

The Impact of Visual Cues and Digit Recall on Visual

Exploration During Locomotion



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Introduction

Parkinson's Disease (PD) is a chronic neurodegenerative disorder associated with a slow and shuffling gait. Cognitive and visual deficits contribute to gait disturbance in PD. Visual cues significantly improve the locomotion of many people with PD, however the underlying mechanisms are not well understood. Attention is thought to play a role.

This preliminary study was conducted in order to advance our understanding of the role of cognition and vision during the observation of a visual cue during gait in people with PD, data from healthy control subjects has been obtained first. Visual behaviour during single-task (walking only) and dual-task (walking with concurrent digit recall task) has been assessed.

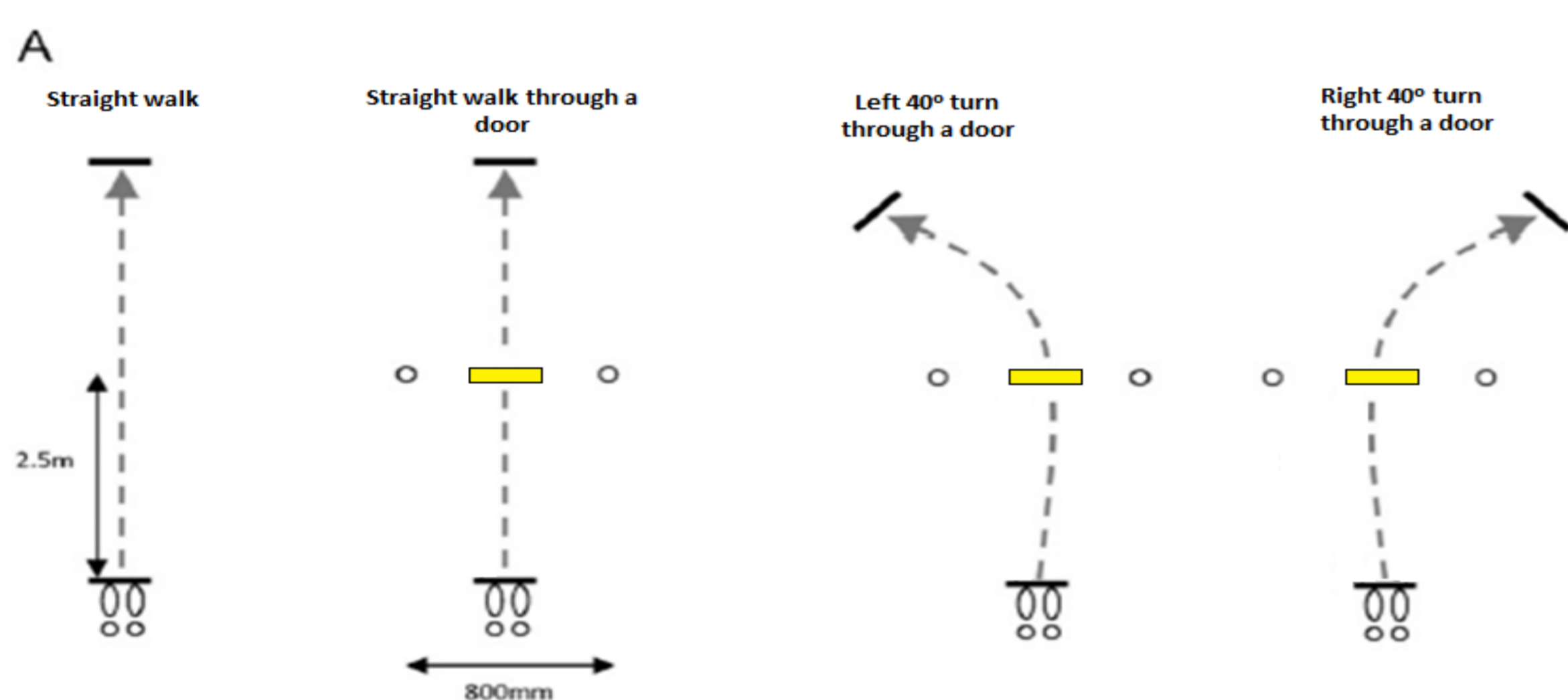


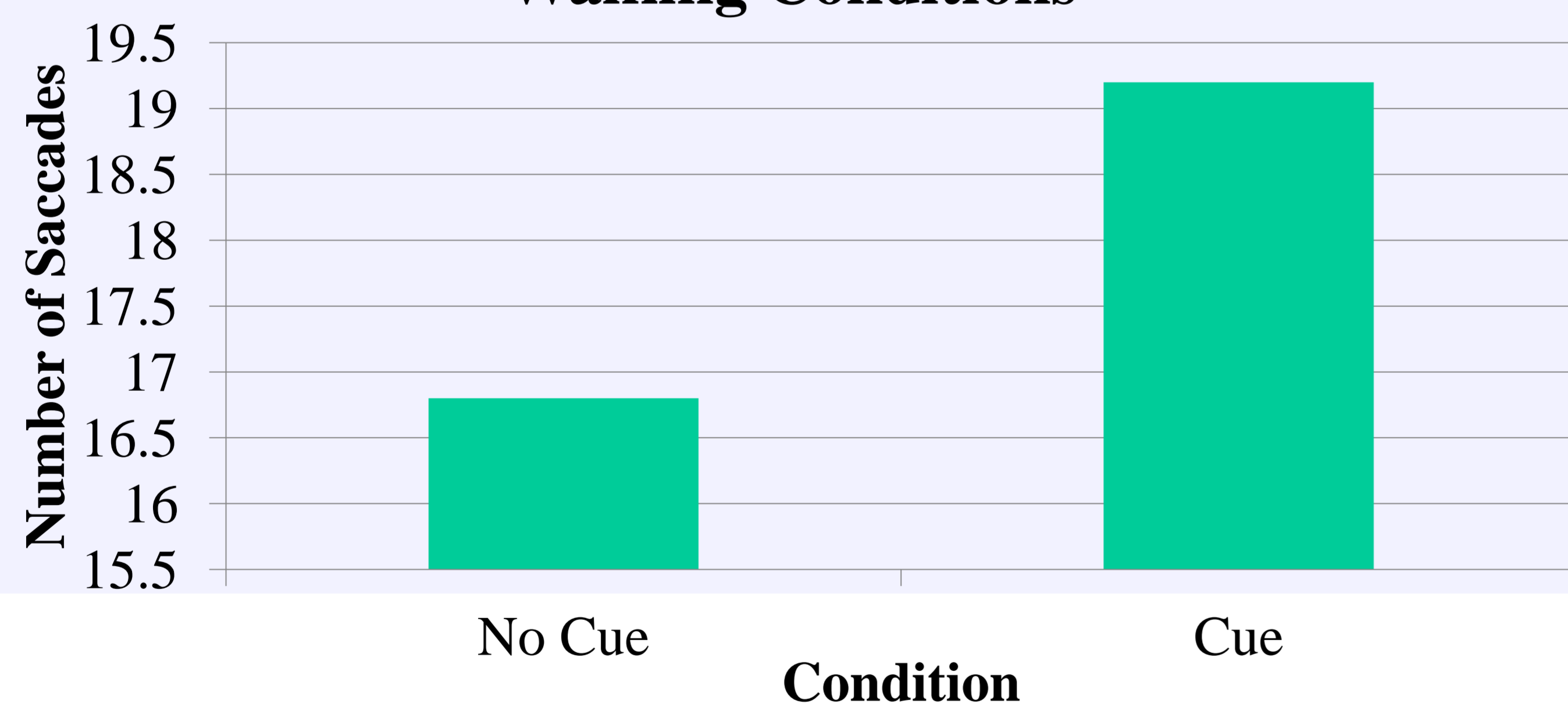
Figure 1. Modified version of (1). Illustrating the four walking tasks. Yellow rectangles represent the visual cue.

Results

Number of Saccades

- The mean number of saccades was increased with a visual cue
- Due to small sample size, data has been described instead of tested statistically

Mean Number of Saccades During Different Walking Conditions



Conclusions

- The number of saccades increased with a visual cue which may reflect heightened attention on the cue
- Fixation frequency also increased during dual-task, possibly because attention was distracted
- Fixation duration decreased during dual-task, which may reflect shorter available visuo-motor processing time.
- These results are very preliminary due to the small number of subjects.

Methods

Ethical approval was obtained from NRES Committee North East - Newcastle & North Tyneside 1. An observational research design was used to measure visual sampling in five healthy older adults (>50 years). The study took place in the gait laboratory at the Clinical Ageing Research Unit at Newcastle University. The data was collected using a Dikablis mobile eye-tracker (50Hz).

Outcome measures included:

- Average number of saccades during locomotion
- Visual cue fixation frequency and duration

Customised Excel (Microsoft, 2010) and MATLAB (2012a) programs were used for data analysis.

A saccade was classed as an eye movement with velocity threshold of ≥ 120 degrees/second (approx. 2° amplitude).

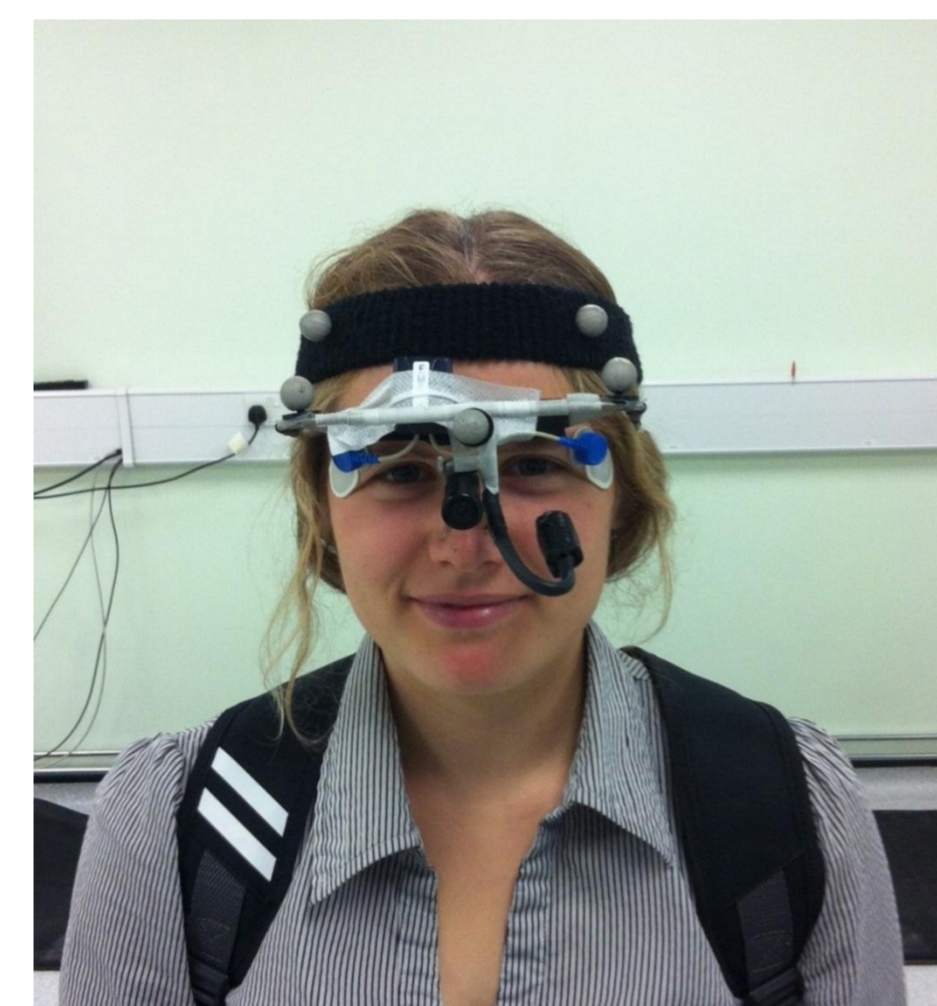


Figure 2. Photograph showing Dikablis mobile eye-tracker.

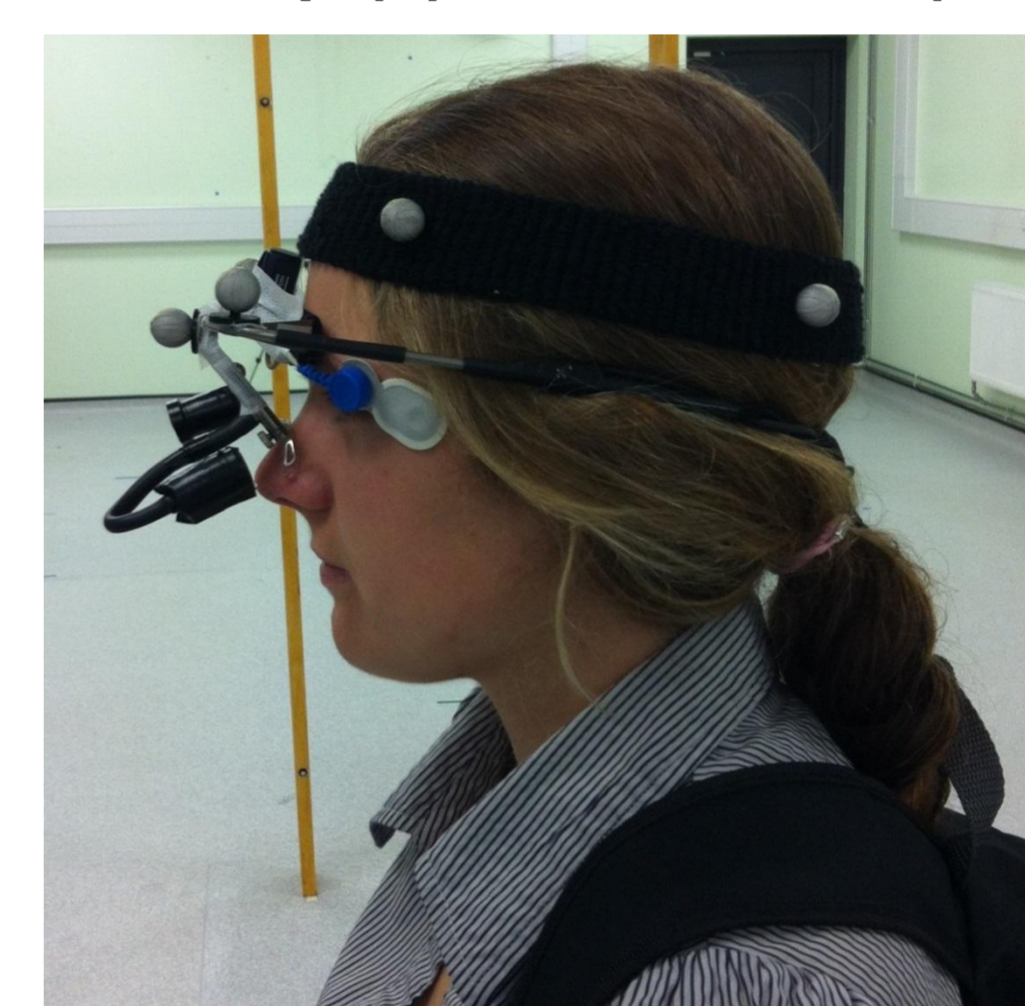


Figure 3. Side view of equipment.

Fixation Frequencies and Durations

- The number of times that participants fixated on the visual cue (fixation frequency) was increased during dual task
- The duration of fixation on the visual cue was reduced during dual task

	Single-task	Dual-task
Average Fixation Frequency (Standard Deviation (SD))	1.1 (0.2)	1.2 (0.2)
Average Fixation Duration in seconds (SD)	0.42 (0.4)	0.38 (0.3)

References

- Galna S, Lord S, Daud D, Archibald N, Burn D and Rochester L. Visual sampling during walking in people with Parkinson's disease and the influence of environment and dual-task. *Brain Research*. 1473(2012) 35-43.

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