Cognitive Performance and Self-Reported Functioning in Daily Life Among Those with Parkinson's Disease: A Brief Report

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Citation

N Koven, R Roth, D Coffey, L Flashman, A Saykin. *Cognitive Performance and Self-Reported Functioning in Daily Life Among Those with Parkinson's Disease: A Brief Report*. The Internet Journal of Mental Health. 2006 Volume 3 Number 2.

Abstract

Objective: Parkinson's disease is associated with cognitive deficits on laboratory-based measures and reports of subjective problems with several aspects of functioning in daily life. In the present investigation, we examined whether neuropsychological test performance in patients with Parkinson's disease is associated with self-reported problems in general cognitive functioning and ability to complete activities of daily living.

Method: Twenty patients with Parkinson's disease completed a battery of cognitive tests and the Parkinson's Disease Questionnaire.

Results: Self-reported problems with cognitive functioning and activities of daily living were only associated with the Initiation/Perseveration subscale of the Dementia Rating Scale. These findings could not be accounted for by either depressed mood or anxiety.

Conclusions: The present findings, though preliminary in nature given the small sample size, point to a role of executive dysfunction in the decreased ability to function in daily life reported by patients with Parkinson's disease.

INTRODUCTION

Parkinson's disease (PD) has been demonstrated to be associated with significantly reduced quality of life and ability to function in daily life, and progression of the disease over time is typically marked by declining functional abilities ([1]). Motor disturbances such as tremor, bradykinesia, postural instability, rigidity, and poor balance adversely affect ability to perform activities of daily living, increase injury risk with associated falls, and often lead to dependence on family members ([2]). Additional studies indicate that pharmacological treatment of PD, to the extent that it produces additional motoric sequelae, is also associated with reduced quality of life ([3]). Furthermore, the ability of individuals with PD to function in aspects of daily life can be further complicated by depression and anxiety ([4], [5]).

Only a small number of studies, however, have examined the relationships of non-motor variables ([6]) to patients' perceptions of their functioning in everyday life. Such studies have reported that subjective reductions in daily functioning are associated with educational, psychological, and behavioral factors. For example, diminished quality of life has been associated with lower educational background, greater subjective memory complaints, presence of psychotic symptoms, and poor access to health care resources in patients with PD ([7]). In another study, increasing severity of depression and self-reported cognitive deficits predicted greater functional disturbance in daily life ([8]).

To our knowledge, the relationship between self-reported problems with aspects of functioning in daily life and performance on neuropsychological tests of cognitive functioning has not been directly examined in PD. Patients with PD across all stages of the illness have been shown to exhibit cognitive deficits, particularly in domains such as episodic memory and executive functions, including problems with working memory and cognitive flexibility ([9]). The present study, therefore, provides a preliminary exploration of whether executive functioning, memory,

visuospatial skills, and language abilities are related to self-reported problems with aspects of functioning in daily life, independent of mood factors, in patients with PD.

METHOD

PARTICIPANTS

Participants included 20 older adults with PD between the ages of 59 and 80 (see Table 1). Diagnoses were made after a comprehensive neurological workup. Patients with diagnoses of essential tremor, dystonia, and cerebellar outflow tremor related to multiple sclerosis were excluded from the sample. All participants were assessed to establish level of cognitive functioning prior to evaluation for potential surgical interventions. Written informed consent was obtained from all participants following an IRB-approved protocol.

NEUROLOGICAL EXAMINATION

Patients were evaluated by a board certified neurologist (D.J.C.) specializing in the evaluation and treatment of movement disorders including PD. The neurological evaluation was conducted blind to other measures reported in the present study. Assessment included the Hoehn and Yahr Rating Scale ($_{10}$) to establish stage of illness (i.e., Stages 1 through 5 ranging from minimal to severe disability, respectively) for each patient and the Unified Parkinson's Disease Rating Scale (UPDRS) ($_{11}$) to assess severity of symptoms across three broad categories: mentation, behavior, and mood (summation of items 1 to 4), activities of daily living (summation of items 5 to 17), and motor functioning (summation of items 18 to 31). The UPDRS Total Score is the summation of values across all items in the complete scale. Higher values on UPDRS subscales and Total Score indicate greater disability.

NEUROPSYCHOLOGICAL BATTERY

Each participant was administered the Wechsler Abbreviated Scale of Intelligence (WASI) to estimate overall intellectual functioning, the Dementia Rating Scale - Second Edition (DRS-2) to assess visual-spatial skills (Construction subscale), memory processes (Memory subscale), attention (Attention subscale), and aspects of executive functioning (Conceptualization and Initiation/Perseveration subscales), the 64-card version of the Wisconsin Card Sorting Test (WCST) to measure executive functions such as novel problem solving and cognitive flexibility, the California Verbal Learning Test - Second Edition (CVLT-II) to evaluate verbal episodic memory, and the Boston Naming Test (BNT) to index word retrieval and confrontation naming (see Table 1). The cognitive evaluation was conducted by trained psychometricians who were blind to scores related to self-reported health status and emotional functioning, as well as results of the neurological evaluation.

ASSESSMENT OF SELF-REPORTED HEALTH STATUS AND MOOD STATE

Each participant was administered the Parkinson's Disease Questionnaire (PDQ) ($_{12}$) to measure problems with aspects of functioning in daily life. The PDQ is a 39-item self-report inventory containing eight subscales: Mobility, Activities of Daily Living (ADL), Emotional Well-Being, Stigma, Social Support, Cognitions, Communication, and Bodily Discomfort. Responses can also be calculated to formulate a single score, termed the Summary Index. The PDQ has been shown to have good test-retest reliability in patients with PD ($_{12}$) .Scores on the PDQ range from 0 to 100, with higher scores reflecting greater problems.

For the purpose of the present investigation, we limited our analyses to the PDQ Summary Index and two subscales, ADL and Cognitions, in order to reduce the probability of Type I error. These two subscales were selected based on the expectation that they would be the most likely to be impacted by cognitive deficits. Mood measures included the Geriatric Depression Scale (GDS) ($_{13}$) and the State-Trait Anxiety Inventory, Form Y-2 (STAI) ($_{14}$) to assess severity of depressive symptoms and anxiety, respectively, with higher scores reflecting greater self-reported problems with mood.

STATISTICAL ANALYSES

Analyses were conducted using SPSS software, version 15.0. The statistical approach involved Spearman correlation analyses given the modest sample size and deviations from normality found for some of the variables. Two sets of correlations were conducted. The first determined whether there are associations between cognitive test scores and the PDQ variables and the second between mood measures and the PDQ variables. Correction for multiple comparisons was not performed given the exploratory nature of the present study.

RESULTS

The Table presents the participant characteristics as well as the scores for the neurological and cognitive measures. Neurological rating scales of the patient sample indicated an average level of disability consistent with Hoehn and Yahr

Stage 3, reflecting significant slowing of body movements, early impairment of equilibrium upon walking or standing, and moderately severe generalized dysfunction. Mood assessment indicated that levels of depression and anxiety were generally in the mild and normal ranges, respectively.

Figure 1

Table 1: Demographic, Neurological, Health Status, Mood, and Neuropsychological Characteristics

Demographic Variables	*N*	*Mean*	*SD*	*Median*
Age (yrs)	20	69.7	6.3	70.5
Education (yrs)	20	15.6	4.5	16.0
Gender (M,F)	16,4	----	----	----
Handedness (R,L)	18,2	----	----	----
*Neurological Status**				
Hoehn-Yahr Stage+	16	3.3	0.9	3.0
UPDRS+				
Total Score	16	77.7	16.0	79.0
Mentation, Behavior, Mood	16	3.3	2.2	2.5
Activities of Daily Living	16	24.3	6.7	23.0
Motor Functioning	16	43.1	9.0	40.5
Self-Report Health Status and Mood				
PDQ+				
Summary Index	20	44.4	14.6	46.0
ADL subscale	20	50.2	25.3	54.2
Cognitions subscale	20	39.7	17.7	37.5
GDS+	18	10.7	5.8	9.5
STAI+	20	39.1	8.9	37.0
Neuropsychological Variables				
WASI Full Scale IQ†	16	108.0	18.3	110.5
DRS-2†				
Total Score	20	129.0	11.4	132.0
Attention subscale	20	36.1	0.8	36.0
Initiation/Perseveration subscale	20	30.5	5.4	31.0
Construction subscale	20	5.6	0.8	6.0
Conceptualization subscale	20	34.7	5.4	37.0
Memory subscale	20	22.1	3.1	23.5
WCST				
Categories†	20	2.6	1.6	2.5
Perseverative Errors+	20	13.4	8.7	10.0
CVLT-II (raw scores)†				
Acquisition Trials	20	35.1	10.7	34.0
Immediate Free Recall	20	5.6	3.3	6.0
Delayed Free Recall	20	5.7	4.1	5.5
Recognition	20	13.1	3.0	14.0
Boston Naming Test†	20	53.5	7.3	57.0

Note. † indicates a measure in which higher values represent better performance or outcome; + indicates a measure in which lower values represent better performance or outcome; * Neurological ratings for four men were not obtained because their examinations were abbreviated due to medical scheduling conflicts. Item-level analysis of the UPDRS and Hoehn-Yahr data that were available do not suggest that these four participants differed significantly from other participants in the group.

No significant correlations were observed between any of the PDQ measures (Summary Index, ADL, and Cognitions) and the DRS-2 total score, WCST perseverative errors, CVLT-II learning, or the Boston Naming Test total score. Further analyses of the five DRS-2 subscales (Construction, Memory, Attention, Conceptualization, Initiation/Perseveration) revealed a relationship between the Initiation/Perseveration subscale and both the PDQ ADL subscale, r_s = -.45, p = .04, and the PDQ Cognitions subscale, r_s = -.54, p = .01. No DRS-2 subscale was associated with the PDQ Summary Index.

Correlation analyses with mood measures indicated that depression (GDS score) but not anxiety (STAI score) was significantly associated with PDQ Cognitions, r_s = .49, p = .04. No association was found between mood measures and either the PDQ Summary Index or the ADL scale. Depression score, however, was not correlated with the DRS-2 Initiation/Perseveration score, signifying that depression cannot be acting as a mediator ([15]) between the performance-based measure of executive functioning (DRS-2 Initiation/Perseveration) and self-reported problems with general cognitive functioning (PDQ Cognitions) in this sample.

DISCUSSION

These present findings revealed that subjective problems with completing activities of daily living and with general cognitive functioning were specifically related to performance on a test of executive functioning, the DRS-2 Initiation/Perseveration subscale, but not other tested domains of cognitive functioning. This relationship could not be accounted for by depressed mood, although greater depressed mood was also associated with more subjective problems with cognitive functioning. Poor performance on the DRS-2 Initiation/Perseveration subscale can be adversely affected by motor disturbances in patients with PD, given the drawing requirements in the subscale. Qualitative analysis of our participants' performance, however, indicated that the results are unlikely to have been significantly impacted by motor impairments. Nonetheless, additional evaluation of the relationship between self-reported integrity of activities of daily living and cognition functioning and performance measures of executive functioning that do not require manual responses would be informative.

Cognitive deficits have been observed across all stages of illness in patients with PD. The present findings highlight the importance of addressing these cognitive factors as they may be affecting the ability of these individuals to function in multiple domains of their daily lives. Investigations of whether cognitive-enhancing medications may improve cognitive functioning and consequently ameliorate aspects of functional disability would be beneficial. In addition, patients with PD may benefit from the application of cognitive remediation techniques ([16]) that are specifically designed to improve executive functioning. Such remediation strategies could be incorporated into multidisciplinary programs of rehabilitation, integrating the role of neuropsychology with other treatment modes such as occupational therapy and physical therapy ([17]).

In summary, the present study suggests that executive dysfunction contributes to problems with functioning in daily life in patients with PD. These findings are preliminary, however, given the modest sample size. While we focused on subjective problems in general cognitive functioning and activities of daily living, we cannot discount the possibility that neuropsychological difficulties may also impact other areas of functioning in daily life in patients with PD. Replication and extension to other aspects of daily functioning, employing a more comprehensive cognitive test battery and using larger sample sizes, will be informative. Finally, daily functioning in PD has been reported to be maximally different from that in the general population in younger patients with the illness ([18]). Examination of relationships between executive functioning and daily functioning across stages of the illness, various age ranges, and in larger discrete samples of men and women will be important to determine the generalizability of our findings.

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