Attention Deficits Play a Major Role in the Profile of Cognitive Dysfunction in Parkinson’s Disease

K. Wesnes¹, D. Miller², L. Alcock³, A. Stutt⁴, M. Eccles⁵, L. Robinson⁵, D. Burn⁴

¹United BioSource Corporation, Goring-on-Thames, UK
²United BioSource Corporation, PA, USA
³Department of Geriatric Medicine, Newcastle General Hospital, UK
⁴Clinical Ageing Research Unit, Newcastle University, UK
⁵Centre for Health Service Research, Newcastle University, UK

Background

Attention deficits have consistently been detected in Parkinson’s disease (e.g. Maddox et al, 1996). Previous collaborations between our research groups using the CDR System in Parkinson’s patients have identified that poor performance on attention tests predicts both subsequent cognitive decline (Taylor et al, 2008) and the likelihood of falls (Alcock et al, 2009).
Attention Deficits Play a Major Role in the Profile of Cognitive Dysfunction in Parkinson’s Disease

K. Wesnes1, D. Miller2, L. Alcock3, A. Stutt4, M. Eccles5, L. Robinson5, D. Burn4

1United BioSource Corporation, Goring-on-Thames, UK 2United BioSource Corporation, PA, USA, 3Department of Geriatric Medicine, Newcastle General Hospital, UK, 4Clinical Ageing Research Unit, Newcastle University, UK, 5Centre for Health Service Research, Newcastle University, UK

BACKGROUND
Attention deficits have consistently been detected in Parkinson’s disease (e.g. Maddox et al., 1996). Previous collaborations between our research groups using the CDR System in Parkinson’s patients have identified that poor performance on attention tests predicts both subsequent cognitive decline (Taylor et al., 2008) and the likelihood of falls (Alcock et al., 2008).

OBJECTIVES & METHODS
Objectives
- To explore the role of attention deficits in the profile of cognitive dysfunction in Parkinson’s disease

Methods
- Comparison of population of PD patients with age and gender matched controls

Tests Administered
- CDR System tests of attention, working and episodic memory

Background
- 76 PD patients

Study Population
- 76 PD patients
- 53 females, 23 males
- Mean age 70.3 years, s.d. 8, range 44-87
- Average UPDRS III score 26.8
- Mean disease duration was 7.3 years
- 63 Controls
- 25 females, 38 males
- Mean age 71.1 years, s.d. 6.8, range 57-86

Analyses
- The cognitive data from the populations were compared using mixed model ANCOVAs to identify the profile of impairments in PD

THE CDR SYSTEM
A set of computerised tests measuring attention, working memory and episodic memory

Used in over 1,100 clinical trials since 1994

Has over 50 alternate forms and over 50 language versions

Core assessments can be conducted within 20 minutes

The CDR System Response Box
Particularly helpful for capturing responses in Parkinson’s patients as its use does not require coordination or complicated motor movements and is not compromised by tremor

The CDR System Core Domains & Tests
- Attention, Concentration, Vigilance
  - Simple Reaction Time
  - Choice Reaction Time
  - Digit Vigilance
- Working Memory & Executive Control
  - Numerics Working Memory
  - Episodic Recognition Memory
  - Immediate and Delayed Word Recognition
  - Picture Recognition

Measures Derived from CDR System Tasks
- Power of Attention
  - Combined speed scores from 3 attention tasks
  - reflects ability to focus attention
- Continuity of Attention
  - Combined accuracy scores from attention tasks
  - reflects ability to sustain attention
- Numeric Working Memory
  - Sensitivity: Reflects ability to hold information in articular working memory
  - Speed: Reflects time taken to retrieve items from working memory
- Episodic Recognition (combined from 3 tasks)
  - Sensitivity: Reflects ability to correctly identify original items and reject novel items
  - Speed: Reflects time taken to access items in episodic memory

RESULTS

- Both focused and sustained attention showed impairments in PD, with large effect sizes
- Working memory was also impaired, both in terms of the ability to hold information on-line, and the time taken to retrieve it
- Episodic recognition for words and pictures was also impaired, though this speed of retrieval was not
- The MMSE was significantly lower in PD patients. However, the MMSE differences became non-significant when the attention scores were fitted as covariates, while the reverse was not true
- The disruption to attention was large in magnitude, being similar to the deficit which occurs 50 years of normal ageing and twice as great as a dose of alcohol which would make it illegal to drive
- Further, over 30% of the PD patients were 1.5 SD or more poorer than controls on each of the attention scores, and 51% on one or both.
- The disruptions to attention on the CDR System have been demonstrated in Parkinson’s disease dementia to most strongly predict problems conducting everyday activities (Bronnick et al., 2007)
- Both Power of Attention and Continuity of Attention have been improved in Parkinson’s Disease dementias by rivastigmine (Wesnes et al., 2005) and donepezil (Rowan et al., 2007). Further, a selective noradrenergic alpha 1 agonist has been shown to improve attention in PD (Bedard et al., 1996)

CONCLUSIONS
- These deficits to attention have relevance for everyday behaviour, and should be considered a target for treatment, as should the impairments to working and episodic memory.
- Further, certain novel treatments for PD may actually reduce these deficits, and the inclusion of cognitive testing in the development programmes would enable such potential benefits to be identified.