

## Executive Functioning in Individuals with Parkinson Disease and Normal Adults

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### Abstract

This study compares the different levels of executive functioning in patients with Parkinson disease (PD), versus neurologically normal older and younger individuals. Executive functioning skills include memory, perception, planning, reasoning, and dual tasking. The executive functioning skills will be assessed by using the Multiple Errands Test (MET), preceded by 5 neurological deficit clinic/lab-based cognitive tests. The test requires participants to gather a number of items from a grocery store in an allotted amount of time. This test will analyze the cognition, perception, memory, and dual tasking abilities in the participants. The comparison of the clinic/lab-based cognitive tests scores and the MET scores will allow researchers to see the negative affects that Parkinson Disease has on the brain.

**Keywords:** Executive Functioning, Neurology, Parkinson Disease, Performance, Communication

### Introduction

Parkinson disease (PD) is the second most common neurodegenerative disease of adult onset after Alzheimer's disease (Bertram & Tanzi 2005). PD is characterized by loss of dopamine in substantia nigra and has symptoms such as bradykinesia, or slowed movements, tremors throughout the body, and may affect different skills including cognition, motor, and communication, all components of executive functioning. Executive functioning (EF) includes a set of cognitive skills including selective attention, inhibition, task management, planning, monitoring of self-performance, coding, and manipulation of information (Funahashi 2001). The majority of existing studies have examined EF skills of individuals with PD with lab/clinic-based tests. Existing studies indicate the need for assessing EF skills of individuals with PD in real-life activities such as shopping and driving. The Multiple Errands Test (MET) has been developed to assess EF skills in real-life shopping activity (Alderman et al. 2003). The present study is

part of a larger project comparing EF performance of individuals with PD and neurologically normal adults in clinic/lab based tests as well as real-life based activities. The aim of the study is to compare EF skills of an individual with PD with a gender-matched neurologically normal adult.

### Methods

For this study, we had two participants: one participant with PD and one gender matched neurologically normal adult. Both participants completed the lab-based tests that included a demographic questionnaire, the Montreal Cognitive Screening (MoCA), the Clock Drawing Test (CDT), the Beck Depression Inventory (BDI), and the Dysexecutive Questionnaire (DEX). The participant with PD, in addition to the clinic/lab-based cognitive tests, also had to complete a simple physical test. Following the lab based tasks, both participants completed the Multiple Errands

test in a local grocery store. The MET included the following tasks; buying six listed items from the grocery store, writing down information related to additional four listed items, such as price or quantity, and meeting the examiner twenty minutes after starting the activity. The MET performance was scored based on following criteria:

- Task failures (Best score= 11; Poorest score= 33)
- Inefficiencies (Best score= 24; Poorest score= 6)
- Strategies (Best score= 4; Poorest score= 24)
- Rule breaks (Best score= 24; Poorest score= 6)
- Interpretation failures (Best score= 8; Poorest score= 4)
- Overall MET score (Best score= 71; Poorest score= 73)
- Total time taken to complete the entire activity (in minutes): 20 minutes

## Results

After the test was completed, each of the MET subtests were interpreted, scored and compared to each other. We found that the participant with PD scored slightly lower

in some performance categories such as strategies and markedly higher in the time

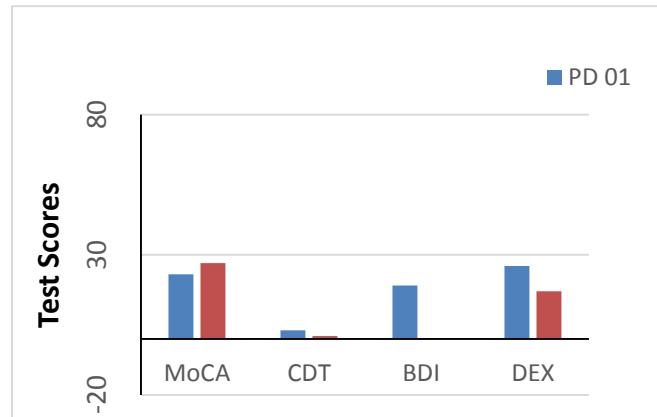


Figure 1 - Graph showing the comparative test scores for the clinic/lab-based cognitive tests such as the MoCA, CDT, BDI, and the DEX. For the MoCA test, a higher score indicated a more neurologically normal mind, while a higher score indicated a deficit in executive functioning.

category. These slightly lower comparative test scores prove to exhibit signs of deteriorated executive functioning. The participant that was neurologically normal scored almost a perfect score on the pre-screener tests as well as the MET test, conducive to an almost perfect neurologically normal state of mind.

Graph showing the comparative test scores for the clinic/lab-based cognitive tests such as the MoCA, CDT, BDI, and the DEX. For the MoCA test, a higher score

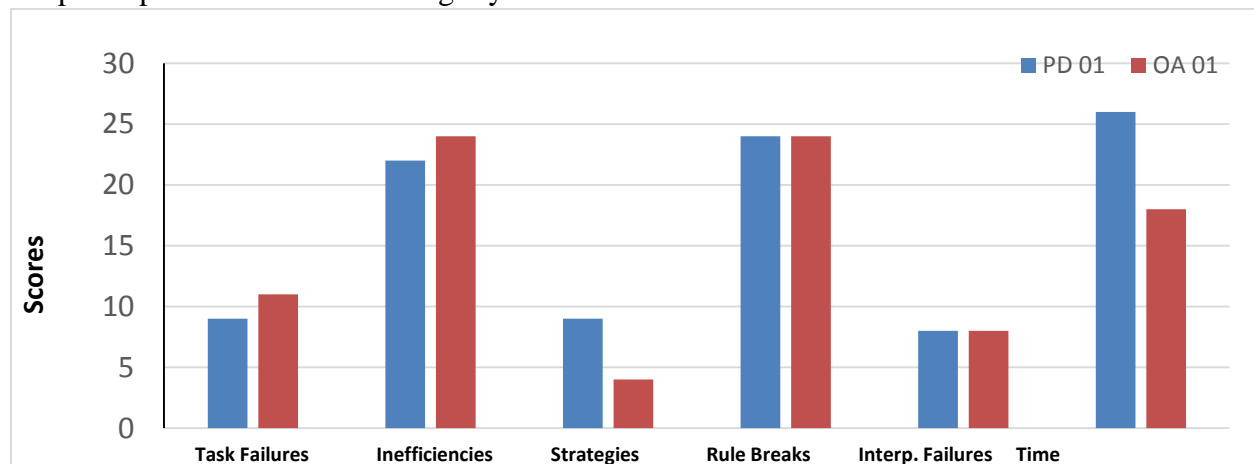


Figure 2 - Graph showing the comparative test scores for the MET test that show the different performance areas. Refer to the scoring interpretation in the Method sections for the different performance areas.

indicated a more neurologically normal mind, while a higher score indicated a deficit in executive functioning.

## Discussion

Overall, based on our preliminary results, the participant with PD showed deficits in EF skills compared to the neurologically normal adult participant. The participant with PD showed possible deficits in both the lab-based EF tests and the real-life shopping task in terms of visuospatial skills, planning, and manipulation of information. The participant with PD took longer to complete the MET test compared to the neurologically normal participant. The data collection for the study will continue to further examine and compare the performance of individuals with PD with neurologically normal participants. This study will help us gain a better understanding of the detrimental effects of Parkinson Disease and how the progression of PD negatively affects most cognitive processes. The results from this study will help researchers to treat PD in the future.

## Acknowledgements

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