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## Effects of an intensive rehabilitation program (Sirocco) on prefrontal activity during walking in patients with Parkinson Disease

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### Background + objective

- **Physical exercises have beneficial effects** on cognition<sup>1</sup> and can induce neuroplasticity by enhancing the compensatory scaffolding mechanism<sup>2</sup>
- In Lyon (France), an **intensive collective multidisciplinary rehabilitation program (Sirocco)** was developed for patients with PD, focusing on intensive, high amplitude movements and loudness in the speech
- Dual-task walking is generally used to assess executive functions<sup>3</sup>, localized in the dorsolateral prefrontal cortex (DLPFC)
- The objective of the present study is to investigate the effects of a 5-week intensive rehabilitation program (Sirocco) on DLPFC activity and on walking performance in PD patients

### Hypothesis

Changes in DLPFC activation and improvement of walking performance are expected after the Sirocco program



Figure 1: Walking path

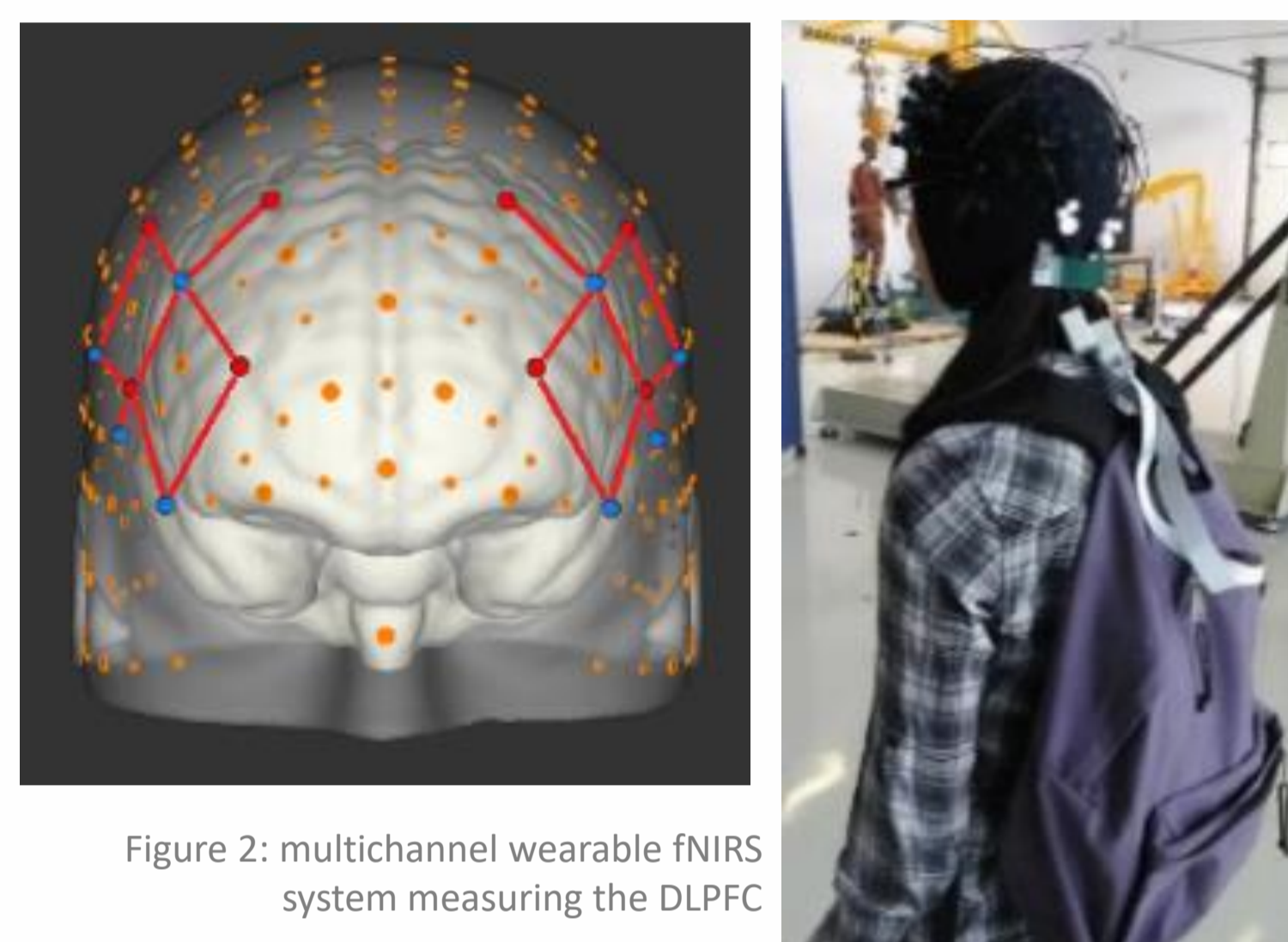


Figure 2: multichannel wearable fNIRS system measuring the DLPFC

### Methods

**Participants:** 9 patients with PD (65 years old  $\pm$  6.4 ; 7 M / 2 F)

**Task** (random order) (Fig.1):

- Usual Walking
- Subtracting
- Walking while subtracting

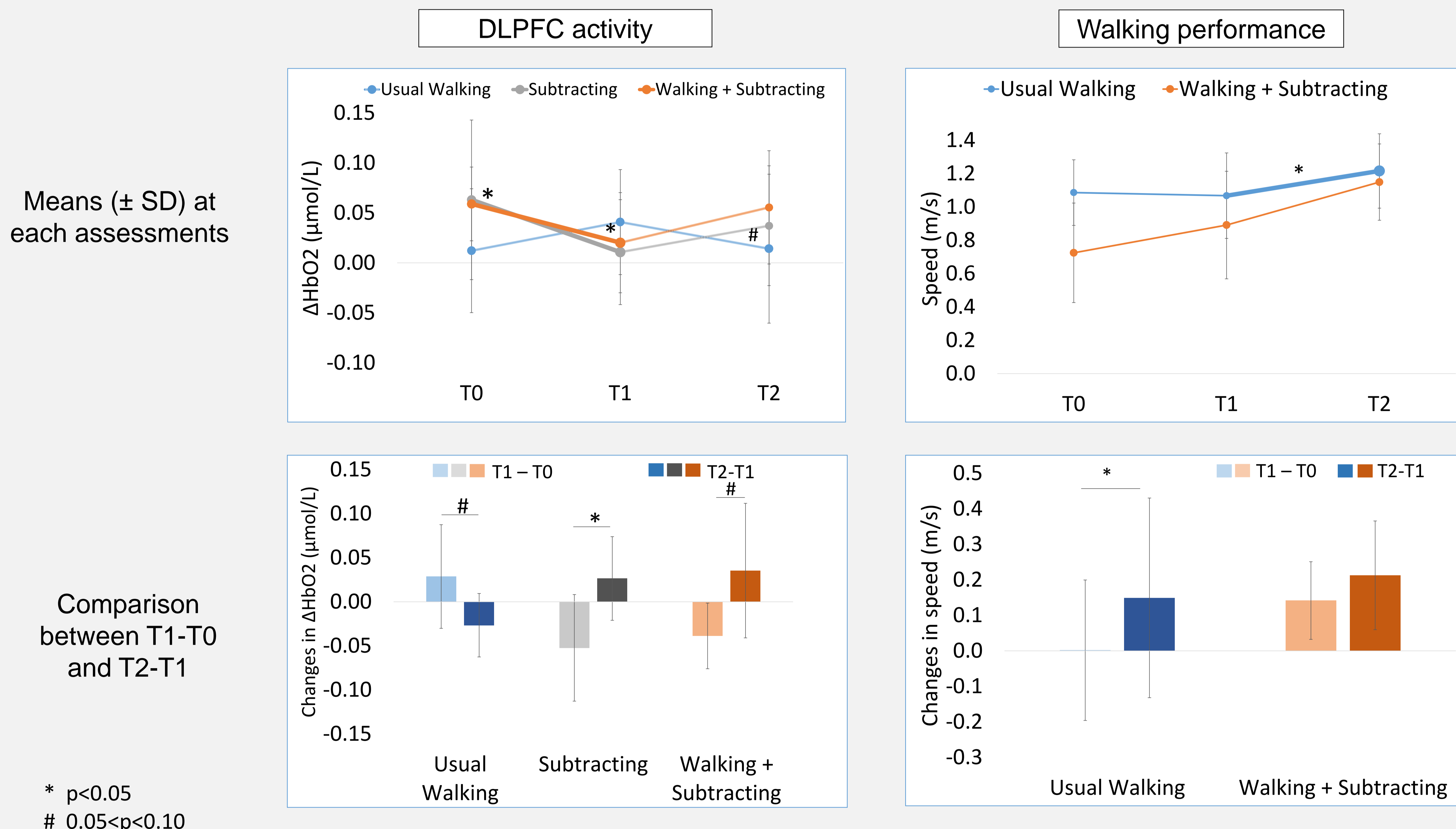
**Measurements:** changes in oxygenated hemoglobin ( $\Delta$ HbO<sub>2</sub>) in the DLPFC using *functional Near Infra-Red Spectroscopy (fNIRS)* (Fig.2) + gait speed (m/s)

### Assessments

3 times:

- Five weeks **before** the program (**T0**)
- Few days **before** (**T1**)
- One week **after** the program (**T2**)

### Results



### Conclusion

- Prefrontal activity during usual walking and during dual-task walking is modified after the rehabilitation program: it decreased in walking and increased in walking while subtracting
- These changes may be accompanied with increased gait speed, especially during usual walking
- These preliminary results suggest that patients require less cognitive resources in usual walking and that they are able to solicit more cognitive resources to improve their performance in a complex walking situation (dual-task)
- Larger sample size is needed to confirm the beneficial effects of the rehabilitation program
- These results will have important implications for clinical practice and rehabilitation

### References

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