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Background and aims

Parkinson's and visual cueing

- External stimuli can facilitate movement in Parkinson's¹, but simple visual cues are limited in their application (e.g., assisting gait) and may not have lasting benefits.
- We are investigating the therapeutic potential of human movement as another form of external action cue.

Action observation facilitates movement

- Seeing another person's movement (action observation; AO) activates neural structures involved in action execution (including a fronto-parietal "mirror neuron" system)². In this way AO and imitation influence movement and facilitate learning³.

- In Parkinson's AO and imitation have been found to facilitate hand movements as well as reducing bradykinesia and freezing⁴.
- However, internal representation of action may be altered in Parkinson's, and there may be an increased reliance on visual mechanisms⁵.



This study aimed to:

- (i) Compare imitation of human hand movement vs. a simple moving cue in people with Parkinson's and a control group
- (ii) Explore mechanisms by analysing eye movements during observation

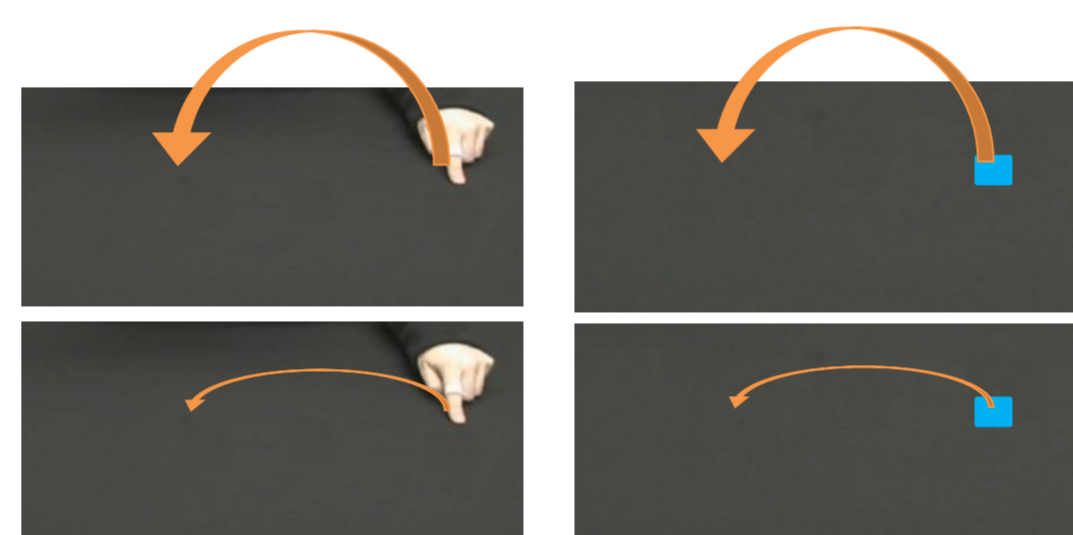
Methods

Participants

- 22 (6F) people with mild to moderate Parkinson's (Hoehn & Yahr 1-3)
- 23 (10F) age-matched healthy controls

Stimuli and task

- Participants observed and imitated sequential movements shown by a human finger or simple shape, both depicting a biological kinematic profile.
- Movements followed a high or low trajectory between points.



High and low amplitude movements shown by a human hand or simple shape

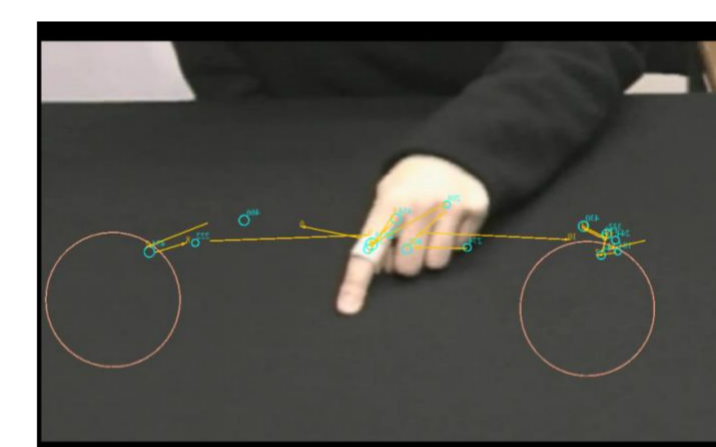


Motion tracking

- 3D coordinates were recorded from the dominant index finger using an electromagnetic tracker at 120Hz.
- The difference in amplitude of finger movements for high vs. low trials (modulation) provided a measure of imitation.

Eye tracking

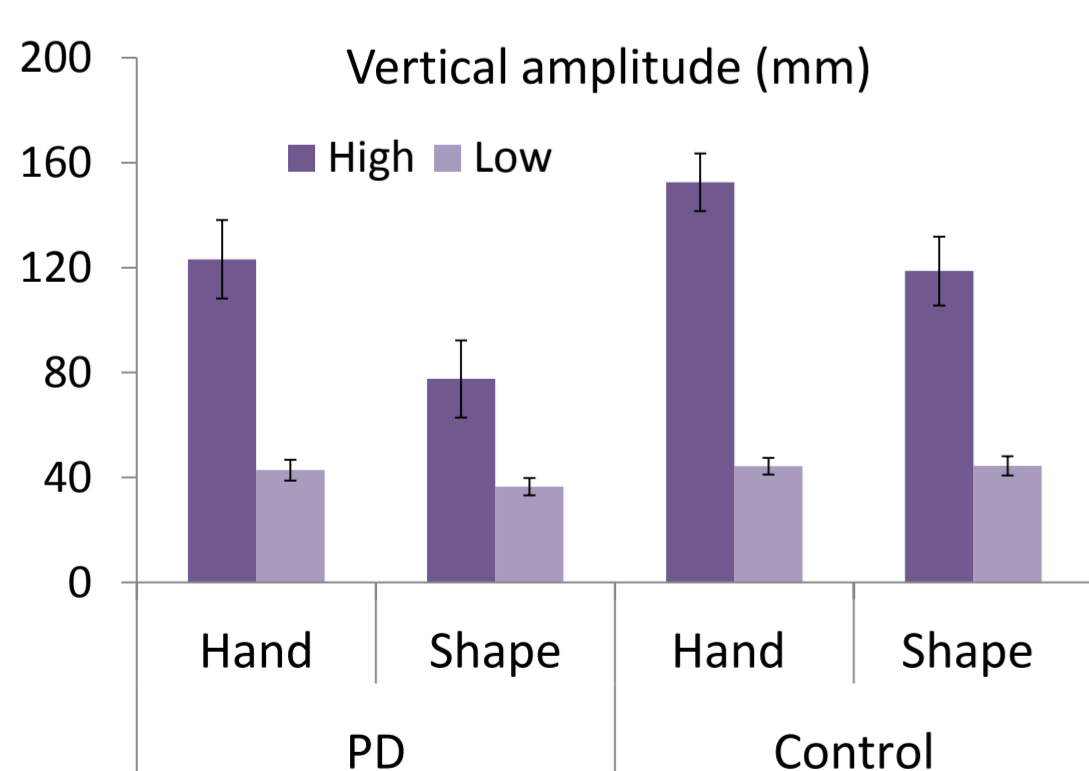
- Eye gaze was recorded using an Eyelink 1000 Plus at 500Hz.
- Eye movements were analysed for the overall trial and the movement end-point.



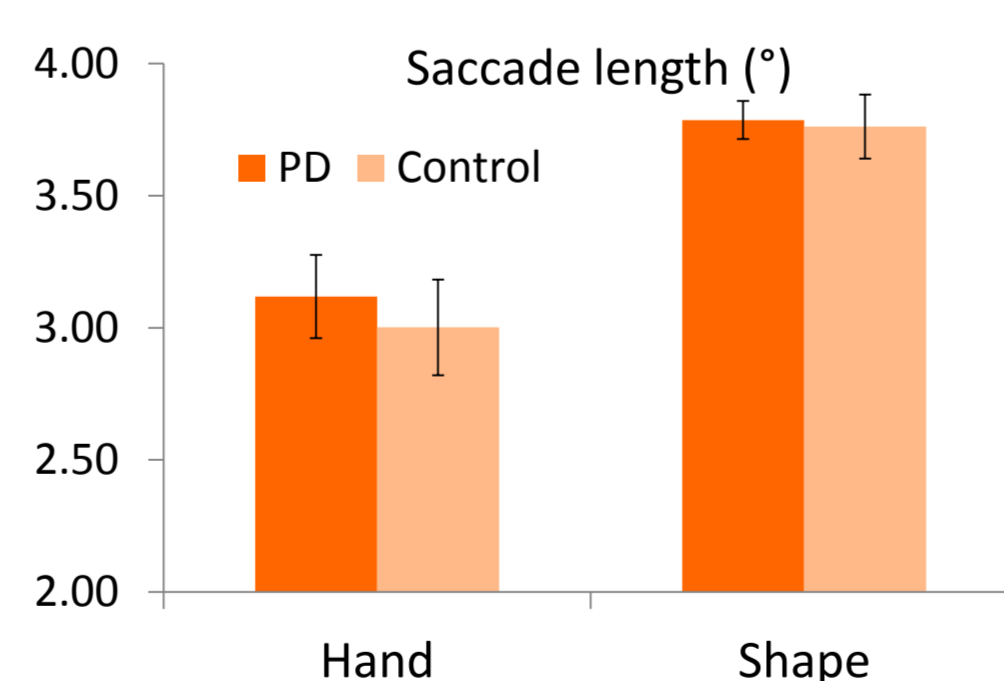
Results

Kinematics

- Both groups showed greater modulation of finger movement amplitude with the hand than the shape ($p < .001$).
- The control group showed a larger degree of modulation ($p < .05$).



Modulation of movement amplitude when imitating hand vs. shape stimuli



Saccade length when observing hand vs. shape stimuli

Eye movements

- Eye gaze was analysed for 15 people with Parkinson's and 20 controls.
- Both groups made smaller saccades ($p < .001$) and fixated the movement end-point earlier ($p < .001$) when observing the hand than the shape.

Discussion

- People with mild to moderate Parkinson's imitated human action to a greater extent than simple visual cues.
- Eye movements indicate that human movement and non-biological stimuli may be observed differently, such as closer tracking of the moving hand.
- Further analysis of eye movements will help to clarify processes during observation of human and non-biological movement.
- Although the extent of modulation was reduced, people with Parkinson's exhibited a similar pattern of imitation to controls.
- These findings support the use of action observation for rehabilitation of manual tasks.

References

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