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 populations¹,²,³.
- 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

- Sig. diff for Path Length: \( p = .021 \)  
  Mean diff = .50 cm

- Sig. diff for Time: \( p = .003 \)  
  Mean diff = .22 s

- Sig. diff for Velocity: \( p = .006 \)  
  Mean diff = -1.02 cm/s

- No sig. diff for Roundness: \( p = .993 \)  
  Mean diff = .00

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.

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