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MCI is Associated With Deficits in Everyday Functioning

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Abstract

The purpose of the present study was to examine the types of impairments in everyday function that accompany mild cognitive impairment (MCI). Data for this study was collected from 434 individuals consecutively evaluated at a university-based Alzheimer's Center. A total of 96 participants were diagnosed with MCI, 105 were cognitively normal, and 233 had dementia. Informant ratings of participants' abilities were obtained across different functional domains reflecting everyday abilities related to memory, language, visual spatial abilities, planning, organization, and divided attention. As expected, the demented group was significantly more impaired than the healthy control and MCI groups across all of the functional domains. The MCI group also showed significantly more functional impairment relative to healthy controls in all of the functional domains. Examination of the effect sizes as a measure of the magnitude of functional impairment in the MCI groups relative to controls showed that the greatest degree of impairment occurred within the Everyday Memory domain. The current findings suggest that individuals with MCI demonstrate deficits in a wide range of everyday functions but that the magnitude of these changes is greatest for those functional abilities that rely heavily on memory.

Keywords

mild cognitive impairment (MCI); dementia; functional impairment

The cognitive changes associated with degenerative dementias such as Alzheimer disease (AD) result in progressive declines in the ability to perform activities of daily living (ADL).^{1,2} Mild cognitive impairment (MCI), a syndrome intermediate to normality and dementia, has become increasingly well defined and extensively studied as a prodrome to and predictor of dementia.³ Although numerous studies have examined functional impairments in dementia, far less research has focused on functional change in MCI. The International Working Group on MCI recently noted that there is currently very little known about which aspects of everyday function are affected in MCI.⁴ The initial diagnostic criteria for MCI specified intact or "only slightly abnormal ADL."³ However, functional change presumably occurs over the course of MCI because it is precisely such cumulative change that leads to eventual conversion to dementia. A few recent studies have, in fact, suggested that mild changes in daily functioning can be detected in MCI groups.^{5,6} At present, the natural history of functional change between normal aging and dementia is undefined. This leaves guidelines for rating functional change in MCI

unclear (eg, how much functional change and in which domains can be present before a dementia syndrome should be diagnosed), reflecting our limited knowledge concerning the types of functional change that occur in association with the syndrome of MCI. In fact, some authors have argued that the explicit inclusion of functional decline should be part of the diagnostic criteria for MCI.⁷

The detection of change in everyday function in MCI is dependent on the method of assessment, more so than in dementia where these changes are severe and pervasive. It has been well established that functional impairments in dementia follow a gradient, such that basic self-care activities (eg, eating, dressing, grooming) are affected after higher order functional abilities become impaired.^{8,9} Thus, when investigating changes in everyday function associated with MCI it is important to focus on higher-level abilities. Further, the detection of mild functional changes is likely to be poor if measurement is limited to whether someone is completely “dependent” or “independent” in a given functional ability or domain. Therefore it is important to be able to measure more subtle or mild changes in function that fall short of leading to complete dependence on others.⁵

Although a few previous studies suggest that when using sensitive measures of everyday functioning, individuals with MCI show mild impairments,^{5,6,10} little is known about the *nature* of these functional changes. That is, it remains unclear which everyday abilities or domains of everyday function are most likely to be affected in MCI and to what degree they are impaired relative to both healthy elders, and individuals with dementia. The purpose of the current study was to better characterize the types of functional changes that are present in individuals with MCI. A questionnaire measuring changes in functional abilities across several different domains including Everyday Memory, Everyday Language, Everyday Visuospatial skills, and a variety of everyday executive abilities including Everyday Planning, Everyday Organization, and Everyday Divided Attention was administered to friends and family of individuals with MCI. Groups of both cognitively normal older adults and persons with dementia were also included in the study for comparative purposes.

METHODS

Subjects

Data for this study was collected from 434 individuals consecutively evaluated at a university based Alzheimer’s Disease Research Center. Subjects are referred through a number of different mechanisms. Eighty-two percent of the sample had been referred directly to the Alzheimer’s Disease Research Center (ADRC) clinic for evaluation or were spouses/friends of patients who were serving as controls, although a small percentage were recruited via a community outreach protocol. The mean age of the entire sample is 76.5 (8.4) and the mean number of years of education was 13.8 (3.7), ranging from 0 to 22 years of formal education. Fifty-six percent of the sample was female. The majority of the participants were white (70%), 8.4% were Hispanic, 14.4% were African American, 2.9% were Asian, and 4.4% were of another racial group. An individual familiar with the patient/control served as the informant and completed the outcome questionnaire measure daily function: 47.2% were spouses of the participant, 39.3% were their adult children (or spouses of their adult children), 4.3% were other family members, and 9.3% were friends of the participant. The average age of the informant was 61.9 (13.7); informants had a mean of 15.1 (4.0) years of education and 71.1% of them were female. On average, informants had known participants for 45.2 years (15.8) and currently spend 85.2 hours a week with the participants.

All participants had undergone a complete clinical dementia work-up, which included a neurologic evaluation, detailed neuropsychologic testing, brain imaging, and appropriate laboratory work. Participants received a clinical diagnosis of either normal cognition, MCI, or

demented based on an ADRC consensus diagnostic conference. Diagnoses were assigned based on the judgment of a neurologist (C.D.) and at least 2 neuropsychologists (S.T.F, D.M., and B.R.), all of whom have expertise in the diagnosis of dementia and MCI. A diagnosis of dementia was based on Diagnostic and Statistical Manual of Mental Disorders-IV criteria, which requires neuropsychologic impairments in multiple cognitive domains in addition to significant functional disability in basic or instrumental ADL. Although no strict psychometric cut-off scores were used to define cognitive impairment, cognitive impairment is clinically identified by ADRC neuropsychologists when a participant's performance falls approximately 1.5 standard deviations (SDs) below age-matched norms and in reference to their educational and socioeconomic background. Individuals with more mild cognitive changes not meeting the Diagnostic and Statistical Manual of Mental Disorders-IV criteria for a dementia were diagnosed with MCI. Individuals with MCI could either have (1) a single memory impairment (amnesic MCI), (2) an impairment in one nonmemory domain (single nonmemory MCI), or (3) subtle changes in multiple cognitive domains (multiple domain MCI). As with the diagnosis of dementia, these were clinical diagnoses made largely based on the neuropsychologic profile compared with age-matched norms in reference to educational and socioeconomic attainment. Individuals with MCI could not have impairments in basic ADL or be dependent on others in any instrumental ADL. A diagnosis of MCI did not require subjective memory complaints because this is a poor predictor of objective cognitive decline.¹¹ For the purposes of the clinical diagnosis, functional change was assessed using a variety of standardized instruments (eg, Clinical Dementia Rating Scale) but was also based on clinical interviews with the patient and an informant. Diagnostic decisions were made without knowledge of the primary outcome measure in this study.

A total of 105 participants were cognitively normal, 96 individuals had a diagnosis of MCI, and 233 were diagnosed with dementia. Of those participants diagnosed with dementia, 178 (76%) had possible or probable AD, 9 had vascular dementia, 8 had possible or probable dementia with Lewy bodies, 8 had frontotemporal dementia, 21 had a dementia of mixed etiology, and the remainder had other more infrequent dementia types. Of those individuals with a diagnosis of MCI, 43 (45%) individuals had a single memory impairment (amnesic MCI), 14 (16%) had a single nonmemory impairment, and 37 (39%) individuals had mild cognitive changes in more than one cognitive domain (multiple domain MCI).

Measurement of Everyday Function

An initial pool of items reflecting various functional abilities was generated by surveying existing functional instruments. To identify additional functional items 8 experts in the field of dementia representing diverse professional backgrounds (eg, neurologists, neuropsychologists, social workers, and nurses) generated additional items. Because we were particularly interested in functional changes that potentially occur in the prodrome of a dementia, the focus was on assessing rather high-level everyday skills. Items related to basic self-care activities, which are generally affected later in the course of a dementia, were not included. Items were generally organized according to relevant cognitive domains. Thus, functional impairments believed to reflect everyday tasks and abilities related to memory, language, visual spatial abilities, planning, organization, and divided attention comprised 6 different scales. Items that had less than 80% agreement among the expert raters as to which cognitively relevant domain they fell into (eg, everyday memory, everyday language, etc.) were excluded. A total of 74 items were included across the 6 domains: 15 items related to Everyday Memory, 14 items related to Everyday Language, 14 items related to Everyday Visuospatial skills, 13 items related to Everyday Planning, 9 items related to Everyday Organization, and 9 items related to Everyday Divided attention. Internal consistency or the degree to which items of each scale reliably measure the same dimension, as measured by Cronbach α , ranged from .92 to .95 for the different scales. Further, the proposed factor structure

of the instrument, representing the 6 cognitively relevant domains, is supported by the results of a confirmatory factor analysis (manuscript in preparation). Informants rated the participants' ability level for each item on a 4-point scale: 1=better or no change compared with 10 years earlier, 2=questionable or occasional problems, 3=consistently a little worse, 4=consistently much worse. A reference point of 10 years prior was chosen because (1) this format, in which the participant is compared with their own baseline, has been shown to be relatively insensitive to level of education,^{12–14} (2) it is likely to be more sensitive to detecting change than simply rating whether the patient is independent or dependent in each area, and (3) it was thought to provide enough of a time lapse that no deterioration in function would likely have been present at that time.

Statistical Analysis

We first examined potential differences in everyday functioning across the groups at the scale level for each of the 6 functional domains. Because the data violated the normality assumption of analysis of variance and *t* tests, nonparametric tests were used instead. The Kruskal-Wallis test was used to compare groups on each functional scale, followed by post-hoc pairwise comparisons. Statistical significance was set at a *P* value of 0.05 for these analyses. To examine the magnitude of any observed functional change in MCI, effect sizes were calculated as follows. First pooled SDs were calculated for each scale using all 3 groups. Effect sizes were then calculated for each scale for pairs of groups where effect size was defined as the difference in means divided by the pooled SD. For example, for Everyday Memory, effect size of the difference between Normals and MCI= (Everyday Memory mean of Normals–Everyday Memory mean of MCI)/pooled SD. Because of the exploratory nature of this study we were also interested in examining, at the individual item level, what specific functional abilities showed decline in the MCI group relative to the normal controls. Group differences in each item of the functional questionnaire were compared using the Wilcoxon rank sum test. Because of the large number of comparisons that were being made in this analysis a Bonferroni correction was applied. All statistical analyses were run using JMP, version 5.0 (SAS) statistical software.

RESULTS

Table 1 presents the mean age, education, sex, ethnicity and Mini Mental State Examination score for each group. The 3 groups did not significantly differ in terms of age or education level. As expected, the groups did differ in terms of their Mini Mental State Examination scores ($P<0.001$), with the dementia group showing the most cognitive impairment. The groups also differed in the percentage of whites in each group, with a higher percentage of whites in the MCI and demented groups than in the healthy controls.

Scale-level Analysis

We first examined difference in level of performance in each of the 6 functional domains across the 3 groups. There was a significant effect of group for all of the everyday domains assessed including Everyday Memory [χ^2 (2)=186.65, $P<0.0001$], Everyday Language scale [χ^2 (2)=155.61, $P<0.0001$], Everyday Visuosperception [χ^2 (2)=150.28, $P<0.0001$], Everyday Planning [χ^2 (2)=170.22, $P<0.0001$], Everyday Organization [χ^2 (2)=165.73, $P<0.0001$], and Everyday Divided attention [χ^2 (2)=146.02, $P<0.0001$]. Follow-up comparisons further revealed that all 3 participant groups were significantly different from one another, in all functional domains, with the normal controls showing the least amount of problems, the MCI group showing an intermediate level of impairment, and the demented group showing the most impairment (for comparisons between the normal and demented groups and the comparisons between the MCI and demented groups all P s <0.0001 ; P values for the comparisons between the MCI and Normal group ranged from <0.0001 to 0.001).

To estimate the magnitude of the differences in level of everyday functioning in each domain for the MCI group compared with the normal and demented groups, effect sizes were examined. Figure 1 presents the effect sizes for the difference in level of everyday functioning between MCI and normals, and the effect sizes related to the difference in level of functioning between MCI and the demented group. The MCI group performed at a level that is nearly one SD worse (higher scores are equated with more impaired function) than the normal group in the domain of Everyday Memory. The level of performance in the MCI group across the other 5 functional domains was about a half a SD below that of the healthy controls. When comparing the MCI group to the dementia group we found that the degree of functional impairment in dementia, relative to MCI is on the order of 1.5 to 2 SDs.

Item-level Analysis

Table 2 includes all of the items of the functional questionnaire that were significantly more impaired in the MCI group compared with healthy older adults (all P s<0.0006). Of those items that made up the Everyday Memory scale, the MCI group showed significantly more functional impairment compared with the cognitively normal controls on the majority of the items of this scale (11 of the 15 items, or 73%). Eight of the 13 Everyday Planning items (61%) and 5 of the 9 Everyday Organization items (55%) were rated by informants as being significantly worse in the MCI group relative to normal controls. Other domains were relatively less affected: 4 of 14 Everyday Language items (28%), none of the 14 Everyday Visuospatial items, 2 of 9 Everyday Divided Attention items (22%) differed significantly between MCI and normals. The demented group was significantly more impaired than both the normals and the MCI group on every one of the 74 scale items (data not included in Table 2).

DISCUSSION

Results of this study demonstrate that individuals with MCI display wide-ranging impairment in everyday functioning relative to cognitively normal older adults. Individuals with MCI demonstrated more functional problems relative to healthy elders in Everyday Memory, Everyday Language, Everyday Visuospatial skills, Everyday Planning, Everyday Organization, and Everyday Divided Attention. When examining the magnitude of the degree of impairment in the MCI group relative to normals, functional activities presumed to be heavily dependent on memory-related abilities were most consistently and robustly impaired compared with the other functional domains examined.

The item level analysis suggests that the MCI group was impaired relative to normals on the majority of individual items of the Everyday Memory scale, most of which require episodic memory for recently acquired information. The finding of prominent changes in Everyday Memory in MCI is not surprising, particularly given that a large portion of our group (45%) had MCI of the amnesic type. Furthermore, even in the multiple domain MCI group, memory impairment is frequently one of the neuropsychologic domains affected. Thus, the domains of everyday functioning that tend to be affected in MCI broadly correspond to the types of impairments that are seen on formal neuropsychologic testing. Further, the presence of changes in memory-dependent functional abilities in MCI are consistent with some of the most common neuroanatomic changes observed in MCI, including significant reductions in volume of the hippocampus and related structures.^{11,15–17} These structures are known to be important for the acquisition and retention of new memories, and help explain why not only neuropsychologic measures of memory but also functional skills dependent on memory are among the earliest signs of MCI and very mild dementia.

In addition to the memory items, a relatively high percentage of items falling in both the Everyday Planning and Everyday Organization domains (61% and 55%, respectively) were rated as more impaired in the MCI group as compared with normal controls. Items in these

domains tap high-level functional abilities that require foresight, planning, organization, reasoning and initiation among other complex mental skills. The finding that the MCI group had difficulty in these functional domains is also consistent with the growing body of neuropsychologic literature showing subtle executive deficits in MCI,^{18–20} and neuroimaging studies implicating dysfunction of frontal lobe regions.^{21,22}

Our results, showing significant functional changes particularly in the areas of everyday function heavily dependent on memory and high-level executive functions, are very similar to the conclusion drawn by Pernecky and colleagues.¹⁰ These researchers examined functional impairment across 18 complex ADL in individuals with MCI compared with age-matched normal controls and concluded that it was those ADL dependent on memory and complex reasoning that were most affected in MCI.

Consistent with clinical experience and diagnostic criteria, the degree of functional impairment in MCI is clearly substantially less than that in dementia. However, the effect sizes related to the differences in everyday function between MCI and healthy elders were in the magnitude of one SD in the Everyday Memory domain, and about a half of a SD in the other domains. Such findings are similar to the effect sizes that can be calculated from the study by Pernecky and colleagues¹⁰ cited above. This degree of functional impairment is unlikely to be trivial. Although no absolute metric for clinical significance is available, the size of these differences and the number of specific items or tasks in which MCI differed significantly from normals suggests that MCI may frequently confer a consequential extent of diminished function.

Admittedly, although functional skills in this study were parceled into cognitively relevant domains based on the judgment of expert raters, most everyday tasks depend on multiple neuropsychologic abilities. That is, we do not wish to present an oversimplified view that any functional skill is strictly dependent on just one cognitive ability. However, as other researchers have noted,^{23,24} there are likely to be everyday activities that depend predominantly on a particular cognitive ability. The goal of dividing functional skills into cognitively relevant domains was to gain a better understanding of the nature or types of functional difficulties present in individuals with MCI. Our findings suggest that it is those everyday tasks that require the ability to learn and retain new information, and higher-level executive skills that are affected in individuals with MCI.

MCI is known to be a heterogeneous group. Various subtypes of MCI have been proposed based on the pattern of neuropsychologic impairments present, and it has been suggested that neuropsychologically distinct MCI subtypes may mark incipient forms of different dementias, such as vascular dementia and frontotemporal lobe dementias. It may be that in such distinct subtypes, different patterns of functional impairment will predominate. The present sample of individuals with MCI did not include sufficient numbers of such cases to examine this idea but will be the focus of future research.

The majority of participants in this study diagnosed with either MCI or dementia were attending a memory disorders clinic. The characteristics of individuals with MCI who are being seen in a clinical setting can differ in many ways from community recruited individuals diagnosed with MCI who were not actively seeking clinical evaluation.^{7,10} Thus, the results of our study may not generalize to community-based MCI samples and should be the focus of future research.

The detection of functional changes in individuals with MCI is important for several reasons. First, the current study suggests that individuals with MCI are more likely than healthy elders to have functional changes across a wide range of domains, with the most prominent deficits occurring in areas of function that depend heavily on memory. Thus, the assessment of functional impairments may help differentiate individuals with MCI from normal older adults.

Unlike neuropsychologic tests that are influenced by educational and ethnic background, there is evidence that informant-rated measures of everyday function can be less influenced by these types of variables^{12–14} and therefore may increase our sensitivity in detecting MCI over and above the information that is provided by neuropsychologic measures. Further, a number of studies have now shown that individuals with MCI who had difficulties in certain aspects of everyday function at baseline are more likely to go on to develop dementia at follow-up.^{5,25, 26} This suggests that the early detection of functional changes associated with mild cognitive changes may contribute to better identifying those who are at greater risk for further decline. Finally, a better understanding of the nature of functional deficits in MCI will help guide the development and implementation of targeted interventions to improve everyday function or prolong independence.

The transition between normal aging, MCI, and dementia is likely to be a continuous one¹⁰ and therefore where the lines are drawn between these 3 states continues to be a matter of debate, in part because of the lack of objective and standard definitions of what constitutes functional impairment and disability. Clearly some degree of functional change can be detected in MCI, albeit significantly less than that of dementia. Further refinement in the guidelines as to the extent of functional change in MCI versus dementia seems warranted.

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References

1. Gauthier L, Gauthier S. Assessment of functional changes in Alzheimer's disease. *Neuroepidemiology* 1990;9:183–188. [PubMed: 2215842]
2. Gauthier S, Panisset M, Nalbantoglu J, et al. Alzheimer's disease: current knowledge, management and research. *Can Med Assoc J* 1997;157:1047–1052. [PubMed: 9347775]
3. Petersen RC, Smith GE, Waring SC, et al. Mild cognitive impairment. Clinical characterization and outcome. *Arch Neurol* 1999;56:303–308. [PubMed: 10190820]
4. Winblad B, Palmer KO, Kivipelto M, et al. Mild cognitive impairment-beyond controversies, towards a consensus: report of the International Working Group on Mild Cognitive Impairment. *J Intern Med* 2004;256:240–246. [PubMed: 15324367]
5. Artero S, Touchon J, Ritchie K. Disability and mild cognitive impairment: a longitudinal population-based study. *Int J Geriatr Psychiatry* 2001;16:1092–1097. [PubMed: 11746656]
6. Tabert MH, Albert SM, Borukhova-Milov L, et al. Functional deficits in patients with mild cognitive impairment. *Neurology* 2002;58:758–764. [PubMed: 11889240]
7. Ritchie K, Artero S, Touchon J. Classification criteria for mild cognitive impairment: a population-based study. *Neurology* 2001;56:37–42. [PubMed: 11148233]
8. Sclan SG, Reisber B. Functional assessment (FAST) in Alzheimer's disease; reliability, validity, and ordinality. *Int Psychogeriatr* 1992;4:55–69. [PubMed: 1504288]
9. Suurmeijer T, Doeglas DM, Mourm T, et al. The Groningen Activity Restriction Scale for measuring disability: its utility in international comparison. *Am J Public Health* 1994;84:1270–1273. [PubMed: 8059884]
10. Perneczky R, Pohl C, Sorg C, et al. Impairment of activities of daily living requiring memory or complex reasoning as part of the MCI syndrome. *Int J Geriatr Psychiatry* 2006;35:240–245.
11. Jack C, Petersen R, Xu Y, et al. Medial temporal atrophy on MRI in normal aging and very mild Alzheimer's disease. *Neurology* 1997;49:786–794. [PubMed: 9305341]
12. Del-Ser T, Morales JM, Barguero MS, et al. Application of the Spanish version of the "Informant Questionnaire on Cognitive Decline in the Elderly" in the clinical assessment of dementia. *Alzheimer Dis Assoc Disord* 1997;11:3–8. [PubMed: 9071438]

13. Morales J, Bermejo F, Romero M, et al. Screening of dementia in community-dwelling elderly through informant report. *J Geriatr Psychiatry* 1997;12:808–816.
14. Farias ST, Mungas D, Reed BR, et al. Everyday functioning in relation to cognitive functioning and neuroimaging in community- dwelling Hispanic and non-Hispanic older adults. *J Int Neuropsychol Soc* 2004;10:342–354. [PubMed: 15147592]
15. Du A, Schu N, Amend D, et al. Magnetic resonance imaging of the entorhinal cortex and hippocampus in mild cognitive impairment and Alzheimer's disease. *J Neurol Neurosurg Psychiatry* 2001;71:441–447. [PubMed: 11561025]
16. Marquis S, Moore M, Howieson D, et al. Independent predictors of cognitive decline in healthy elderly person. *Arch Neurol* 2002;59:601–606. [PubMed: 11939895]
17. Wolf H, Hensel A, Kruggel F, et al. Structural correlates of mild cognitive impairment. *Neurobiol Aging* 2004;25:913–924. [PubMed: 15212845]
18. Arnaiz E, Almkvist O, Ivnik R, et al. Mild cognitive impairment: a cross-national comparison. *J Neurol Neurosurg Psychiatry* 2004;75:1275–1280. [PubMed: 15314114]
19. Nagahama Y, Okina T, Suzuki N, et al. Factor structure of a modified version of the Wisconsin Card Sorting Test: an analysis of executive deficits in Alzheimer's disease and mild cognitive impairment. *Dement Geriatr Cogn Disord* 2003;16:103–112. [PubMed: 12784035]
20. Davie J, Azuma T, Goldinger S, et al. Sensitivity to expectancy violations in healthy aging and mild cognitive impairment. *Neuropsychology* 2004;18:269–275. [PubMed: 15099149]
21. Rosano C, Aizenstein H, Cochran J, et al. Event-related functional magnetic resonance imaging investigation of executive control in very old individuals with mild cognitive impairment. *Biol Psychiatry* 2005;57:761–767. [PubMed: 15820233]
22. Nordahl C, Rananath C, DeCarli C, et al. Different mechanisms of episodic memory failure in mild cognitive impairment. *Neuropsychologia* 2005;43:1688–1697. [PubMed: 16009250]
23. Williams, MJ. *A Practical Model of Everyday Assessment*. Delray: GR Press/St Lucie Press; 1996.
24. Chaytor N, Schmitter-Edgecombe M. The ecological validity of neuropsychological tests: a review of the literature on everyday cognitive skills. *Neuropsychol Rev* 2003;13:181–197. [PubMed: 15000225]
25. Barberger-Gateau P, Fabrigoule C, Helmer C, et al. Functional impairment in instrumental activities of daily living: an early clinical sign of dementia? *J Am Geriatr Soc* 1999;47:456–462. [PubMed: 10203122]
26. Daly E, Zaitchik D, Copeland M, et al. Predicting conversion to Alzheimer disease using standardized clinical information. *Arch Neurol* 2000;57:675–680. [PubMed: 10815133]

Error bars correspond to the standard errors of the effect size estimates

FIGURE 1.
Magnitude of difference in levels of everyday function as reflected by effect sizes.

TABLE 1

Demographic Information

	Normal (N=105) M (SD)	MCI (N=96) M (SD)	Dementia (N=233) M (SD)	<i>P</i>
Age	77.8 (9.1)	74.7 (9.5)	76.9 (7.7)	0.683
Education	14.6 (3.1)	15.0 (3.5)	13.5 (3.7)	0.088
MMSE	29.1 (1.2)	25.0 (6.5)	20.3 (6.0)	<0.001
Sex (% female)	53.5%	49.4%	59.2%	0.289
Ethnicity (% white)	53.7%	67.1%	78.7%	<0.0001

Note: Analysis of variance was used to compare differences across groups for continuous variables and χ^2 for categorical variables.

MMSE indicates Mini Mental State Examination.

TABLE 2

Items That Were Significantly Worse in the MCI Group (N = 96) Relative to Normal Controls (N = 105), Along With the Percentage of the Samples Impaired on Each Item Across the 3 Groups

	% of Normal Sample Impaired	% of MCI Sample Impaired	% of Demented Sample Impaired
Everyday Memory			
Remembering a few shopping items without a list	21.1	51.7	86.4
Remembering the names of new people	42.4	59.5	86.9
Remembering things that happened recently (such as recent outings, events in the news)	15.8	22.3	86.1
Recalling conversations a few days later	23.3	59.4	89.4
Remembering where she/he has placed objects	44.3	55.1	93.4
Remembering movies or TV shows he/she has seen before	16.9	42.5	77.7
Repeating stories and/or questions	18.3	57.2	86.5
Remembering the current date or day of the week	3.0	38.1	85.2
Remembering he/she has already told someone something	14.6	53.9	85.9
Remembering things about family and friends (such as addresses, birth dates, jobs)	7.1	35.3	76.7
Remembering appointments, meetings, or engagements	7.1	44.5	83.2
Everyday Language			
Following a story in a book	6.2	21.0	65.7
Describing a program he/she has watched on TV	2.0	35.3	69.8
Understanding spoken directions or instructions	12.1	32.1	65.3
Understanding what he/she has read	4.1	14.8	55.3
Everyday Planning			
Planning a big dinner, social event, birthday party, or club meeting	9.9	39.4	84.8
The ability to develop a good strategy in a game of skill (ie, card or board game)	6.4	30.1	82.6
Planning a weekly meal schedule ahead of time	4.1	25.6	87.4
Planning the sequence of stops on a shopping trip	6.4	21.5	79.9
Planning recreational outings such as family visits, golfing, picnics, weekend getaways	5.6	32.2	77.0
Developing a schedule in advance of anticipated events	4.4	17.8	71.8
Thinking ahead	3.1	29.4	75.6
Thinking things through before acting	6.4	24.4	75.6
Everyday Organization			
Assembling business, tax, or financial records	12.9	45.0	87.7
Balancing the checkbook without error	8.1	41.1	85.6
Keeping financial records organized	13.1	42.7	85.6
Prioritizing tasks by importance	13.8	31.6	80.2

	% of Normal Sample Impaired	% of MCI Sample Impaired	% of Demented Sample Impaired
Keeping mail and papers organized	4.3	20.1	62.7
Everyday Divided Attention			
The ability to do 2 things at once	20.6	47.6	84.2
Returning to a task after being interrupted	13.0	43.5	73.6

Impaired here is defined as a rating of either 3=consistently a little worse, or 4=consistently much worse on each item.

For all items listed, the MCI group was statistically more impaired than normal controls with *P* values ranging from <0.0001 to <0.0006 (based on Wilcoxon/Kruskal-Wallis Tests).