Cognitive & Behavioral Assessment

Relationship between the Activities of Daily Living Questionnaire and the Montreal Cognitive Assessment

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Abstract

Introduction: The Activities of Daily Living Questionnaire (ADL-Q) is an informant report questionnaire assessing functional impairment in daily living skills. Previous research has demonstrated correlations between ADL-Q and cognitive screening measures among patients with dementia. This study examined the relationship between ADL-Q and the Montreal Cognitive Assessment (MoCA), a brief cognitive screening.

Methods: Records of 448 individuals from an outpatient neurology clinic were reviewed. Pearson correlations were calculated between ADL-Q scores and MoCA scores. Linear regression models were fit using demographic information to predict ADL-Q scores. MoCA scores were then added to the models to determine the increase in predictive value of the MoCA.

Results: Lower MoCA scores were associated with higher levels of functional impairment. For each model, adding the MoCA significantly improved model fit.

Discussion: Low scores on the MoCA, among patient's presenting for memory complaints, should raise concerns about functional decline and prompt for further assessment of functional ability.

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1. Introduction

Impairments in basic and instrumental activities of daily living (ADL) are often associated with cognitive decline in elderly populations. Measuring an individual's functioning in ADLs is an important aspect of assessment for neurodegenerative disease and is necessary in making accurate diagnoses, evaluating the severity of disease, monitoring disease progression over time, and ensuring appropriate levels of support are in place. Clinicians often use brief cognitive screening tests (e.g., Montreal Cognitive Assessment, Mini-Mental Status Examination) and measures of ADLs as part of routine dementia evaluations, and understanding how such measures are related is important to establish how performance on cognitive screening may be predictive of functional independence and establish the need for further testing.

Research comparing performance on brief cognitive screening tests and measures of ADLs has demonstrated that individuals with greater cognitive impairment are more likely to have functional impairments in ADLs (e.g., [1,2]). In the dementia process, ADLs are typically lost in a hierarchical manner, with instrumental ADLs being impacted before basic ADLs [3,4]. Although performing ADLs involves multiple cognitive processes, research suggests that levels of executive functioning may be particularly important in predicting levels of functional impairment [5].

Given variable levels of insight among individuals with neurodegenerative disease, assessment of functional independence often uses collateral reports. One example

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designed to assess independence in both basic and instrumental ADLs is the Activities of Daily Living Questionnaire (ADL-Q [6]), which provides an overall indication of functional independence, as well as, more specific assessment of targeted domains (e.g., self-care, household care, employment and recreation, shopping and money, travel, and communication). Johnson et al. [6] examined its relationship with the mini-mental state examination (MMSE [7]) and the Clinical Dementia Rating Scale [8] and showed that individuals with lower scores on the cognitive screening measures had greater levels of functional impairment in ADLs.

The Montreal Cognitive Assessment (MoCA [9]) has been increasingly adopted as a cognitive screening tool given its increased sensitivity over other cognitive screening tools and its inclusion of cognitive domains not assessed by other screening measures (e.g., executive functioning) [10–12]. Given that the MoCA is a new measure that has not been included in most research associating functional impairment with cognition, it is valuable to examine the MoCA's relationship to the ADL-Q to ensure a similar trend holds true. The inclusion of executive functioning on the MoCA may increase its sensitivity to functional decline. This study sought to ascertain the relationship between performance on the MoCA and informant reports of functional independence using the ADL-Q in a memory disordered population because both are freely available measures that could be readily used in clinical settings.

2. Method

2.1. Participants

Data were obtained from medical records of 448 consecutive patients seen by neuropsychology in an outpatient neurology center specializing in neurodegenerative disease. Patients with Parkinson's disease (PD) were excluded to limit the influence of motor impairments on functional status. All other patients referred for neuropsychological testing were included. The analyzed sample was 47.3% women and predominately Caucasian (91.5%) with an average age of 71.3 years (SD = 8.9), an average of 14.5 years (SD = 2.8) of education, and average estimated premorbid intelligence of 99.1 (SD = 13.9). Working diagnostic considerations included Alzheimer Disease ($n = 115$), mild cognitive impairment ($n = 91$), cognitive disorder not otherwise specified ($n = 72$), psychiatric illness including depression and anxiety (PSY, $n = 18$), dementia with Lewy bodies ($n = 17$), frontotemporal dementia ($n = 12$), cognitively normal (Normal; $n = 12$), vascular dementia ($n = 6$), and other neurological conditions including hydrocephalus, primary progressive aphasia, post concussive syndrome, seizures, stroke, cognitive impairment due to an acute medical illness, and subjective memory complaints

(Other; $n = 26$). Diagnostic information was unavailable for 79 individuals. The MoCA was completed during the initial visit with neurology, and subsequent neuropsychological assessment included a standard battery of cognitive measures. A family member or caregiver completed an inventory rating functional independence. This study was reviewed and approved by the Cleveland Clinic Institutional Review Board.

2.2. Measures

2.2.1. Activities of Daily Living Questionnaire

The ADL-Q is an informant report questionnaire completed by a caregiver and is divided into six domains of functioning as follows: (1) self-care, (2) household care, (3) employment/recreation, (4) shopping/money, (5) travel, and (6) communication. Each domain contains three to six items rated using a 4-point scale, ranging from zero (no problem) to 3 (no longer capable). An option to indicate the individual never performed the activity in the past, stopped the activity before illness, or the rater does not have sufficient knowledge to rate functioning in that area is also available; if endorsed, this item is not counted. A total score representing overall functional impairment and subscale scores representing functional impairment in each of the six areas are calculated. Total scores ranging from 0%–33% indicate minimal impairment, 34%–66% moderate impairment, and ≥67% severe impairment.

2.2.2. Montreal Cognitive Assessment

The MoCA is a brief cognitive screening measure that takes approximately 10 minutes to administer and can be administered by various levels of health care providers. The MoCA consists of 12 individual tasks grouped into cognitive domains including (1) visuospatial/executive functioning, (2) naming, (3) attention, (4) language, (5) abstraction, (6) memory, and (7) orientation. A total score is calculated, and an educational correction is made if applicable (i.e., one point added for individuals with 12 years of education or less). Validated clinical use of the MoCA is interpretation of the total score, with a total score of ≤26 indicating cognitive impairment.

2.3. Data analysis

Pearson correlation coefficients were calculated to determine the relationship between ADL-Q scores and MoCA total scores. Several linear regression models were first fit using age, gender, education, and estimated premorbid intelligence as predictors in a base model. Outcomes of interest included separate models for the ADL-Q total score, as well as, the individual ADL-Q domain scores, for a total of seven separate models. The MoCA total score was then added to each base model to determine the added predictive

value afforded by the MoCA above and beyond the base demographics. Model performance was evaluated by the change in R^2 values from adding the MoCA and inspecting standardized regression coefficients of each predictor. To evaluate cognitive domains most strongly related to functional impairment, another regression was fit using the same base model and then adding the individual MoCA domain scores as predictors of the ADL-Q Total. To isolate effects of cognition, the orientation score was not included in the model.

3. Results

MoCA and ADL-Q scores for the entire sample are listed in Table 1 along with associated correlations. The mean total MoCA score was 20.2 (SD = 5.11), and the mean ADL-Q total was 27.9 (SD = 18.6). The Pearson correlation between total scores was weak-to-moderate ($r = -0.34$; $P < .001$), such that lower MoCA scores were associated with higher levels of functional impairment in ADLs.

R^2 and associated R^2 change values obtained from adding the MoCA total score to each base model are reported in Table 2, along with standardized regression coefficients and confidence intervals. For each model fit, adding the MoCA significantly increased the proportion of variance accounted for above and beyond demographic factors alone. The visuospatial/executive domain of the MoCA was the cognitive domain most predictive of ADL-Q total score ($\beta = -0.25$, $P = <.001$), followed by attention ($\beta = -0.13$, $P = <.001$), language ($\beta = -0.11$, $P = <.001$), and delayed recall ($\beta = -0.085$, $P = .001$). Naming and abstraction domain scores were not significant predictors of ADL-Q total score. Owing to listwise exclusion, the sample size for the model including individual MoCA domains was reduced (see Table 1).

Table 1
Test means, standard deviations, and ADL-Q correlation with MoCA total score

Test Domain	Mean (SD)	N	r
ADL-Q domain			
Total score	27.90 (18.61)	448	-0.34
Self-care	11.40 (13.27)	448	-0.27
Household care	32.78 (30.06)	448	-0.21
Employment/recreation	44.89 (25.49)	448	-0.19
Shopping/money	31.32 (32.44)	448	-0.35
Travel	32.78 (28.07)	448	-0.29
Communication	26.10 (19.26)	448	-0.37
MoCA domain			
Total score	20.15 (5.11)	448	
Visuospatial/executive	3.42 (1.33)	411	
Naming	2.69 (.58)	411	
Attention	4.70 (1.44)	411	
Language	1.84 (.93)	411	
Abstraction	1.28 (.82)	411	
Delayed recall	1.36 (1.57)	411	

NOTE. r = Pearson correlation with MoCA total score. All r coefficients significant at $P < .001$.

Table 2
Effect of adding MoCA total score as a predictor of ADL-Q scores

ADL-Q domain	R^2	R^2 change	MoCA β	95% CI	
Total	0.134	0.121	-0.38	-1.72	-1.03
Self-care	0.098	0.093	-0.33	-1.11	-0.61
Household care	0.083	0.046	-0.23	-1.94	-0.80
Employment/recreation	0.044	0.042	-0.22	-1.60	-0.61
Shopping/money	0.138	0.132	-0.39	-3.10	-1.90
Travel	0.089	0.069	-0.28	-2.10	-1.03
Communication	0.165	0.119	-0.37	-1.76	-1.06

Abbreviations: *N*, 448; ADL-Q, Activities of Daily Living Questionnaire; MoCA, Montreal Cognitive Assessment.

NOTE. Beta coefficients presented are for the MoCA total score. All models also fit age, education, gender, and estimated intelligence in addition to the MoCA total. All R^2 change statistics and all regression coefficients significant at the $P < .001$ level.

4. Discussion

In an outpatient neurology clinic population, there is a weak-to-moderate inverse relationship between performance on the MoCA and ADL-Q such that individuals with lower MoCA scores are more likely to have impairment in ADLs. These findings add to previous research demonstrating the relationship between cognitive screening measures and functional status (i.e., MMSE and ADL-Q) [6] and the larger body of research demonstrating the association between cognition and everyday functioning in the elderly [13]. For each functional domain, integrating the MoCA improved characterization of functional status above and beyond simple demographic variables. Reviewing the individual standardized regression coefficients finds that financial management was most sensitive to changes in MoCA scores, and participation in employment and recreational activities was the least sensitive. Of the six MoCA domains examined, the visuospatial/executive functioning domain was the most predictive of functional ability, which is consistent with previous research highlighting the importance of executive functioning in ADLs [5]. This finding provides further evidence of the added utility of the MoCA over other cognitive screening measures that do not include a measure of executive functioning.

A limitation of the present study is that the sample is somewhat diverse from a diagnostic standpoint and precise diagnostic information was not available for all individuals. The advantage of the present sample, however, is that the clinical heterogeneity is more likely to reflect that seen in a typical outpatient setting, increasing the generalizability of these findings. Future directions should evaluate the relationship between the MoCA and ADL-Q in specific disease populations. Although diagnostic considerations were available in the present data set, both the MoCA and the ADL-Q were used in the clinical decision-making process, thus preventing more refined study of specific patient groups with the present data set.

Among older adults, especially those presenting for memory complaints, cognitive screening should be a routine component of the neurological examination. The MoCA is one such option that has the added sensitivity to executive dysfunction. Given the present findings, low scores on the MoCA should raise concerns about functional decline and prompt for more in-depth functional assessment as part of comprehensive neuropsychological testing.

RESEARCH IN CONTEXT

1. Systematic review: The authors reviewed the literature on the association between cognitive screening measures, including the MMSE and MoCA and measures of activities of daily living (ADL), using traditional sources (e.g., PubMed).

2. Interpretation: Lower MoCA scores were associated with higher levels of functional impairment in ADLs. For each functional domain, integrating the MoCA improved characterization of functional status above and beyond simple demographic variables. The visuospatial/executive functioning domain was the most predictive of functional ability. These results highlight the importance of executive functioning in ADLs and provide further evidence of the added utility of the MoCA over other cognitive screening measures that do not include a measure of executive functioning.

3. Future directions: The present study is limited by a heterogeneous clinical sample. Future directions for research should include evaluation of the relationship between the MoCA and ADL-Q in specific disease populations.

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