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Older Adults in the SeniorWISE Study At Risk for Mild Cognitive Impairment

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Abstract

As part of a larger clinical trial, SeniorWISE™ (Wisdom Is Simply Exploration), this study provides baseline affective, cognitive, and functional ability data and reports on the likely incidence of mild cognitive impairment (MCI) in a triethnic community sample of older adults ($N = 265$). Seventy-eight individuals had memory complaints, whereas 105 had none. Of the complainants, 32 had normal memory function and 46 had poor memory performance. Among those without memory complaints, 42 had no memory impairment and 63 had poor memory performance. Forty-six individuals (17%) met the criteria of poor everyday memory functioning and memory complaints whereas 81 (31%) would be considered to be at risk based on other MCI criteria. This pattern of results suggests that those with declining memory are less aware of their deficits in activities of daily living than their actual performance would suggest are occurring.

Older adults are at greater risk than others for developing mild cognitive impairment (MCI), with memory loss being the earliest manifestation. An MCI diagnosis includes the five criteria of having (1) cognitive complaints not normal for the age of the individual, (2) no dementia, (3) cognitive decline, (4) memory impairment, and (5) essentially normal functional activities (Winblad et al., 2004). This vulnerability to cognitive impairment may be difficult to identify because cognitive decline is often undetectable in preclinical dementia. Consequently, individuals maintain their performance within normal limits on screening measures of cognitive and functional ability (Geerlings, Jonker, Bouter, Ader, & Schmand, 1999; Sliwinski, Lipton, Buschke, & Stewart, 1996; Ware, 1994; Ware & Sherbourne, 1992).

Minority elders may be at an increased risk of developing Alzheimer's disease (AD) and cognitive impairment because they are less likely to have completed high school and are three times more likely to be poor (Berkman et al., 1993; Schmand, Smit, Geerlings, & Lindeboom, 1997). In one study, although African-American elders reported poor memory and forgetfulness, they had fewer complaints about memory loss than their Caucasian counterparts (Smith, Petersen, Ivnik, Malec, & Tangalos, 1996). However, the actual measurable decline was far worse. Although the ability to differentiate MCI from other forms of cognitive impairment has expanded the classification of an individual's function, the criteria were derived from clinical practice and will be strengthened with empirical validation and testing in mixed and diverse samples.

Older adults at risk for memory loss have deficits with both affective and cognitive functions all operating to increase their vulnerability for declining memory performance. Burt, Zembar, and Niederehe (1995) found a significant association between depression and memory impairment. In a population-based cohort of community elderly persons, researchers validated

that depressive symptoms portend future cognitive losses among persons with moderate cognitive impairments (Backman, Hassing, Forsell, & Viitanen, 1996). Royall (1999) found that frontal deficits, manifested as executive dysfunction, rather than mood disturbance explained the disability of depressed patients. Wetherell, Reynolds, Gatz, and Pedersen (2002) concluded that higher state anxiety was associated with poorer performance on several cognitive tests. Consequently, it is important to include affective measures in any assessment for MCI. Based on memory performance, this study reports on the application and classification of the five clinical criteria of MCI using valid and reliable psychometric measures in a triethnic sample of older adults. Measures of depression and anxiety are also included so that the relationship of affect and memory can be explored within this population.

MATERIALS AND METHODS

The institutional review board of the university approved the study before data collection began. All participants who enrolled in the SeniorWISE (Wisdom Is Simply Exploration) study, a National Institute on Aging-funded randomized clinical trial, were knowledgeable that they would be randomized to either memory improvement or health promotion classes. The eligibility interview required that the participants were aged 65 years or older, spoke or understood and read English, lived independently in the community, had reliable transportation, and agreed to come for an initial screening meeting. Study participants were drawn from the greater Austin, Texas, area through print and TV media as well as direct recruitment at city-run senior activity centers, churches, health fairs, and festivals. Our aim was to have a subject pool that matched the demographic profile of Austin, so African-American, Hispanic, and Caucasian subjects were recruited for the study, which was conducted entirely in English.

Screening

At the screening interview, prospective participants completed background checklists, were reassessed to determine that they met study criteria, and were administered the following measures of intellectual and executive functioning: the Mini Mental Status Examination (MMSE; Folstein, Folstein, & McHugh, 1975; Leveille et al., 1998), the Controlled Oral Word Association Test (COWAT) from the Multilingual Aphasia Examination (MAE; Sumerall, Timmons, James, Ewing, & Oehlert, 1997), and the Trail-Making Test (Reitan, 1958). Participants were required to achieve a score of 23 or higher on the MMSE to be eligible for the study. Those participants who passed the other eligibility tests but had a score just below the cutoff on the MMSE were reviewed on a case-to-case basis for inclusion into the study. Usually, a score between 18 and 22 indicates MCI and that between 0 and 17 indicates severe cognitive impairment (Pearson, Cherrier, & Teri, 1989; Tombaugh & McIntyre, 1992). However, Phillips, Chu, Morris, and Hawes (1993) determined in residents of nursing homes that the average MMSE score for those cognitively impaired was 9.97 whereas that for those cognitively intact was 21.34. Eight individuals with MMSE scores between 20 and 23 from an intact group of Hispanic elders at one senior center site were admitted into the study.

Executive function was operationalized with measures of organizational strategy and cognitive flexibility. The COWAT (Sumerall et al., 1997) was used to measure organizational strategy. The COWAT is part of the MAE. It required corrections for both age and education. The Trail-Making Test (Parts A and B; Reitan, 1958) was used to evaluate executive processes. Participants were required to pass Trails A and/or Trails B at or above the 10th percentile for their age group for inclusion into this study. Cognitive flexibility was measured using the Trail-Making Test Part B. In Part B, randomly arrayed numbers and letters must be connected in an ascending alphanumeric sequence (1-A, 2-B, 3-C, and so on). After passing the prescreening

and screening batteries, participants underwent the baseline testing battery. In this study, both self-report and performance data were collected.

Sample

Data were available for 265 subjects, 205 (81%) women and 60 (19%) men. The typical participant was 75 years old with 14 years of education. Ethnicity data were available for 259 individuals, including Caucasians ($n = 206$), African Americans ($n = 29$), and Hispanic Americans ($n = 24$). Eighty-two individuals were married (32%), 49 were divorced (19%), 119 were widowed (46%), and 7 (3%) were never married (Table 1). Two individuals were missing data on marital status. The participants' MMSE scores ranged from 20 to 30 ($M = 28.34$, $SD = 1.69$). The participants' years of schooling ranged from 0 to 22 years ($M = 13.69$, $SD = 3.93$), and their ages ranged from 65 to 94 years ($M = 74.67$, $SD = 6.00$).

Health

Health status was operationalized by the Health Scale, a subscale of the Multilevel Assessment Instrument (Lawton, Moss, Fulcomer, & Kleban, 1982). Subjects rated the quality of their health, with higher scores indicating better health. Total scores of the four-item tool range from 4 to 13. Anchors are “better” to “not so good” and “excellent” to “poor.” Lawton et al. reported an α coefficient of .76 and a test–retest correlation of .92.

Anxiety

The State–Trait Anxiety Inventory (STAI; Spielberger, Gorsuch, & Lushene, 1970) was used to measure anxiety in test participants. The STAI was developed for the expressed purpose of detecting anxiety in adults (Spielberger et al., 1970) and to differentiate between the temporary condition of “state anxiety” and the chronic concept of “trait anxiety” (Koenders et al., 1993).

Depression

Participants were administered the Center for Epidemiological Studies Depression Scale (CES-D), a measure of depression designed for research (Radloff & Teri, 1986). Somatic complaints are emphasized on this measure, to which individuals respond on a four-point Likert scale.

Memory Complaints

A revised Metamemory in Adulthood Questionnaire (MIA) change scale was utilized based on a factor analysis of 690 older adults conducted by the investigators. The new complaint subscale consists of 21 items and determines individuals' perception of their memory abilities as generally stable or subject to long-term decline. A higher average item score (>2.5) translates to greater stability and fewer complaints about a failing memory (Dixon, Hultsch, & Hertzog, 1988).

Memory Performance

The Rivermead Everyday Behavioral Memory Test (RBMT) was used to assess memory performance. The RBMT is designed to reflect everyday memory and is a bridge between laboratory-based measures of memory and assessments obtained by questionnaire and observation (Cockburn & Smith, 1989, 1991, 1994; Wilson, Cockburn, Baddeley, & Hiorns, 1989). The developers of the RBMT provided cutoff points for four groups of memory function: normal, 22–24; poor memory, 17–21; moderately impaired, 10–16; and severely impaired, 0–9. Because many of the patients in the instrument development sample fell below the fifth percentile of normal memory performance, Wilson et al. created the four categories of memory

function based on their assessment of the relationship between RBMT scores and everyday performance.

Performance-Based Instrumental Activities of Daily Living

The Direct Assessment of Functional Status (DAFS) is a performance-based measure that contains 85 items (Loewenstein et al., 1989; Loewenstein et al., 1992). The DAFS scale measures a broad spectrum of behaviors within each of the seven functional domains and is administered in an outpatient setting. A modified version of the DAFS had been tested with community elders and is sensitive to level of cognitive function and dementia (Green et al., 2002; Mahurin et al., 1991; Rankin & Keefover, 1998). A modified version of the DAFS was used in this study to account for lack of kitchen and bathroom facilities in the evaluation rooms at the study sites. The domains measured from the DAFS in this study included time orientation, communication abilities, transportation, financial skills, and shopping skills. A fifth domain, medication knowledge, was added for this study. Direct Assessment of Functional Status scores range from 0 to 90.

Self-Reported Instrumental Activities of Daily Living

Self-reported function was measured with the Instrumental Activities of Daily Living (IADL) Scale (Lawton, 1988; Lawton & Brody, 1969; Lawton et al., 1982), which is a self-report measure of IADL items that represent complex skills requiring combinations of tasks to be completed. The instrument has a total of nine domains: using the telephone, transportation, going shopping, preparing meals, cleaning the house, handyman work, doing the laundry, taking medications, and managing money. Three response formats are available for each question.

Data Analysis

Two data analytic sections are reported. First, because memory performance is crucial to an MCI diagnosis, the sample was divided into four Rivermead performance groups: normal ($n = 75$), poor memory ($n = 124$), moderately impaired ($n = 59$), and severely impaired ($n = 7$). Next, descriptive statistics including frequencies, percentages, means, standard deviations, and ranges were calculated for demographics; executive function, anxiety, depression, health, functional ability (self-report and performance), and metamemory are reported for three memory performance groups. Univariate analysis of variance was then used to assess differences among the three Rivermead categories. The severely impaired group was dropped from further analyses because the sample size was so small that subgroup analyses could not be made.

The second analyses consisted of two parts and classified the participants by the five MCI criteria to determine which individuals fit the five criteria. The criteria were having (1) cognitive decline, (2) memory impairment, (3) no dementia, (4) essentially normal functional activities, and (5) cognitive complaints not normal for the age of the individual (Winblad et al., 2004). The five measures included the MIA Complaint Subscale (≤ 2.5), the MMSE (> 23), Trails B ($> 10\%$), DAFS ($< 10\%$), and the RBMT Standard Profile Score ($17 \leq \text{SPS} \leq 21$). These findings are shown in Tables 2–4.

RESULTS

Group Differences by Memory Performance (RBMT Classifications)

Racial and ethnic data were missing for six individuals (Table 5). There were significant group differences ($P < .01$) on age, education, and cognitive function (Table 2). Those individuals

with normal memory function were younger, had longer years of schooling, and had higher scores on cognitive function (MMSE scores; Butler et al., 1996; Gladsjo et al., 1999).

The first analysis consisted of determining the frequency of depressive symptoms in the memory performance groups. Of the 75 individuals with normal memory performance, 8 (11%) qualified; of the 124 individuals with poor memory performance, 22 (18%) qualified; and of the 66 individuals with moderate and severe memory impairments, 18 (27%) had depressive symptoms. Eighteen percent of the sample had CES-D scores higher than the cutoff (≥ 16), indicating that they had increased symptoms of depression.

On all three measures of executive function, there were significant group differences on Trails A and cognitive flexibility (Trails B) and on organizational strategy (COWAT). The executive function scores worsened as scores on memory performance declined (Table 3). There were significant ($P < .05$) group differences in memory complaints. Individuals in the moderately impaired memory group perceived their memories as unstable and had greater memory complaints than those in the normal and poor groups.

On self-reported health, there was no group difference (Table 4). There was no group difference on self-reported IADL ($M = 26.08, 25.69, 25.42$). However, on the DAFS, the performance-based IADL measure, there were significant group differences ($M = 84.67, 82.38, 79.30$); the lower the memory performance, the poorer the DAFS score (Table 4).

Mild Cognitive Impairment Criteria

All participants in the SeniorWISE sample had no cognitive impairment or dementia. However, based on the RBMT clinical criteria, there were four memory performance groups: normal, poor, moderately impaired, and severely impaired (this fourth group was dropped from further analysis). The five MCI criteria of having cognitive decline, memory impairment, no dementia, essentially normal functional activities, and cognitive complaints not normal for the age of the individual proposed by the International Working Group on MCI (Winblad et al., 2004) were operationalized to the study variables.

In the first analysis, the percentage of memory complaints was calculated based on memory performance group membership. Of the 75 individuals with normal memory performance, 32 (43%) had complaints; of the 124 individuals with poor memory performance, 54 (44%) had complaints; and of the 66 individuals with moderate and severe memory impairments, 37 (56%) had complaints. One hundred twenty-three individuals (46%) had memory complaints. Winblad et al. (2004) classified individuals with only memory impairment as having a diagnosis of amnesic MCI and/or amnesic multidomain MCI.

The next analysis consisted of determining the frequency of individuals in the memory performance groups who had memory complaints and deficits in the three additional criteria that included having (1) no dementia, (2) cognitive decline, and (3) essentially normal functional activities. Of those 75 individuals with normal memory performance, 1 (0.01%) individual was included; of the 124 individuals with poor memory performance, 14 (11%) were included; and of the 66 individuals with moderate and severe memory impairments, 31 (47%) had additional problems. Therefore, of the 265 participants, 46 (17%) had problems in other domains besides memory. Winblad et al. (2004) classified individuals with these characteristics as having nonamnesic multidomain MCI or single-domain MCI.

In summary, there were 169 (64%) individuals with measurable problems in one or more domains of everyday function. If those with poor memory function were eliminated, then 46 (17%) individuals would be of serious concern for further neuropsychological referral and potentially meet the criteria for MCI.

DISCUSSION

This study demonstrates to psychiatric nurses that memory concerns are not necessarily a component of normal aging and that neither is it possible to accurately evaluate this memory performance without valid and reliable instruments. The older adults in this sample had wide variations in their everyday memory performance. If mild memory problems are actually early signs of AD, then the issue of memory loss with normal aging, in the absence of incipient AD, becomes a new area of inquiry. Before making a diagnosis that has lasting implications, all the clinical evidence need to be evaluated. An MCI diagnosis is evolving, and the addition of psychometric measures adds empirical depth to the five existing clinical criteria.

An MCI diagnosis includes the five criteria of having (1) cognitive complaints not normal for the age of the individual, (2) no dementia, (3) cognitive decline, (4) memory impairment, and (5) essentially normal functional activities (Winblad et al., 2004). Given these specific diagnostic criteria and without psychometric measures available to measure performance, clinicians would be unable to differentiate these symptoms from normal aging. These findings contribute to new clinical knowledge of psychiatric and mental health nurses' understanding of the empirical basis for determining an MCI diagnosis. In addition, these research findings assist with translating research into the clinical setting.

Memory performance scores classified the participants into four distinct memory function groups; 75 individuals or 29% of the total sample were in the normal group. Almost half of the sample (48%) was classified into the poor memory function group. Memory performance decreased considerably for the African-American and Hispanic-American participants. Caucasians were overrepresented (33.5%) in the normal memory group; however, 10.7% were African American and 5.6% were Hispanic. The poor memory performance group included Caucasians (49%), Blacks (42.9%), and Hispanics (50%). Conversely, in the moderately impaired group, 17.5% were Caucasian whereas 46.4% were Black and 44.4% were Hispanic. Although all three racial groups were almost equivalent in their representation of poor memory, clearly, the Hispanics and Blacks were almost three times more likely to be classified, based on RBMT scores, as having impaired memory performance.

Clinical Evaluation

The general criteria for MCI include those individuals with and without memory impairment and/or memory complaints. The 46 participants or 17% of the sample who clearly had problematic areas of function besides memory impairment would benefit from a referral for further diagnosis and evaluation. However, the group of 63 essentially normal functioning individuals or 24% of the sample who had no memory complaint but had poor memory performance would be considered to be at risk and would also qualify for further neuropsychological evaluation. If a participant's memory is significantly lower than would be expected for his or her age, then the clinician must determine whether other cognitive domains are also impaired (e.g., language, executive function, and visuospatial skills). If the nonmemory domains are intact, then the person would be classified as having amnesic MCI. If there are mild deficits in a number of different domains, then the person would have multidomain MCI, with or without a memory component (Winblad et al., 2004).

An individual's subjective evaluation of his or her decreased function is a cause for concern and emotional pain. In this study, as memory performance decreased, symptoms of both anxiety and depression increased. The determination of an individual's affective state provides further demonstration of this deterioration. On all three measures of affective functioning, state and trait anxiety and depression, as memory performance became more impaired, affective states of anxiety and depression worsened. Depression has been identified as both a predictor of treatment non-compliance and memory impairment; therefore, the findings from this study

have implications for day-to-day adherence to medical treatments. In a previous study, McDougall (2004) found a higher incidence of depression in African-American participants. Depression is a serious concern in older adults, and screening is an effective option for recognizing individuals requiring more in-depth evaluation (Pignone et al., 2002). In addition, older adults have more difficulty following complex treatment regimens when depressed (DiMatteo, Lepper, & Croghan, 2000; Lyness et al., 1994).

Instrumental activities are cognitively demanding and become more difficult as individuals' age and memory problems become more compromised (Berkman et al., 1993; Carlson et al., 1999; Dugbartey et al., 1999; Einstein et al., 1997; Fratiglioni et al., 1997; Greiner et al., 1996; Head et al., 2002; Laukanen, Kauppinen, Era, & Heikkinen, 1993; Loewenstein et al., 1989, 1992; Mantyla, 1994; West et al., 1992). This study is unique in that two measures of instrumental activities (self-report and performance based) were evaluated. On self-reported functioning, there was no difference perceived by the older adults in the study. However, scores on the DAFS, the performance measure of function, revealed significant group differences. Individuals with poorer memory function performed significantly worse on the DAFS. This pattern of results suggests that individuals with declining memory function may be less aware of the deficits in activities of daily living that their actual performance would suggest are occurring.

The prevalence of memory impairment in the older adult population is often tolerated and expected. Primary care physicians and managed care organizations identified six common clinical problems to be impaired memory, anxiety, depression, fatigue, high cholesterol, and low back pain (Meyer, Ladenson, Scharfstein, Danese, & Powe, 2000; Liu et al., 1997). The annual cost estimate for memory impairment in primary care is \$569 ± \$243 per person, the second most expensive cost following low back pain. Early identification and referral will potentially improve outcomes for adults with questionable memory functioning.

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Table 1
Frequency and Percentages of Demographic Variables by RBMT Profile Scores

Variable	Normal (<i>n</i> = 75)		Poor (<i>n</i> = 124)		Moderately impaired (<i>n</i> = 59)		<i>P</i>
	<i>f</i>	%	<i>f</i>	%	<i>f</i>	%	
Sex							
Female	58	29.1	95	47.7	46	23.1	<i>ns</i>
Male	17	28.8	29	49.2	13	22.0	<i>ns</i>
Ethnicity							
Hispanic	6	15.0	17	42.5	17	42.5	.003
Non-Hispanic	68	31.3	107	49.3	42	19.4	.003
Marital status							
Married	31	37.8	32	39.0	19	23.2	.009
Never married	5	71.4	2	28.6	0	0.0	.009
Divorced	15	30.6	27	55.1	7	14.3	.009
Widowed	24	20.2	62	52.1	33	27.7	.009

Table 2
Means and Standard Deviations of Demographic Variables by RBMT Profile Scores

Variable	Normal (<i>n</i> = 75)		Poor (<i>n</i> = 124)		Moderately impaired (<i>n</i> = 59)		<i>P</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
Age (years)	72.52	5.57	75.56	5.59	75.88	6.49	.000
Education (years)	14.99	3.16	13.72	3.76	12.21	3.65	.000
Cognition*	28.84	1.39	28.05	1.88	26.73	2.47	.000

* MMSE.

Table 3
Means and Standard Deviations of Cognitive and Memory Variables by RBMT Profile Scores

Variable	Normal (<i>n</i> = 75)		Poor (<i>n</i> = 124)		Moderately impaired (<i>n</i> = 59)		<i>P</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
Trails A	29.48	9.37	43.42	29.56	64.90	49.30	.000
Trails B	89.80	40.40	121.64	73.88	187.81	115.05	.000
COWAT	44.33	10.65	41.06	11.63	37.29	10.31	.001
Complaint *	2.84	0.66	2.77	0.61	2.51	0.65	.008

* MIA Complaint Scale.

Table 4
Means and Standard Deviations of Health and Affective Variables by RBMT Profile Scores

Variable	Normal (<i>n</i> = 75)		Poor (<i>n</i> = 124)		Moderately impaired (<i>n</i> = 59)		<i>P</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
Health *	10.29	1.74	9.78	1.75	9.84	1.74	<i>ns</i>
Depression†	7.16	5.67	9.07	6.18	11.78	7.51	.000
State anxiety	26.96	6.27	29.66	8.27	32.02	9.09	.001
Trait anxiety	29.64	7.17	32.09	9.26	34.45	9.20	.007
IADL	25.93	1.02	25.67	1.14	25.53	1.08	<i>ns</i>
DAFS	84.59	2.79	82.33	4.43	79.32	5.53	.000

* Self-Reported Health.

† CES-D.

Table 5
Frequencies and Percentages of Racial Groups by RBMT Profile Scores

Race	Normal (<i>n</i> = 73)		Poor (<i>n</i> = 122)		Moderately impaired (<i>n</i> = 57)		<i>P</i>
	<i>f</i>	%	<i>f</i>	%	<i>f</i>	%	
White	69	32	101	49.0	36	17.5	.000
Black	3	13	12	42.9	13	46.4	.000
Other	1	5.6	9	50.0	8	44.4	.000
Total	73		122		57		