



Short communication

Everyday functioning in Parkinson's disease: Evidence from the Revised-Observed Tasks of Daily Living (OTDL-R)



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ABSTRACT

Introduction: Performance tasks are presumed to have greater validity than rating scales in assessing day-to-day behaviors in Parkinson's disease (PD). One such task is the revised Observed Tasks of Daily Living (OTDL-R), which has been used extensively in healthy older adults, and but not yet empirically examined in PD. Thus, the aims of the current study were to examine and determine the impact of cognitive, motor, and mood symptoms on OTDL-R performance in PD.

Method: Nineteen non-demented PD patients and 18 healthy older adults (HC) were administered measures of mood and cognitive functioning, and the OTDL-R (subtests include medication and telephone use, and medication management). Clinical severity of PD was assessed using the H&Y stage, UPDRS, and Schwab and England functional disability scores.

Results: Mann Whitney U tests indicated the PD patients were significantly slower to complete the OTDL-R and performed worse on only the telephone use subtest, relative to the HC group. In the PD group, hierarchical regression analyses revealed memory, attention, and initiative/perseveration were uniquely associated with the financial management subtest, after controlling for motor severity ($ps < .05$). No other significant relationships were found.

Conclusions: PD patients were slower to complete the OTDL-R, but only less accurate on the telephone use subtest. Poor performance on the telephone use subtest may be related to motor severity, while poor performance on the financial management subtest was related to attention and working memory. Overall, the findings warrant future investigation to determine the validity and reliability of the OTDL-R in PD.

1. Introduction

Parkinson's disease (PD) is an age-related progressive neurodegenerative disorder that often leads to declines in functional independence. In PD, these declines in everyday functioning are associated with greater motor severity, worsened cognition, older age of onset, and lower quality of life [1]. Indeed, these factors may be differentially associated with the ability to complete specific functional activities. For instance, cognitive symptoms, particularly executive function deficits (e.g., planning, organizing), have been uniquely associated with reports of unsuccessful medication and financial management, whereas motor symptoms have not [2].

To date, most studies investigating instrumental activities of daily living (iADLs; e.g., shopping, finances) in PD use rating scales and

questionnaires (e.g., self, informant, or clinician) which can be subject to several forms of bias. Thus, cognitive impairment, lack of patient insight, and informant bias may lead to over- or underestimations of functional status in PD [3]. Attractive alternatives are performance-based measures that directly assess functional ability by having patients complete a simulated real-world task in a laboratory or clinical setting [4]. Performance-based measures are presumed to have greater ecological validity than self-report measures as they typically include tasks such as balancing checkbooks, managing medications, and using transportation schedules.

One such performance-based measure is the revised Observed Tasks of Daily Living (OTDL-R [5]). This measure of everyday problem solving has been used in one of the largest NIH supported longitudinal studies of cognitive intervention for older adults, known as Advanced

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Cognitive Training for Independent and Vital Elderly (ACTIVE [6]). The OTDL-R includes nine distinct behavioral tasks that fall under the domains of telephone use, medication use, and financial management. The OTDL-R has been shown to have strong psychometric properties including internal consistency, concurrent validity, construct validity, and discriminant validity in healthy and clinical populations (e.g., schizophrenia, brain injuries [7]). Diehl and colleagues (2005) reported that the OTDL-R total score was positively correlated with general health, memory, reasoning, and processing speed. Indeed, findings from the ACTIVE five-year follow-up indicated that participants assigned to a Reasoning training group reported less difficulty in self-rated performance of iADL tasks, relative to controls [6].

Despite the advantages of performance-based measures, relatively few studies have examined their relationship with cognitive and motor symptoms in PD patients [8–11]. Of those doing so, findings have been mixed both across and within laboratories. Some investigators have found that worse cognition and/or motor symptoms relate to specific functional domains [8,9,11], whereas others have not [10]. The basis for these discrepancies is unclear, but likely relate to methodological differences across studies ranging from variability in types of cognitive tasks, the precise performance-based measure, and differences in clinical characteristics of the PD sample.

The overall goal of the current study was to examine the utility of the revised Observed Tasks of Daily Living (OTDL-R) in a sample of non-demented patients with early-mid stage PD. Our working hypothesis was that this performance-based measure of functional activity, widely used with older adults, might elucidate nuanced behavioral differences between non-demented PD and healthy control (HC) participants. There were two specific aims. First, we wanted to learn whether PD patients were merely slower in completing the subtasks, or whether difficulties involved inaccuracies in task completion. Based on prior findings with other performance-based measures [8,9,11], we predicted that the PD group would be less accurate than the HC group, independent of performance speed. Second, we wanted to assess the contributions of cognitive, motor, and mood symptoms on OTDL-R performance. We predicted that cognitive symptoms, particularly attention and memory, would be more strongly associated with OTDL-R performance in PD patients, than would mood or motor symptoms.

2. Method

2.1. Participants

Participants included 19 PD patients and 18 healthy controls (HC). The PD group was recruited through the University of Florida's Center for Movement Disorders and Neurorestoration, and the HC group was recruited through the community. All PD patients met stringent diagnostic criteria for idiopathic Parkinson's disease [12] and were free from other neurological or medical illnesses compromising participation. Exclusion criteria for all participants entailed current or past history of major psychiatric disturbance, severe chronic medical illness, anticholinergic medications, and scores in the demented range (≤ 24) on the Mini Mental Status Exam (MMSE). Informed consent was obtained according to the University of Florida Institutional Review Board Guidelines and the Declaration of Helsinki. None of the PD patients had undergone deep brain stimulation or other brain surgery.

All participants were administered a cognitive screener (MMSE), measures of depression (Beck Depression Inventory-II [13]) and apathy (Apathy Scale [14]) and the OTDL-R. Dementia Rating Scale-2 (DRS-2) scores were only available for the PD group. Table 1 depicts descriptive characteristics of the PD and HC groups. Overall, the participants were well educated and ranged in age from 44 to 81 years. As a group, the PD patients were in the early-mid stages of disease severity based on ratings using the Hoehn and Yahr Stage (H&Y) and Part III (e.g., motor scale) of the Unified Parkinson's disease Rating Scale (UPDRS). Clinician and patient rated scores on the Schwab and England (S&E) scale

Table 1
Characteristics of study participants (n = 37).

	PD group (n = 19)	HC group (n = 18)	Statistic	p-value
Age (years)	63.5 (10.1)	67.3 (9.5)	t = -1.181	.246
Gender (M/F)	15/4	8/10	$\chi^2 = 4.678$.031*
Education (years)	15.1 (1.9)	16.7 (2.8)	t = -1.997	.054 ^{tr}
MMSE (total score)	28.6 (1.4)	29.3 (0.8)	t = -1.752	.089
DRS-2 (total score)	136 (1.4)	–		
Attention	35.5 (1.3)	–		
Initiation/Perseveration	35.8 (2.3)	–		
Conceptualization	36.3 (2.9)	–		
Memory	22.7 (1.4)	–		
Construction	6 (0)	–		
Apathy Scale	12.5 (5.8)	7.1 (4.5)	U = 81.5	.006*
BDI-II	9.9 (5.2)	3.7 (2.7)	U = 50	.000**
Disease duration (years)	7.6 (2.3)	–		
UPDRS III (on medication)	21.6 (6.8)	–		
Levodopa equivalency dosage (mg/day)	844 (712)	–		
H&Y Stage (%)		–		
1	0			
2	88.2			
2.5	5.9			
3	5.9			
4	0			
5	0			
Schwab and England ADL – Clinician (%)	76.67 (21.14)			
Schwab and England ADL – Patient (%)	78.33 (19.78)			

Note: MMSE = Mini Mental Status Exam, DRS-2 = Dementia Rating Scale-2, BDI-II = Beck Depression Inventory-II, UPDRS III = Unified Parkinson's disease Rating Scale Part III; H&Y = Hoehn and Yahr. Data expressed as mean (standard deviation) unless otherwise specified. DRS-2 total and subtests are presented as raw scores.

**p < .001.

*p < .05.

^{tr}.05 < p < .08.

reflected minimal functional disability. All PD patients completed the assessments while on dopaminergic medications.

2.2. Revised Observed Tasks of Daily Living

The revised Observed Tasks of Daily Living (OTDL-R [5]) assess three domains of functional behavior (telephone and medication use, and financial management), with three tasks per domain. In the current study, all tasks were timed, which is not standard protocol for the OTDL-R, in an effort to address the first aim of the current study. For the medication use domain, the three tasks include: understanding a medicine label, following leaflet directions and completing a patient record form. For the telephone use domain, using a corded trimline telephone, the tasks include finding and dialing a number from the yellow pages, finding and dialing a number from a directory of social service resources from the phone book, and using a rate discount chart from a phone book. For the financial management domain, the tasks include making change with coins and bills, balancing a checkbook, and paying a utility bill with a check and mailing it. For each task, participants were provided real-life materials and were asked to perform necessary steps to find the correct answer to questions presented on 4 × 5 index cards. Each item was scored in a binary format (0 = incorrect, 1 = correct), with total scores ranging from 0 to 28, with higher scores indicating better day to day functioning.

2.3. Statistical analyses

Data were checked for normality using Shapiro Wilks test of normality, which revealed that the OTDL-R scores were non-normally

Table 2
Medians and interquartile ranges of OTDL-R performance.

	PD Group (n = 19)	NC Group (n = 18)	U	p	η^2
Medication Use	7.00 (6.00–10.0)	8.00 (7.75–10.0)	141	.179	.02
Telephone Use	4.00 (3.00–6.00)	5.00 (4.00–6.00)	108	.029*	.11
Financial Management	9.00 (8.00–10.0)	10.0 (8.00–10.25)	134	.129	.04
Total Score	20.0 (18.0–25.0)	23.0 (21.0–24.3)	120	.063 ^{tr}	.07
Total Time	21.0 (16.0–24.0)	15.0 (12.0–20.8)	101	.012*	.13

Note: U = Mann Whitney U Test Statistic; η^2 effect size conventions: small effect – 0.01, medium effect – 0.06, large effect – 0.14.

* $p < .05$. ^{tr} $p < .08$.

distributed ($ps < .05$). Thus, nonparametric statistics (Mann Whitney U Tests) were used to test for group differences on the OTDL-R. For the PD group (Shapiro Wilks: $ps > .05$), correlational analyses examined the relationship between S&E and UPDRS scores with OTDL-R total and subtest scores. For the PD group, separate hierarchical regression analyses examined the influence of cognitive and mood symptoms on OTDL-R total and subtest scores after controlling for motor severity.

3. Results

Table 2 depicts the scores of the PD and HC groups across the three domains of the OTDL-R. As shown, the PD group was significantly slower in completing the OTDL-R and performed significantly worse than the HC group only on the telephone use subtest. No other significant group differences were found.

Within the PD group, results of correlational analyses revealed that UPDRS motor severity was strongly and negatively correlated with OTDL-R total score, ($r = -.538$, $p = .026$), telephone use, ($r = -0.506$, $p = .038$), and financial management, ($r = -0.677$, $p = .003$). In contrast, neither clinician nor patient rated S&E scores were correlated with OTDL-R total and subset scores ($ps < .05$).

To determine the relationship between cognition and OTDL-R performance in the PD group, a series of hierarchical multiple regression analyses were conducted for each of the three OTDL-R subtests separately. In each analysis, motor severity was ‘controlled’ by entering UPDRS-III scores into block one whereas standardized DRS-2 subtest scores were entered into block two as cognitive predictors (e.g., attention, initiation/perseveration, conceptualization, and memory). Results indicated that three DRS-2 subtest scores accounted for significant variance, when controlling for motor severity, only for the *financial management* subtest score, ($F(5,9) = 12.97$, $p < .001$, $\Delta R^2 = 0.497$, $R^2 = 0.810$). The three unique cognitive predictors of financial management were memory, ($\beta = 0.896$, $t = 3.969$, $p = .003$), attention, ($\beta = 0.756$, $t = 4.032$, $p = .003$), and initiation, ($\beta = 0.514$, $t = 2.506$, $p = .034$). However, cognitive predictors did not account for significant variance for either telephone or medication use subtest scores, after controlling for motor severity.

Similar regression analyses examined the relationship between mood and motivation with OTDL-R performance. In these analyses, motor severity (e.g. UPDRS) was entered into block one, and scores for depressive (BDI-II) and apathetic (AS) symptoms were entered into block two as mood and motivation predictors, respectively. Results indicated that neither depression nor apathy scores accounted for significant variance across the OTDL-R subtest scores, after controlling for motor severity ($ps < .05$).

4. Discussion

To our knowledge, the current study was the first to examine performance-based functional behaviors using the OTDL-R in a sample of non-demented PD patients. We found that the PD group was

significantly slower in completing the OTDL-R, but their accuracy was similar to that of the HC group across all OTDL-R subtests, except for one (i.e., telephone use). A possible explanation is that the greater fine motor demands involved in executing telephone dialing may have placed the PD group at greater disadvantage. In line with this possibility, we found that motor symptom severity was uniquely associated with poor telephone use performance in PD patients.

The second major finding pertained to the influence of mood and cognitive symptoms on OTDL-R performance in the PD group. While mood symptoms were unrelated to OTDL-R performance, we found that attention, memory, and initiation/perseveration were uniquely associated with poor financial management performance but not the other OTDL-R subtests. This finding implies that the cognitive skill set involved in the financial management subtest likely relies more heavily on attention/working memory, which is known to be affected early on in PD patients.

Despite one prior study, using self-report measures, that found cognitively demanding tasks, such as telephone use, may not be problematic until more advanced stages of PD [3], the findings of the current study suggest patients in early-mid stages of PD may indeed have difficulties with such a task. Although additional evidence is needed, the findings highlight the necessity of assessing multiple iADL domains in order to determine functional status in PD, as poor performance in one iADL domain may not be indicative of global iADL performance. Taken together, OTDL-R subtests may be differentially associated to nuanced declines in everyday functioning in PD patients.

This study has several limitations. The PD participants were early in disease stage, non-demented, primarily Caucasian, and highly educated which may limit the generalizability of these findings to other PD samples. The sample size was small and participants were neither depressed nor apathetic. Indeed, there were significant differences between PD and HC groups with regard depression and apathy; however, none of these differences were clinically significant. Nonetheless, results from bootstrapped analyses of covariance indicated a lack of significance across OTDL-R test scores after controlling for gender, apathy, and depression. Despite a lack of significance on OTDL-R scores including telephone use and financial management, and time completion, these differences were associated with small to medium, and medium to large effect sizes, respectively, suggesting the analyses may have been underpowered. Lastly, although the OTDL-R has strong psychometric properties in older adults [5,6], no previous studies have examined its reliability and validity in PD cohorts or compared it to other paper and pencil measures of functional performance or informant rating scales, such as the Penn Parkinson's Daily Activities Questionnaire [15]. Thus, subsequent research should examine the convergent and divergent validity of the OTDL-R as well as explore the OTDL-R longitudinally to determine the course, stability, and predictive utility of the OTDL-R in PD. This is important as declines in iADL, using self-report measures, have been suggested to be an indicator of progression to mild cognitive impairment and dementia in PD [16].

In summary, the current study adds to the growing body of literature examining functional performance scales in non-demented PD patients. The findings suggest motor symptoms may have an impact on telephone use in the early-mid stages of PD, and these subtle difficulties may be detectable using the OTDL-R. Cognitive symptoms, such as poor attention and memory performance, may account for poor financial management performance in PD even in early-mid stages of the disease. Taken together, the findings suggest the OTDL-R may capture nuanced functional declines, and warrants future investigation to determine the validity and reliability of the OTDL-R to assess and predict functional decline in PD.

Contributors

All authors made substantial contributions to the development of the study, analysis and/or interpretation of data, drafting of the article,

and/or providing critical review of the manuscript, and have approved the final version.

Conflicts of interest

None.

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