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## Introduction

- People with Parkinson's report difficulties navigating everyday environments and using maps.
- They also perform more poorly than control participants on tests of visuospatial memory (e.g. Owen et al., 1997) and visuospatial construction (e.g. Karadi et al. 2015).
- Co-speech gestures, which occur spontaneously alongside spoken language, arise from and depict underlying spatial imagery. In healthy adults, gesture rate increases when people communicate spatial information (e.g. giving directions; Alibali et al., 2001).
- When describing spatial information, gestures also improve the listener's comprehension (Holler et al., 1999).



- Therefore, the visuospatial impairments in people with Parkinson's may lead to difficulties in producing gestures communicating spatial properties.

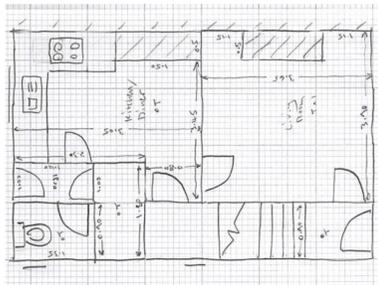
The current study asked do people with Parkinson's:

- Gesture about spatial information at a different rate?
- Gesture about different categories of spatial information (position, direction, shape, size)?
- Produce less complex spatial gestures?
- Produce more complementary or redundant spatial gestures?

## Method

**Participants:** 37 people with Parkinson's and 33 age and education matched controls were asked to describe layout of their house to an addressee who sketched the plan.

	Parkinson's	Control
Age	65.00 (7.31)	66.00 (6.02)
Gender	25M, 12F	14M, 21F
Years in Education	14.78 (3.75)	15.91 (3.02)



### Gesture Coding:

All gestures which accompanied the speech produced in the first minute of the description were identified and categorise (yes/no) as to whether they contained four spatial properties (see examples in table). Note that a gesture can contain more than one property.

	Speech	Gesture
Location or relative position	"the dining room is on the left"	Left hand points to floor and moves to left to show location
Size	"you come in through the door into quite a large hall"	Both arms extend with flat palms inwards to show size of hall
Shape	"I live in a bungalow, and it's very square"	Pointed index fingers brought together and move symmetrically to draw a square shape
Direction	"As you get to the end of the hall, you turn right into a longer corridor"	Right hand with a vertical flat palm curves over to the right.

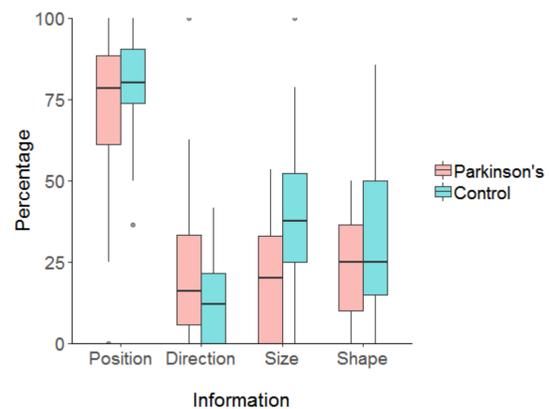
## Results

Parkinson's Group	Mean (SD) or Sum	Min-Max
Age of Onset	58.19 (8.76)	39 - 75
Disease Duration	6.56 (4.34)	1 - 20
Hoehn and Yahr Staging	2.0 (.41)	1-3
Motor-UPDRS	36.24 (11.78)	14 - 55
Laterality	17R, 18L, 1 bilateral	n/a
Levodopa Equivalent Dose	681.26 (339.07)	100 - 1344.25

**Gesture rate:** No difference in overall or spatial gesture rate.

	Parkinson's	Control	
Overall gesture rate per 100 words	9.92 (6.43)	11.3 (6.87)	t(68) = .87, p = .39
Spatial gestures rate per 100 words	8.48 (5.43)	9.6 (6.04)	t(62) = 1.02, p = .31
Spatial properties per gesture	1.39 (.34)	1.64 (.37)	t(61) = 2.81, p = .007

### Spatial content:



The Parkinson's group made a significantly higher proportion of direction gestures, but a lower proportion of size and shape.

The control group made significantly more complex gestures, with more spatial properties per gesture.

## Discussion

- Gesture rate did not differ between groups, replicating previous findings about co-speech gestures depicting actions (Humphries et al., 2016; Cleary et al., 2011).
- This suggests that co-speech gestures could be considered within strategies to improve and maintain communication in Parkinson's.
- However, the content of the gestures differed. The Parkinson's group made fewer complex gestures (cf. Cleary et al., 2011) and gestured significantly more about 'direction' information, whereas controls gestured significantly more about 'shape' and 'size'. But why?
- One possibility is that the controls adopted a bird's eye view, creating a shared perspective between speaker and listener, while the Parkinson's group may have gestured mainly from their own perspective. These different perspectives have been referred to as "survey" (birds-eye) and "route" (first-person) perspectives (e.g. Taylor & Tversky, 1992). We are currently conducting follow-up analyses on the gestures and concurrent speech to test this hypothesis.

## References

Alibali et al. (2001) *Journal of Memory and Language*, 44: 169-188. Cleary et al. (2011) *Parkinsonism and Related Disorders*, 17, 753-756. Holler et al. (1999) *Journal of Nonverbal Behavior*, 33, 73-88. Humphries et al. (2016) *Cortex*, 78, 44-54. Karadi et al. (2015) *Laterality*, 20, 112-127. Owen et al. (1997). *Neuropsychologia*, 35(4), 519-532. Taylor & Tversky (1992) *Journal of Memory and Language*, 31, 261-292.

