Everyday Problem Solving in Alzheimer's Disease Patients

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The research reported in this paper was supported by funding from the National Institute on Aging (AG11032) to S. L. Willis. R. Allen-Burge received postdoctoral funding by Training Grant MH 18904-07 from the National Institute of Mental Health.

Abstract

Along with memory problems, loss of competence in complex cognitive tasks of daily living is a hallmark feature of dementing illness. This study is conducted in collaboration with a longitudinal research project with Alzheimer patients at the Stanford Aging Clinical Research Center. Thirty-two individuals completed self-report inventories regarding performance of instrumental activities of daily living (IADLs), standard neuropsychological screening instruments, and an objective measure of everyday competence, the Everyday Problems Test for Cognitively Challenged Elderly (EPCCE). Performance on the EPCCE was predicted by the level of dementia and the Mini-Mental Status Exam. A qualitative analysis of errors made in everyday tasks revealed that over 90% of the sample made computational, financial, dosage, and incomplete processing errors as well as errors based on the inappropriate use of prior experience. These results indicate the need for interventions focused on aiding demented individuals in the management of finances and medications as well as identifying appropriate compensatory usages for prior knowledge.

EVERYDAY PROBLEM SOLVING IN INDIVIDUALS WITH ALZHEIMER'S DISEASE

The assessment of everyday cognitive competence among at-risk or cognitively challenged older adults remains a provocative but little studied research area. Loss of everyday competence, along with memory impairment, are the cardina diagnostic features of dementia (American Psychiatric Association, 1994). Cognitiv decline may be manifested early in the disease process in the individual's ability to perform complex instrumental activities of daily living (IADLs). These activities include managing finances, driving, preparing meals, taking medication, shopping, light housework, and the ability to use the telephone. Decline in these tasks is typically noted prior to decline in self-care tasks such as bathing or grooming (ADL Ashford, Hsu, Becker, Kuman, & Bekian, 1986). Additionally, it may be decline in IADL functioning that brings individuals with incipient dementia to the attention of health care professionals.

Currently the ability of cognitively challenged individuals to perform IADL is assessed by self-report, caregiver report, or ratings made by medical staff (Lawton & Brody, 1969). There are problems, however, with the sole use of this approach to the assessment of everyday competence. Fillenbaum (1978) and Ford, Folmar, Salmon, Medalie, Roy, and Galazka (1988) found that healthy older adults overestimate their functional competence in comparison to physician's ratings of the

competence. Individuals with dementia are much more likely to overestimate their functional competence in comparison to caregiver's ratings (Kuriansky, Gurland, Fleiss, & Cowan, 1976). Ratings made by physicians or other medical staff are problematic due to the limited time period and contextual constrictions surrounding how these evaluations are made. Therefore, making decisions regarding a person's everyday competency based on these ratings may provide an incomplete picture and lead either to spurious institutional placement or to leaving someone in the community who needs assistance in IADL tasks.

Additionally, little is known about the relationship between a person's cognitive performance on traditional neuropsychological assessments and his/her ability to function independently in the community (Lowenstein et al, 1989). Neuropsychologists are often asked to make judgments about an individual's ability to live alone, however, based on information gleaned from such assessments. The only relevant data concerning such relationships come from epidemiological studies demonstrating significant relationships between self-report of everyday competence and brief cognitive rating scales such as the Mini-Mental Status Examination (Fillenbaum, 1985; Galanos, Fillenbaum, Cohen, & Burchett, 1991). Again, there is obvious need for a new approach to the assessment of the everyday competence of at-risk or cognitively challenged older adults.

The Everyday Problems Test for the Cognitively Challenged Elderly

(EPCCE) was developed to objectively measure the problem solving ability of o adults with lower levels of education or with declining cognitive abilities in an ecologically valid manner. It measures competency to perform complex cogniti activities, (i.e., IADLs) that are important in the maintenance of individual independence. Examples of EPCCE items in each of several functional domain provided in Table 1 (see Table 1). The EPCCE provides a rich dimension to the cognitive assessment of everyday competence and is intended to supplement self report ratings and neuropsychological assessment.

Insert Table 1 about here

The purpose of the current study was two-fold. First, we were interest objectively assessing the everyday problem solving ability of individuals in the stages of Alzheimer's disease and in exploring relationships between everyday competence and standard neuropsychological measures. Second, we qualitative examined the errors made by individuals with Alzheimer's disease on the EPC

Method

Participants

Participants (N = 32) were enrolled in one of several research projects conducted at the Stanford Medical Center's Aging Clinical Research Center (A

The mean age of the sample was 72.83 years (SD = 7.91, Range 50 - 84). Fifty-two percent of the participants were male and 52 percent had a high school education or less. The majority of participants were Caucasian. Forty-five percent of the sample were veterans. Stage of cognitive decline was measured by the Global Deterioration Scale (GDS; Reisberg, 1983) and the Mini-Mental Status Examination (MMSE; Folstein, Folstein, & McHugh, 1975). The average GDS for this sample was 4.45 (SD = 0.60, Range 3 - 5.5), indicating moderate to moderately severe cognitive decline and early dementia. The average MMSE total score was 18.87 (SD = 4.47, Range 12-29), which is well below the cut-off point of 24 to determine cognitive decline. There were no differences in education by gender, ($X^2 = 7.42$, $p = .19$), race, ($X^2 = 16.89$, $p = .33$), or GDS, ($X^2 = 14.97$, $p = .78$). There were also no differences in gender by race, ($X^2 = 3.35$, $p = .34$), or GDS level by race, ($X^2 = 5.84$, $p = .92$). There was, however, a marginally significant difference in GDS level by gender, ($X^2 = 8.69$, $p = .07$), with women demonstrating greater cognitive decline than men.

Materials and Procedure

Individuals in this study had been enrolled in longitudinal research at the ACRC for variable lengths of time. Participants undergo baseline, six-month follow-up, and yearly follow-up testing. The core assessment battery given at each testing occasion consists of the following tests. Cognitive and Neuropsychological Tests

Mini-Mental Status Examination (MMSE; Folstein et al., 1975). The

MMSE is a brief cognitive screening battery assessing global cognitive ability. Domains of cognitive functioning include orientation, immediate and delayed recall for words, attention and concentration, language, and praxis. The maximum MMSE score is 30.

Global Deterioration Scale (GDS; Reisberg, 1983). Another clinician ratin scale indexing the degree of cognitive decline of individuals with dementia. The GD ranges from 1, indicating no cognitive decline, to 7, indicating very severe cognitive decline and late dementia.

Alzheimer's Disease Assessment Scale (ADAS; Mohs, 1994). This is a brief cognitive screening battery assessing the following domains: word list immedia and delayed recall, word list recognition, verbal comprehension, confrontation naming, constructional praxis, ideational praxis, and incidental memory.

Tests of Everyday Competency

Instrumental Activities of Daily Living (IADL; Lawton & Brody, 1969). This instrument ranges from 0 to 31, with high scores indicating greater functional impairment. In this study, IADL ratings were obtained from both the individual wit Alzheimer's disease as well as the caregiver. Individuals are asked to make ratings i each of the seven IADL domains.

Physician Self-Maintenance Scale (PSMS). This clinician rating scale measures the functional competence of the patient in each of the six Activities of

Daily Living (ADL) domains: toileting, feeding, dressing, grooming, physical ambulation, and bathing. Scores range from 0 to 30 with high scores indicating greater functional impairment.

The Everyday Problems Test for the Cognitively Challenged Elderly (EPCCE; Willis, 1993). This 32-item test measures problem solving ability. Participants are shown printed material encountered in everyday activities and asked to solve two problems associated with each stimuli. Stimuli are directions, forms, or charts encountered in everyday life. For example, directions for cough medicine were taken from an over-the-counter cough medicine label, and insurance forms were taken from actual applications for insurance (see Table 1).

Results

Relationship of the EPCCE to IADL Ratings and Neuropsychological Measures

All analyses follow a cross-sectional design, using only an individual's initial EPCCE and all concomitant tests from that testing occasion. Table 2 presents descriptive statistics for the EPCCE, other tests of everyday competence, and neuropsychological measures. There was a significant difference between IADL ratings made by caregivers in comparison with the IADL ratings made by the participants, paired $t(27) = 3.80$, $p < .01$. Caregivers rated the participants' everyday competence more poorly than the participants did.

Insert Table 2 about here

The correlation matrix is presented in Table 3. Significant univariate associations were found between the total EPCCE, the GDS, and several cogni variables. These included mean recognition memory from the ADAS, ADAS MMSE total, and MMSE orientation and language. As expected, everyday competency measures were moderately intercorrelated (i.e., IADL ratings by participants and caregivers and the PSMS), as were cognitive tests.

Insert Table 3 about here

Two simultaneous multiple regressions were conducted in order to ex variables associated with the performance of Alzheimer's patients on the EPC the first analysis, the demographic variables age, education and race were used predict total EPCCE scores. This model failed to predict a significant amount o variance in the EPCCE, $F(3, 25) = 0.17$, $p = .91$, $R^2 = .02$. In the second analy measures significantly correlated with total EPCCE scores (i.e., GDS, mean AD recognition memory, ADAS cognitive, and MMSE total score; see Table 3) we as the predictors. No demographic variables were used in this model because t

model was nonsignificant and none of the demographic variables demonstrated significant univariate correlations with the EPCCE. The second model predicted significant variance in the EPCCE, $F(4, 22) = 8.74$, $p < .01$, $R^2 = .61$. However, there was considerable multicolinearity among the measures. Therefore, reduced regression models were run eliminating the most nonsignificant measures (i.e., mean ADAS recognition memory and ADAS cognitive). The final model consisted of the MMSE, $F(1, 26) = 5.28$, $p < .03$, and the GDS, $F(1, 26) = 3.87$, $p < .06$, accounting for 55 percent of the variance in EPCCE scores.

Error Analysis

Errors on the EPCCE were coded into one of the following categories (Bertrand, Dolan, & Willis, 1995): inappropriate use of prior experience, incomplete processing of information, computation, financial, dosage, no response, and random errors. Additional categories used only for the Alzheimer's disease patients were 1) Perseveration - the tendency to respond with the same answer to more than one question either within the same stimulus or across stimuli; 2) Idiosyncratic - self-referential errors indicating loss of set for the task, release from inhibition, and distractibility, and 3) Echoing - tendency to respond to a question by repeating parts of the question as the answer (see Table 4).

Insert Table 4 about here

Table 5 and Figure 1 present information regarding EPCCE error categori Financial errors resulting in underpayment are not included because too few errors this kind were made to calculate reliable point estimates. The most frequently occurring types of errors in terms of the number of errors possible on the EPCCE were computation errors, financial errors, and dosage errors. Financial and dosing errors most commonly involved overpayment and overdosing.

Insert Table 5 and Figure 1 about here

Table 5 and Figure 1 also show the frequencies of the different error types among participants. Over 90% of the sample made errors based on inappropriate us of prior experience, incomplete processing of information, computation errors, financial errors, and dosage errors. Random, no response, and perseveration errors were also common among participants. Idiosyncratic and echoing errors were uncommon, occurring in less than 20% of the sample.

Discussion

In this investigation we were interested in addressing the relationship between the performance of individuals with Alzheimer's disease on an objective test of everyday competency and the performance of these individuals on standard neuropsychological instruments. Significant associations were found between the EPCCE and measures of global deterioration associated with dementia and cognitive performance. Surprisingly, the EPCCE was not related in univariate analyses to IADL ratings made by participants or caregivers. In simultaneous multiple regression analyses, level of deterioration and general cognitive performance predicted performance on the EPCCE, accounting for 55% of the variance. The performance of individuals with Alzheimer's disease on the EPCCE appears to be influenced by multiple domains, including stage of disease progression and cognitive ability.

Additionally, we explored several different types of errors in everyday competency. Of particular interest was the frequency with which different types of errors were made by these cognitively challenged individuals. Over 90% of participants made errors due to lack of fully processing the problem and the information provided to solve the problem. This lack of complete information processing is reflected in the communality of computation, financial, and dosage errors (over 90% for each error type) in this sample. Particularly striking was the finding that over 90% of the sample made errors in the performance of everyday tasks

by relying on prior experience. It appears, therefore, that compensating for cog deterioration by relying on prior knowledge can be detrimental for many cognit challenged individuals.

It is important to note that these findings are preliminary and based on small sample of individuals with Alzheimer's disease from the Stanford Aging Clinical Research Center. As part of the longitudinal research of the center, dat collection will continue and will eventually afford the opportunity to look at ch everyday competency as the disease progresses.

Finally, it is hoped that the EPCCE could serve as an early diagnostic t incipient dementia. Additionally, it is hoped that the EPCCE will help bridge th between current assessment tools and knowledge of daily functioning. Knowle the errors made by individuals with Alzheimer's disease on the EPCCE may he identify interventions that will enable these individuals to maintain independen the community for a longer time.

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Proportions of EPCCE Error Categories