

Using Immersive Virtual Reality to remotely examine performance differences between dominant and non-dominant hands.

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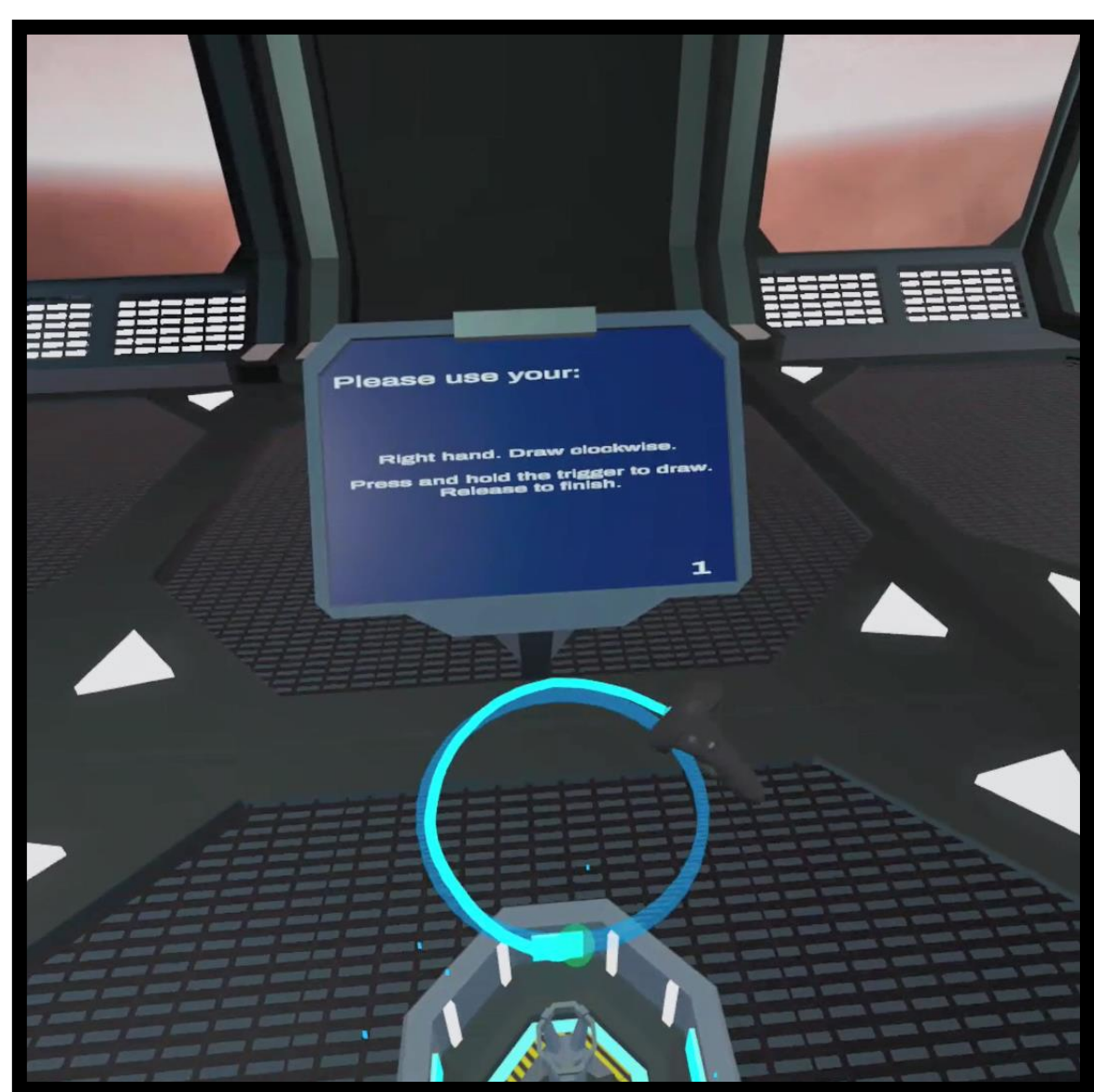
Introduction

- Circle drawing may be a useful task to study upper-limb function in patient populations^{1,2}.
- Commercial virtual reality (VR) is low-cost, customisable and includes integrated motion capture. As such, it may be a useful tool for rehabilitation and assessment³.
- We implemented a VR circle drawing task in healthy participants to test the method prior to use with patient populations.

If this method can detect fine differences between dominant and non-dominant hands, it may be suitable for clinical use.

Methods

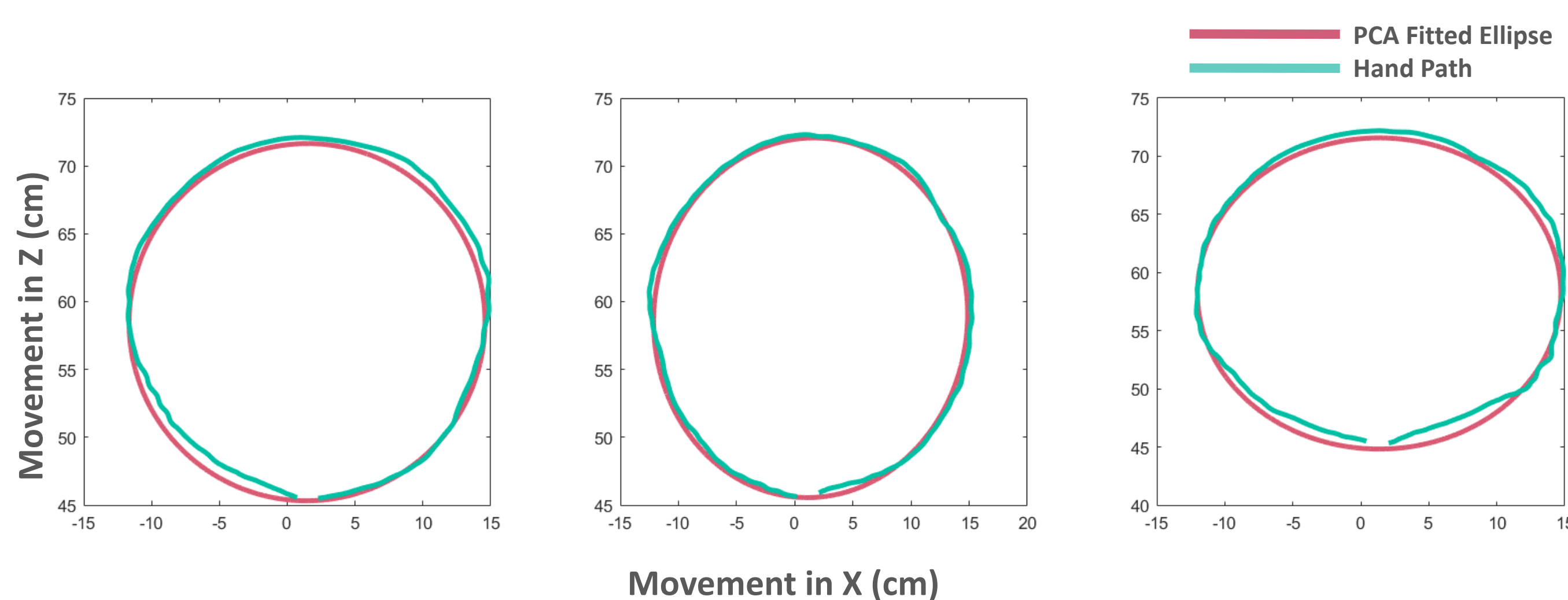
- Preregistered on OSF
- Experiment performed entirely remotely. Available as an app on SideQuest
- 34 participants recruited through the Oculus Quest user-base
- Completed experiment using their own Oculus Quest HMD



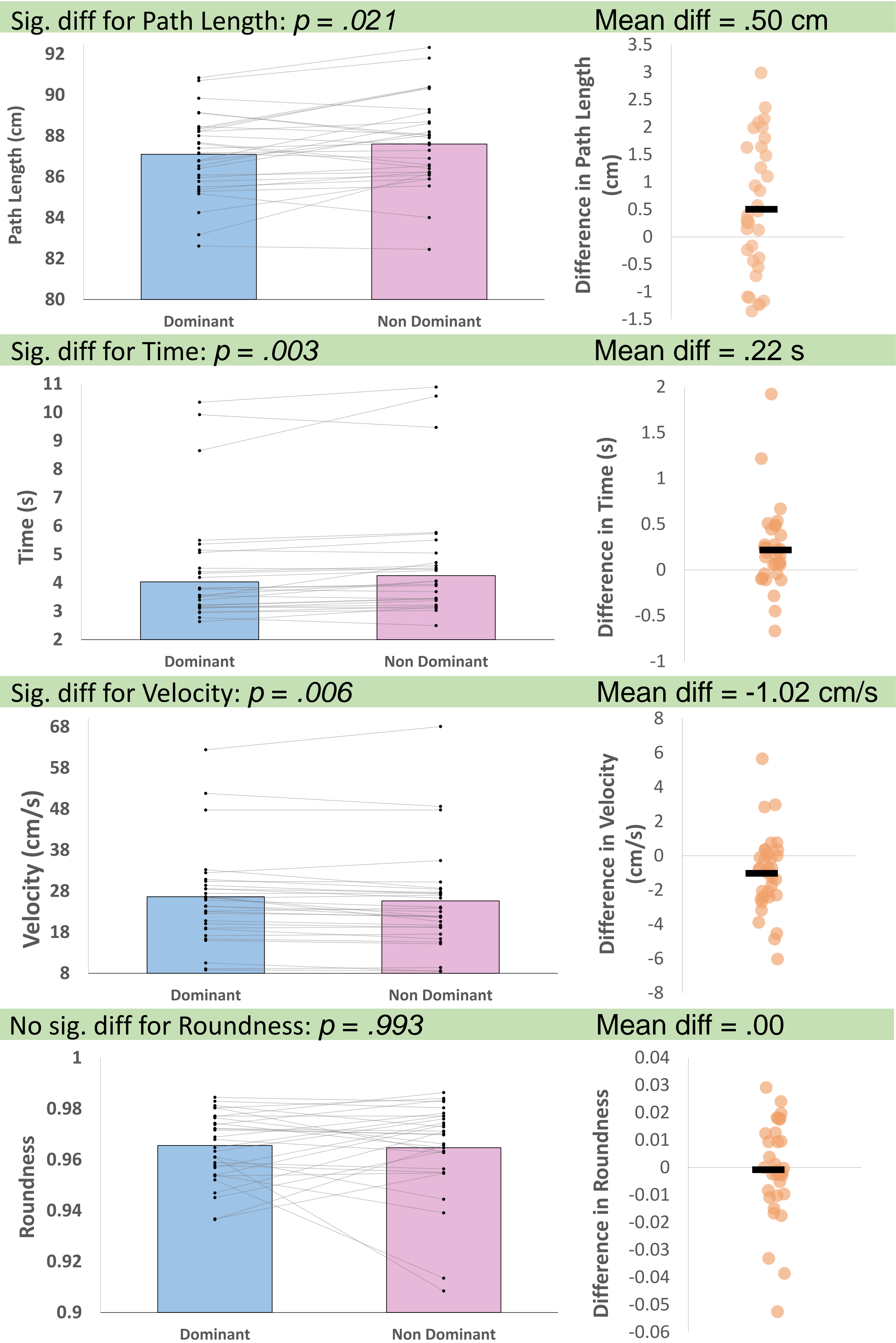
- Circle drawing task: "Trace this circle with your hand"
- 16 x Dominant hand
- 16 x Non-dominant hand
- Hand kinematics collected through Oculus Quest controllers

Evaluating quality of circles (How circular is it?)

- PCA was used to fit ellipses to participant's hand path.
- Used to calculate the length of the circle-axes and to judge the roundness of the hand path.
- Roundness = minor-axis/major-axis



Results



Conclusions

- Hand does not affect circle drawing ability (i.e. no difference in roundness)
- Hand does affect drawing method: non-dominant use leads to slower and longer hand paths.
- Differences are very slight – but detectable.

VR circle-drawing task can detect fine differences in hand kinematics. There is a case for testing the method in patient populations.

1: Krabben, T., Molier, B. I., Houwink, A., Rietman, J. S., Buurke, J. H., & Prange, G. B. (2011). Circle drawing as evaluative movement task in stroke rehabilitation: an explorative study. *Journal of neuroengineering and rehabilitation*, 8(1), 1-11.
 2: McCambridge, A. B., Stinear, J. W., & Byblow, W. D. (2018). Revisiting interhemispheric imbalance in chronic stroke: a tDCS study. *Clinical Neurophysiology*, 129(1), 42-50.
 3: Laver, K. E., Lange, B., George, S., Deutsch, J. E., Saposnik, G., & Crotty, M. (2017). Virtual reality for stroke rehabilitation. *Cochrane database of systematic reviews*, (11).