2023

In this study, Hill and Nantel investigate the effect of dual tasking on inter- and intralimb coordination during treadmill walking. The study is well motivated, and aims to address a real gap in the literature using strong methodology, so I commend the authors for that! At the same time, the description and presentation of the methods and results could be improved, and the statistical analysis also raises some questions. Kindly find specific comments below. All the best!

Methods:
1.   Definition of MA side – an objective metric would have been preferred, even though they are not without their limitations.
Kindly clarify – was the definition made separately for upper and lower limbs?
Kindly consider/discuss – How robust do you think the self-report was (in terms of recall bias), and based on the UPDRS III, were these sides still the most affected?

2.   Task protocol – The description of the methods could be more elaborate
Kindly clarify – How was the preferred walking speed determined and standardized?
Kindly clarify – Was the background containing other stimuli apart from the words? Was the challenge to recognize words in the noise? How was the contrast determined? Was the duration/frequency of the words sufficient to demand continuous attention to the task? 80 + 20 seconds is less than 2 minutes – was there no dual task for the last 20 seconds of the dual task trial?

3.   Outcomes
Kindly clarify – How was DTC calculated?

4.   Medication state
Kindle discuss - the possible impact of medication state on coordination results, contrasting with the earlier mentioned research

Statistics
5.   Equivalence testing – is it applicable and applied correctly?
Kindly reconsider approach – the smallest effect size detectable with the current sample size is d= 0.9, yet the equivalence bounds used are far smaller than that (d=0.36). This seems contrary to the recommendations in the Lakens paper which suggests using the smallest detectable effect size to determine the bounds.
Kindly clarify – only one bound is mentioned for the various outcomes, is this the upper bound, and if so, what is the lower bound? Or is inferiority testing being applied, rather than equivalence testing?

6.   Multiple comparison problem
Kindly consider – reporting multiple-comparison corrected p-values

Results
7.   Demographics
Kindly clarify – For a mid-stage PD population such as this, including freezers and fallers, the UPDRS scores are extremely low. Were these scored by a movement disorders specialist?

8.   Presentation of results
Kindly adjust – Bilateral difference in DTC could also go into a table to reduce the text

9.   Presentation of data

Kindly adjust – add figures to show individual data points for important results.