DOMAIN-SPECIFIC COGNITIVE IMPAIRMENT IN PARKINSON'S DISEASE DETECTED USING TOUCHSCREEN COGNITIVE TESTING IN ROUTINE CLINICAL CARE

Francesca Cormack[1], Peter Annas[1], Shuna Colville[2], Dawn Lyle[2], Denise Cranley[2], Jennifer H. Barnett[1,3], Katy Murray[2,4,5], and Suvankar Pal[2,4,5]

1 Cambridge Cognition, Cambridge, United Kingdom, 2 Anne Rowling Regenerative Neurology Clinic, University of Edinburgh, Edinburgh, United Kingdom, 3 Department of Psychiatry, University of Cambridge, Cambridge, United Kingdom, 4 Forth Valley Royal Hospital, Larbert, United Kingdom, 5 Centre for Clinical Brain Sciences, University of Edinburgh, Edinburgh, United Kingdom

CAMBRIDGE COGNITION

Background

- Patients with Parkinson's disease (PD) are at increased risk of developing dementia. The presence of cognitive deficits is associated with worse functional outcomes and risk of decline.
- Previous studies have shown that the Cambridge Neuropsychological Test Automated Battery (CANTAB) can be sensitive to impairment in this population and predict later decline.
- The aim of this study was to investigate the feasibility of assessing cognitive impairment in patients with PD presenting to a specialist neurology clinic using an automated abbreviated version of the CANTAB battery.

Methods

- 28 consecutive patients aged 39-79 years presenting to clinic completed computerized CANTAB tasks assessing working memory, executive function, processing speed, attention, and episodic memory (Figure1). Patient demographic characteristics are shown in table 1.
- The cognitive tests were administered on an iPad. All tests had automated instructions given via voiceover, which was available in multiple languages. Patients completed the assessments independently, in the clinic waiting room.
- Scores were adjusted for age, sex, and level of education and classified as normal or impaired based on comparisons with a large normative data pool.
- Depressive symptoms were measured using the Geriatric Depression Scale, and self-reported cognitive function was also reported.
- Data were analysed after adjustment for age, education and gender variables which allowed the norm-based categorisation of performance in six bands relative to age and education adjusted means :
  - Superior (z-scores > 1.5);
  - Above average (z-scores 1.5<>1);
  - Average(z -scores-1><1);
  - Low average (z score -1.5>< -1);
  - Poor (z score -2>< - 1.5);
  - Very Poor (z-score < - 2).
- Patients in the bottom two categories (z-score <-1.5), corresponding to the bottom 15.87% of the normative population, were considered to be impaired relative to their age and education matched peers.

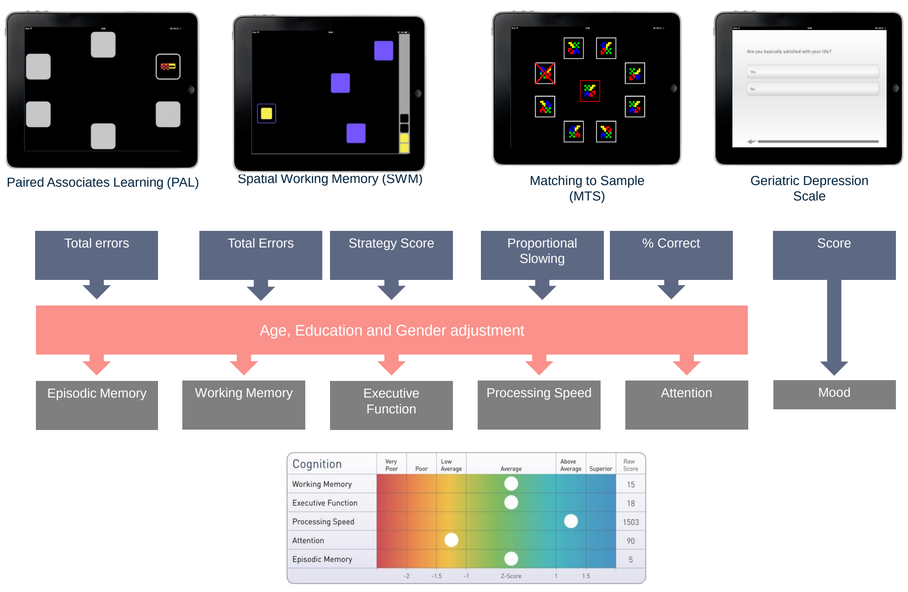

Figure 1: Three cognitive tests were used.. A: The spatial working memory task, which assesses working memory and executive function. B: The paired associates learning task which assesses episodic memory. C: The match to sample task, which assesses attention and processing speed. D: Once testing was completed a report was instantly generated for the clinician to view, which summarised the patients performance on each cognitive domain, compared to the expected level for someone of their age, level of education and gender.

Results

- Patient demographic characteristics are shown in Table 1.
- Geriatric Depression Scale short-form was available for 23 patients. 9 of these (39%) had depression scores >5, which represents the threshold for an suspected depression.

Table 1: Patient Demographics

n	28
Age (mean (SD))	58.43 (10.42)
Education category (%)	
Left before age 16	5 (17.9)
Left age 16 to 18	19 (67.9)
Left after age 18	4 (14.3)
Self-reported cognition (mean (SD))	9.96 (3.49)
GDS score (mean (SD))	4.22 (3.32)

Cognitive performance

- One third (32%) of the group had an impairment in a single cognitive domain and 18% had multi-domain cognitive deficits. 28% were unimpaired on any test (Figure 2).
- The most commonly impaired cognitive domain was executive function which was impaired in 32% of cases, followed by working memory which was impaired in 25% of patients (Figure 3).
- The distribution of scores on the different tests is shown in Figure 4. The boundary between low average and impaired performance is shown as a dashed line.
- Our measure of processing speed, which examines relative slowing with additional, rather than absolute reaction time, was found to be relatively preserved in this sample, with performance typically in the average or low average range.
- Despite correcting for age, there was a significant correlation between age and processing speed (Kendalls Tau = -0.29, p <0.05). Age was not associated with any other measure.

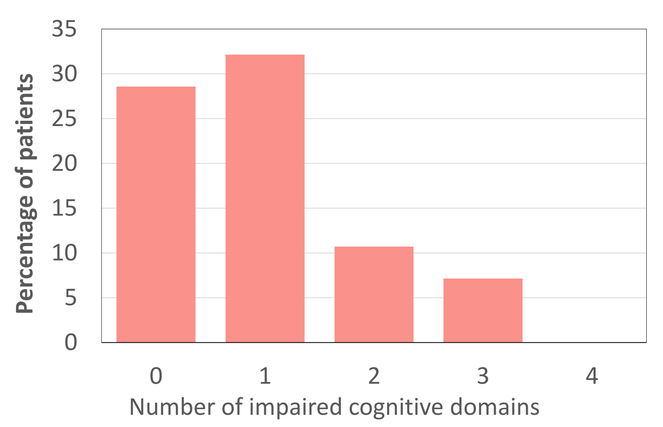

Figure 2: Percentage of the patient group presenting with impaired performance in multiple cognitive domains.

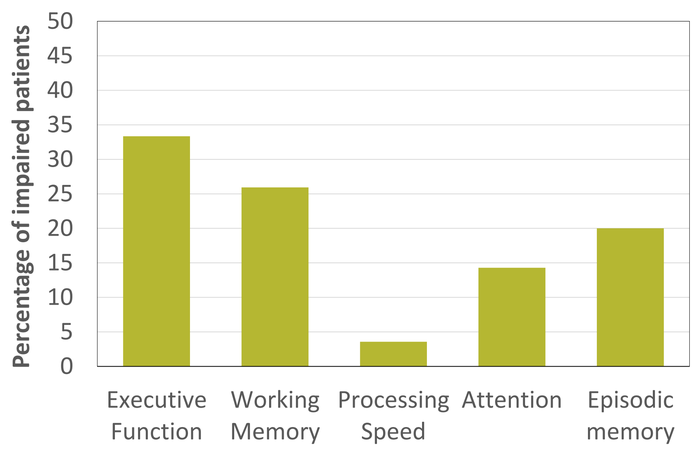

Figure 3: Percentage of the patient group presenting with impaired performance in each cognitive domain.

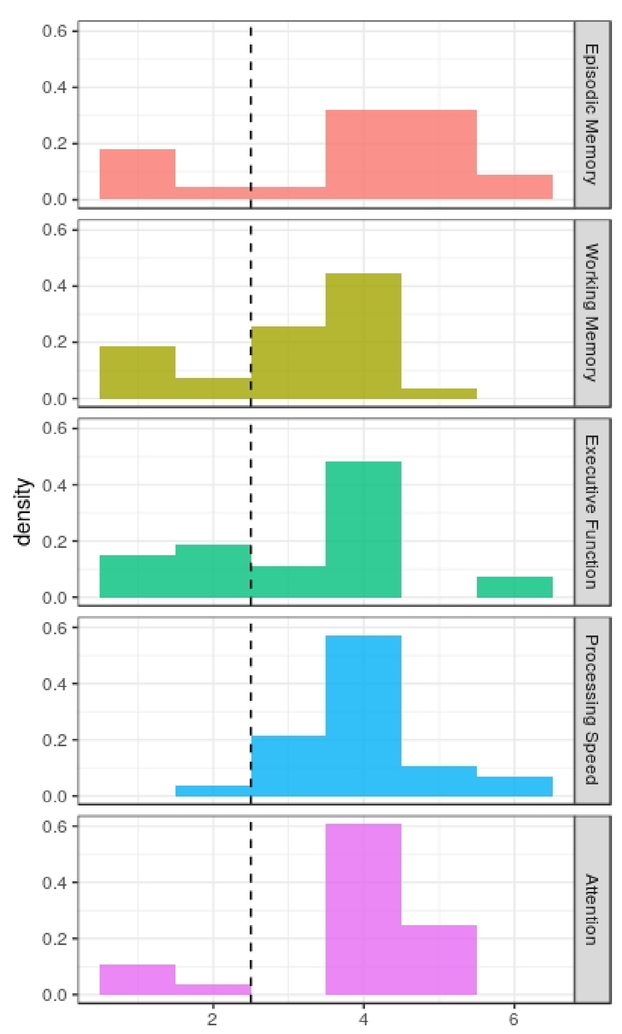

Figure 4: Distribution of cognitive test scores in the patient groups, with 6 representing the highest level of performance. The dashed line indicates the impaired performance boundary.

Conclusions

- Clinically significant depression scores were seen in nearly 40% of patients with PD tested in clinic. Impaired cognitive scores were seen in more than half of patients. Executive function and working memory were most often affected.
- These data are consistent with other studies in multiple sclerosis and head injury supporting the use of computerised cognitive testing in routine clinical visits for cognitive profiling cognitive function in patients with neurological disorders.

Contacts: Francesca.Cormack@camcog.com; Cambridge Cognition Ltd, Tunbridge Court, Tunbridge Lane, Bottisham, Cambridge, CB25 9TU, UK

Anne Rowling Regenerative Neurology Clinic · The University of Edinburgh · University of Cambridge · Cambridge Cognition