Sensitivity of fNIRS Brain Imaging to Determine Hemispheric Laterality During Lower-Body Motor Tasks

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INTRODUCTION

- Use of functional near-infrared spectroscopy (fNIRS) to measure and image brain activity during movement is increasing (1).
- It is highly portable and robust to motion artifacts, making it ideal for human movement science (2).
- However, its relatively poor spatial resolution leaves questions about its sensitivity (2). For example, the areas of the motor cortex dedicated to lower body control from each hemisphere are in close proximity to each other within the longitudinal fissure. It is unclear if fNIRS is capable of discerning between the two areas.
- **Research Question:** Is fNIRS sensitive enough to discern contractions of the left leg from those of the right leg?
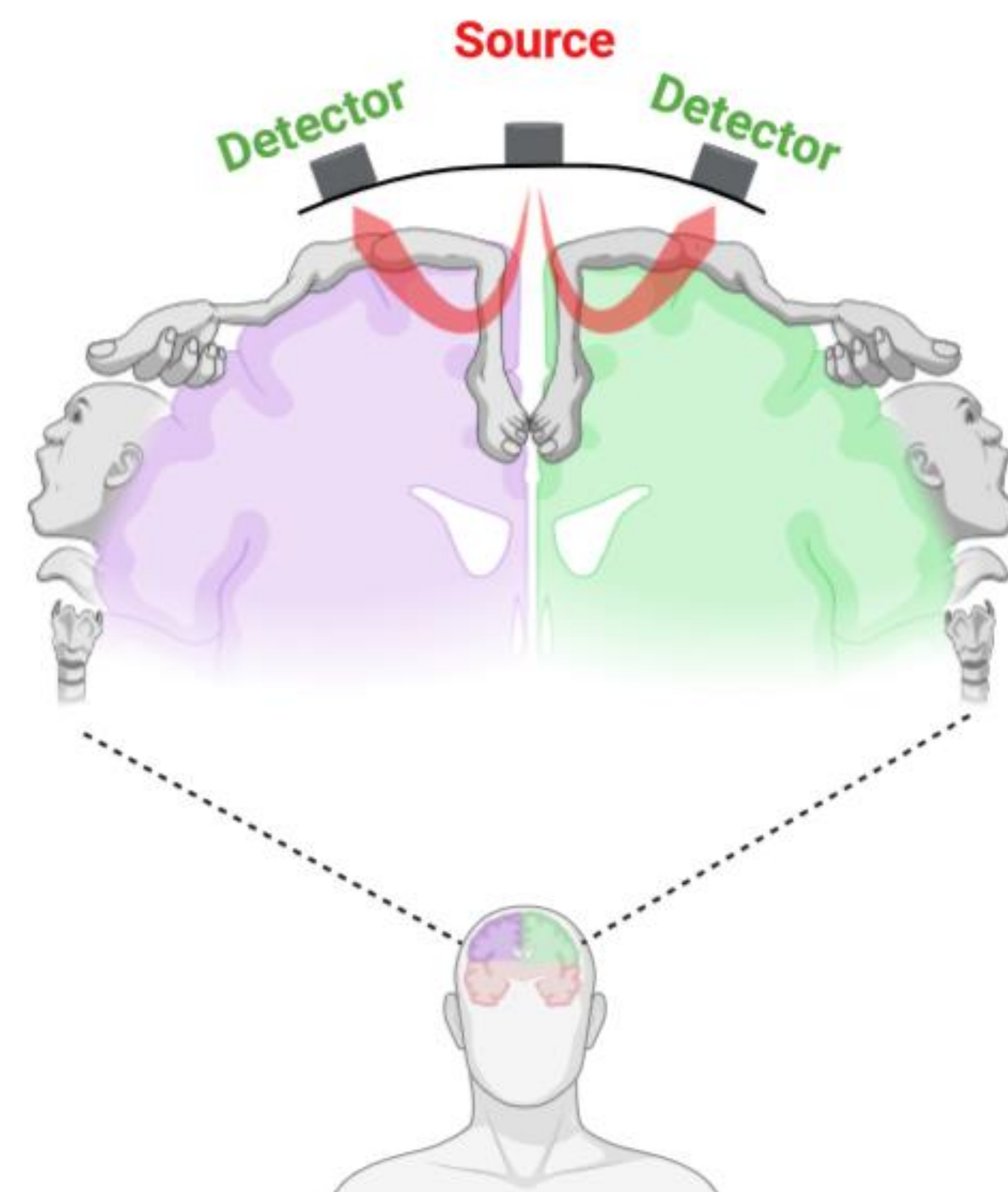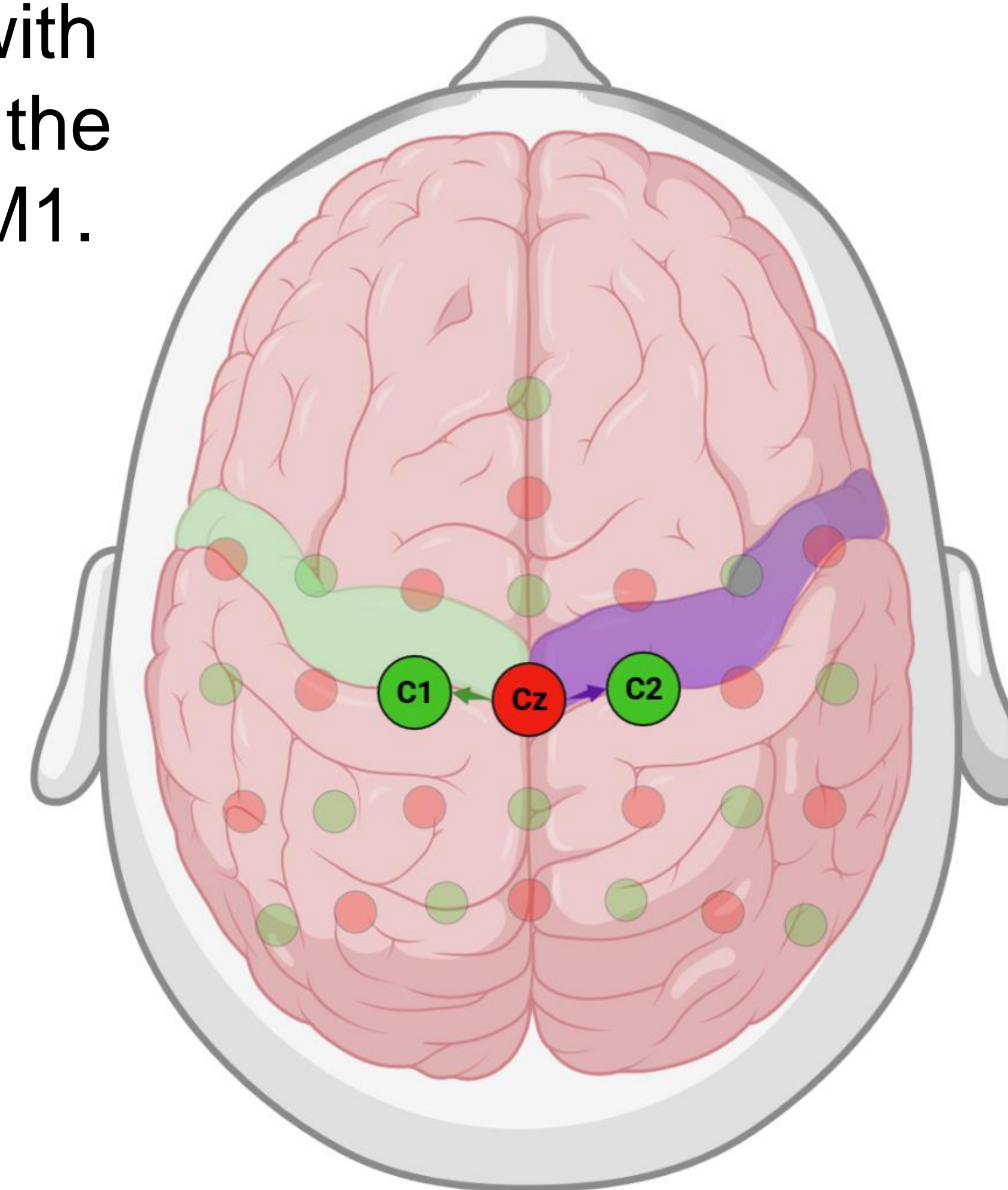
METHODS

Subjects: Nine college age males.

Contractions: 30% of MVC with left and right legs against a handheld dynamometer.
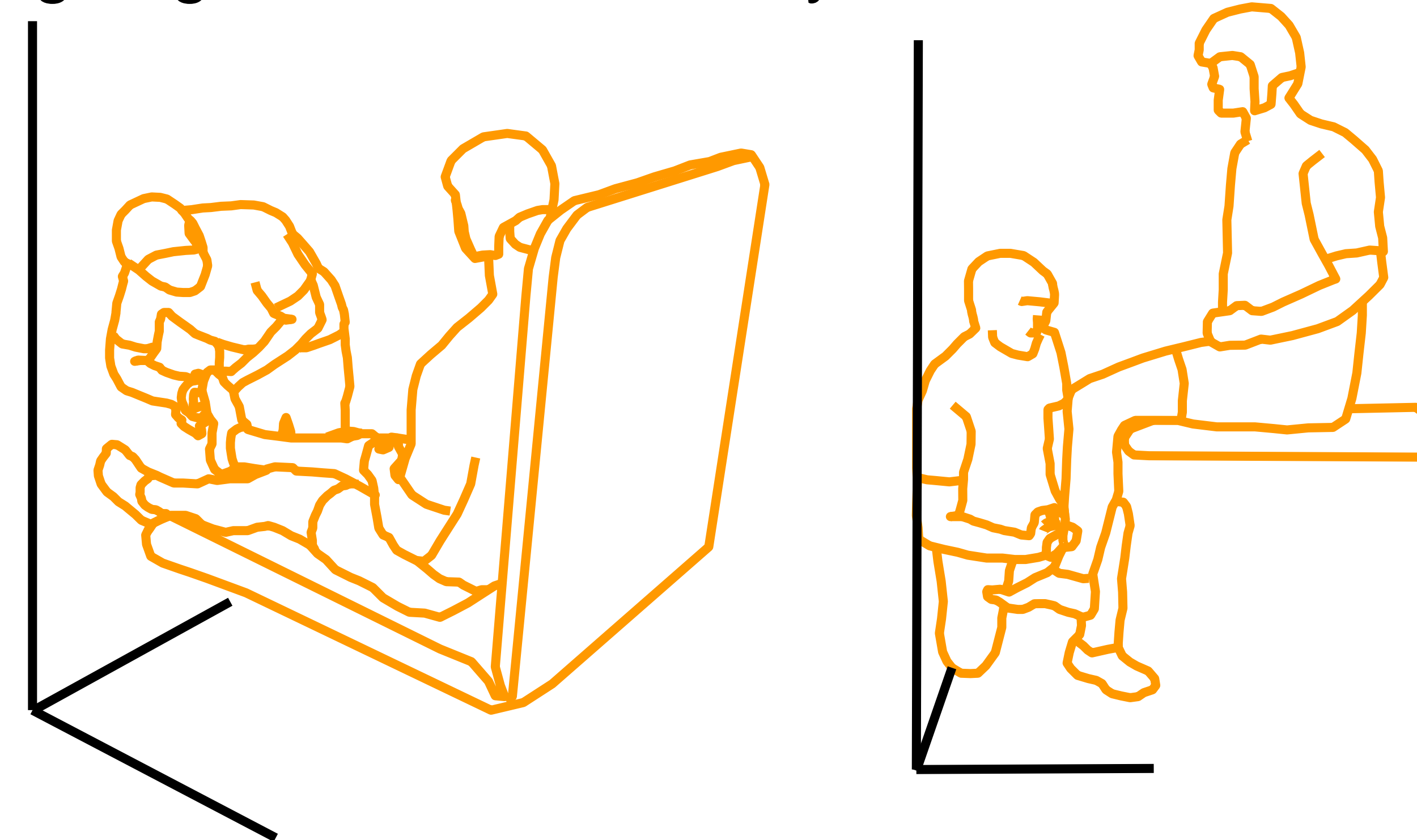
**fNIRS:** Cap with sensors over the leg areas of M1.

Processing: Block averaging with MATLAB based Homer3 (3).

Statistics: 2-way (contraction type [left & right legs] × channel location [left & right M1]) repeated measures ANOVA.

RESULTS

No significant interaction.
- During right leg contractions, activity in the left hemisphere was 66% higher than in the right hemisphere.
- During left leg contractions, activity in the right hemisphere was 39% higher than in the left hemisphere.
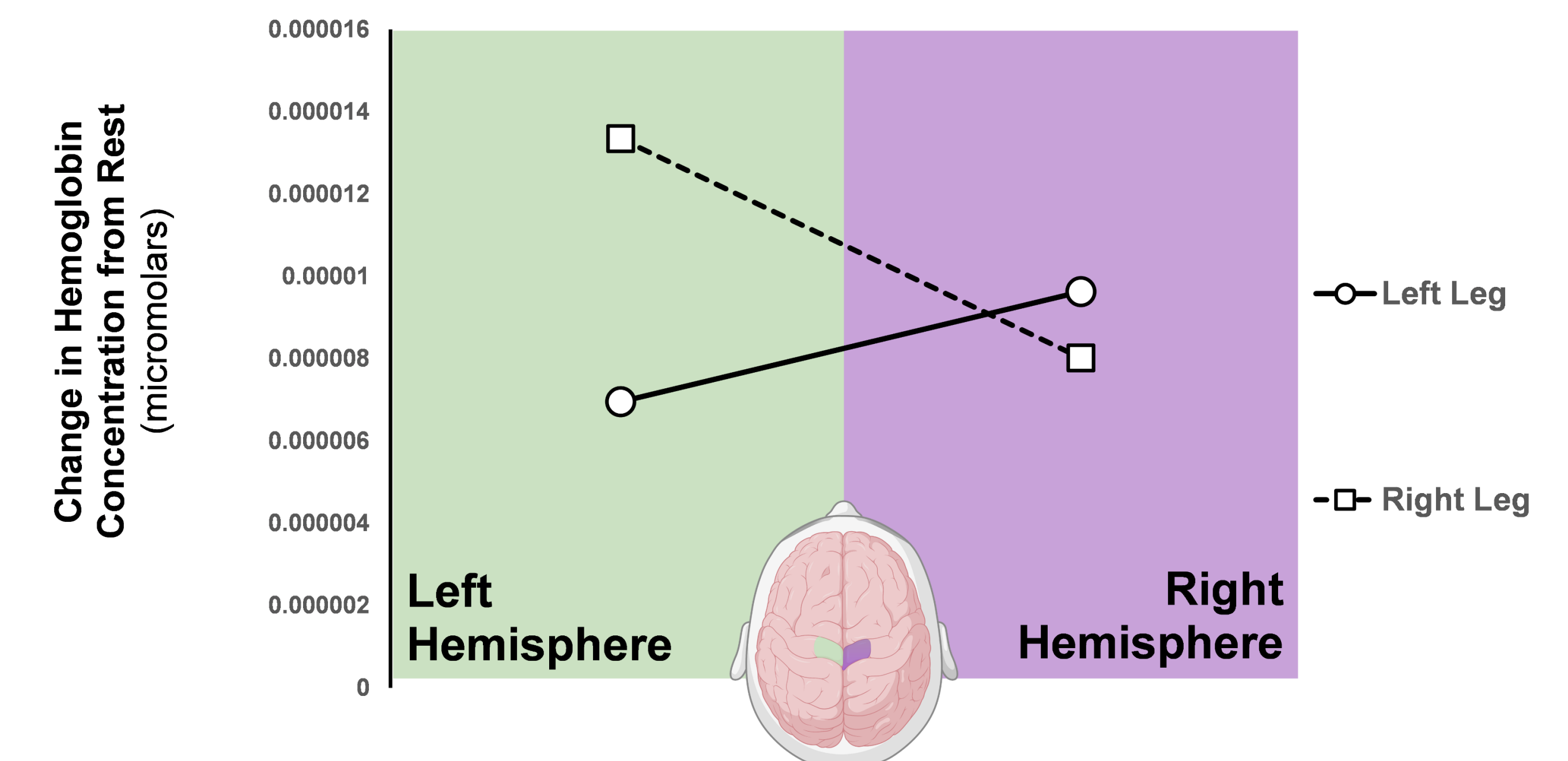
DISCUSSION

- Though no interaction was found, this is a preliminary analysis with low sample size.
- If future analysis with larger sample size shows the same magnitude of differences and the same visual interaction shown in the plot above, the data would suggest fNIRS is capable of discerning hemispheric laterality of lower body motor tasks.

REFERENCES

1. Boas et al., 2014.
2. Scarapicchia et al., 2017.
3. Huppert et al., 2009.