



PADRECC

# Working Memory Functioning in Mild and Moderately Severe Parkinson's Disease Patients

Michele K. York, Ph.D.<sup>1,2</sup>, Eugene C. Lai, M.D., Ph.D.<sup>1,2</sup>, Harvey S. Levin, Ph.D.<sup>2</sup>, Robert G. Grossman, M.D.<sup>2</sup>

<sup>1</sup>Parkinson's Disease Research, Education, and Clinical Center (PADRECC) Houston Veterans Affairs Medical Center, <sup>2</sup>Baylor College of Medicine; Houston, Texas USA



## INTRODUCTION

Working memory is a prospective, on-line, limited capacity process which temporarily stores and processes information, associates this information with incoming stimuli, and facilitates response selection. Neuroimaging studies have revealed activation in the prefrontal and parietal lobes during working memory tasks. Parkinson's disease is purported to disrupt frontostriatal neural circuitry which may be responsible for successful performance of working memory. We hypothesized that Parkinson's disease patients will show impairments in working memory.

## OBJECTIVE

To investigate the relationship between the stage of Parkinson's disease and frontostriatal functioning using a computerized working memory task with an increasing memory load and a minimal motor requirement.

## METHODS

### Subjects

We examined the differences in performance in 14 mild PD (H&Y Stages 1 & 2), 9 moderately severe PD (H&Y Stage 3), and 14 elderly control subjects. The control subjects differed from the PD subjects on gender.

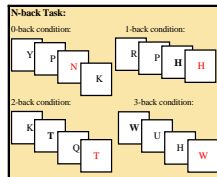
	Mild PD (n=14)	Moderate PD (n=9)	Elderly Control (n=14)
Gender			
Male/Female (%)	6/8	8/1	29/71
Age	63.9 (7.3)	64.6 (11.9)	64.0 (14.7)
Education	15.8 (1.1)	16.9 (2.9)	16.5 (1.6)
Age of Onset	61.5 (9.4)	57.0 (2.9)	NA
Duration	3.3 (4.3)	7.6 (4.9)	NA

### Procedure

The N-back working memory task is a computerized test that consists of 4 conditions with increasing memory load (0- to 3-back). The measures of analysis are Hits (correct responses) and False Alarms (incorrect guesses).

### Task Conditions:

- 0-back: One letter search
- 1-back: Same as previous
- 2-back: Same as 2 before
- 3-back: Same as 3 before



## METHODS (cont.)

### Statistical Methods

We used one-way ANOVAs with memory load (0-3 back) Hits and False Alarms as the dependent measures to examine the differences between the mild PD, moderately severe PD, and elderly control groups.

## RESULTS

Figure 1: N-back Hits for Mild PD, Moderately Severe PD, and Elderly Control Subjects

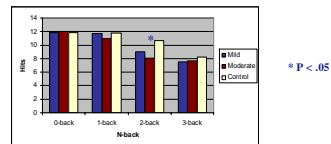
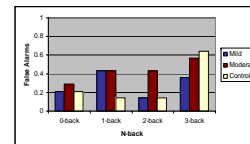


Figure 2: N-back False Alarms for Mild PD, Moderately Severe PD, and Elderly Control Subjects



## RESULTS (cont.)

- Moderately severe PD patients demonstrated a deficit compared to mild PD and elderly controls on the 2-back condition of the N-back test.
- No significant differences were found for the 0-back Hits or FA, 1-back Hits or FA, or 3-back Hits or FA.

## CONCLUSIONS

Our results suggest that working memory is adversely affected in Parkinson's disease patients at later stages of disease progression during which there is likely a greater amount of disruption in the frontostriatal neural circuitry. The causes and characteristics of this deficit should be further investigated.

### ACKNOWLEDGMENTS

This research was supported by NIH Grant NS-21889 and by the Office of Research and Development, Medical Research Service, Department of Veteran's Affairs.

