

# THE EFFECT OF ASSISTIVE DEVICES ON GAIT PATTERNS IN PARKINSON'S DISEASE

## PRELIMINARY RESULTS

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### INTRODUCTION

Parkinson's disease (PD) is a neurodegenerative, progressive, and chronic disease. As the disease progresses, postural instability appears and eventually leads to gait abnormalities and falling. The use of Assistive Devices (ADs) to improve mobility is an important area of management of gait impairments. However, their true usefulness, risks and influence on gait patterns still need further research.

**Our goal** is to assess the influence of seven different ADs on gait patterns in patients with Idiopathic Parkinson's Disease (IPD).

### METHODS

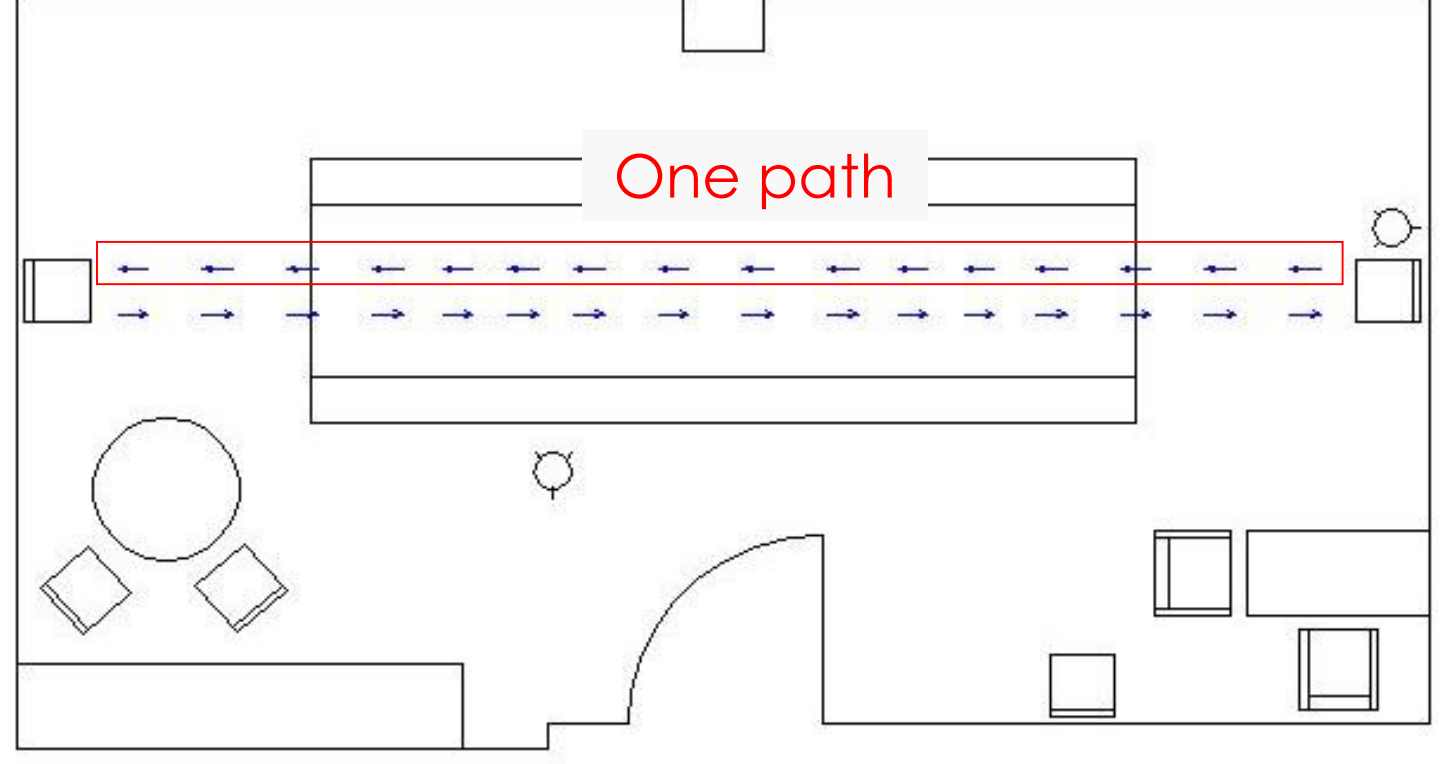
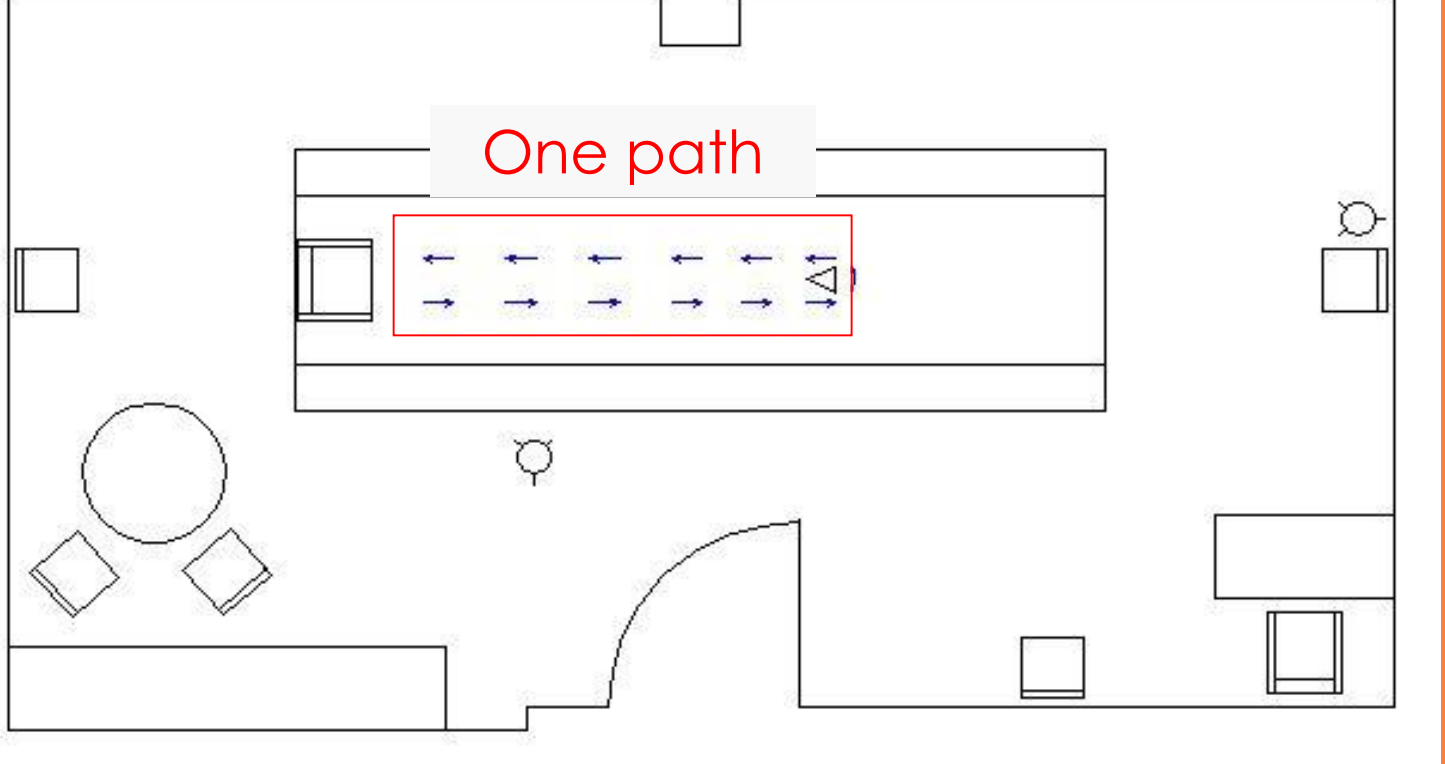
30 Participants	3 Groups (10 pax each)	7 Assistive Devices/8 Conditions	Zeno Walkway*
<b>Inclusion Criteria</b> <ul style="list-style-type: none"> <li>≥ 18 years old</li> <li>Diagnosis of IPD</li> <li>Ambulate independently (10m minimum, without assistance)</li> <li>Anti-parkinsonian medication</li> </ul> <b>Exclusion Criteria</b> <ul style="list-style-type: none"> <li>No significant cognitive impairment</li> <li>No psychiatric, neurological, visual or orthopedics disorders that enables participants to perform the required tests</li> </ul>	<ul style="list-style-type: none"> <li>1) PD with postural instability and freezing</li> <li>2) PD with postural instability and no freezing</li> <li>3) PD without postural instability and no freezing</li> </ul>	<ul style="list-style-type: none"> <li>1 Cane (Cane)</li> <li>1 Tripod cane (TCane)</li> <li>2 Nordic walking sticks (NWS)</li> <li>1 Standard walker (StW)</li> <li>1 Two-wheeled walker (2WW)</li> <li>1 Four-wheeled walker (4WW)</li> <li>1 Mobilaser in a StW (MStW)</li> </ul> <p><b>• Baseline for comparison: 'no AD' condition</b></p>	<ul style="list-style-type: none"> <li>Electronic walkway (spatiotemporal gait measures collector)</li> <li>Length: 5,6 m</li> <li>Width: 0,9 m</li> </ul> <p>→ To process data sample we use Pkmas software</p>
<b>2 Courses</b>			
<b>First Course – Straight line</b> <ul style="list-style-type: none"> <li>Walk in straight line, at a normal, comfortable pace</li> <li>4 paths: Only the mean of the last 3 paths is calculated and analysed (first is a trial)</li> </ul>		<b>Second Course - Timed Up and Go Test (TUG)</b> <ul style="list-style-type: none"> <li>To test manoeuvrability around obstacles and fast walk</li> <li>2 paths: Only the 2<sup>nd</sup> path is calculated and analysed (first is a trial)</li> </ul>	

Figure 1. First Course: Straight line

Figure 2. Second Course: TUG Test

### RESULTS

**Note:** This results consider only 9 participants, performing the First Course.

Subject characteristics	Mean ± SD
Age	66 ± 9,86
Height	1,61 ± 0,1
Weight	70,09 ± 18,2
Years of PD	8 ± 4,9

Table 1. Subject characteristics (N=9; 5 males, 4 females)



Figure 3. Gait cycle

#### Analysis of differences between gait parameters across ADs showed:

- The StW and the MStW produced the most significant differences on the gait cycle (Figure 3);
- The 4WW, Cane and NWS produced the most similar pattern when compared with the 'No AD' condition (Figure 4).

#### Future Work:

- We will include the remaining 21 participants (30 in total) to have a large sample and to observe more in depth effects;
- We will also include any freezing episodes, anxiety and/or panic attacks, stumbles and/or falls, patient level of satisfaction, perception of feeling safe and all the Second Course data in the analysis.

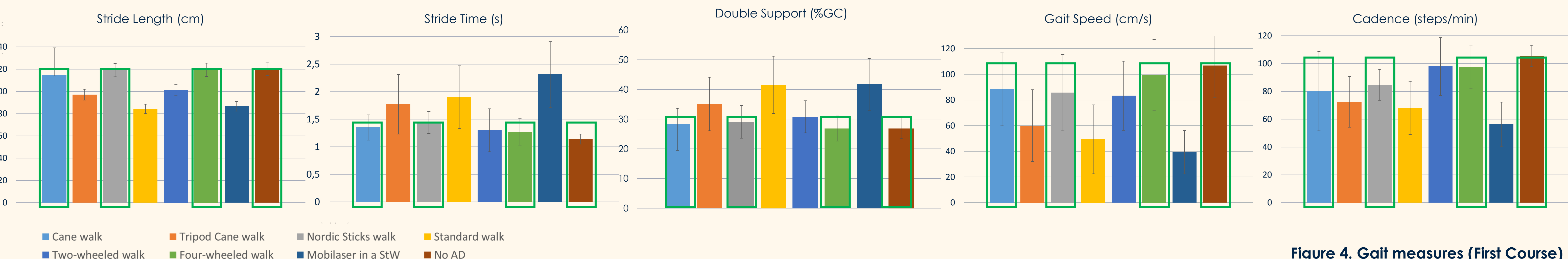


Figure 4. Gait measures (First Course)

### CONCLUSION

At the end of this study, we expect that the results will add to current knowledge, how people with PD change their gait patterns when walking with different ADs. We also expect to deliver better guidance to health professionals to prescribe ADs properly and to provide proper additional gait training. This will lead to a more cautious clinical practice in gait rehabilitation using ambulatory ADs.

#### BIBLIOGRAPHY

Bryant MS, P. A., Thrasher MSA (2012). "Gait changes with walking devices in persons with Parkinson's disease." *Disability and Rehabilitation: Assistive Technology* 7(2): 149-152.  
 Constantinescu R, L. C., Deeley C, Kurlan R (2007). "Assistive devices for gait in Parkinson's disease." *Parkinsonism Related Disorders* 13(3): 133-138.  
 Kegelmeier DA, P. S., Kostyk SK, White SE, Kloos AD (2013). "Assistive devices alter gait patterns in Parkinson disease: Advantages of the four-wheeled walker." *Gait Posture* 38(1): 20-24.  
 \*http://protokinetics.com/

#### ACKNOWLEDGEMENTS

