Memory Performance, Health Literacy, and Instrumental Activities of Daily Living of Community Residing Older Adults

Graham J. McDougall Jr • Michael Mackert • Heather Becker

**Background:** Health literacy is associated with cognitive function across multiple domains in older adults, and these older adults may face special memory and cognitive challenges that can limit their health literacy and, in turn, their ability to live independently.

**Objectives:** The aim of this study was to evaluate if an association existed among health literacy, memory performance, and performance-based functional ability in community-residing older adults.

**Methods:** Forty-five adults participated in this study. Designed to reflect everyday memory, the Rivermead Behavioral Memory Test (RBMT) bridges laboratory-based measures of memory and assessments obtained by self-report and observation. The RBMT classifies individuals into four categories of memory performance: normal, poor, mildly impaired, and severely impaired. The participants were recruited in the two categories of normal (≥22) or impaired (≤16) category on the RBMT. The sample consisted of 14 who were in the impaired category and 31 in the normal group. Their average age was 77.11 years, and their average number of years of education was 15.33 years. Health literacy scores measured with the Rapid Estimate of Adult Literacy in Medicine.

**Results:** Health literacy scores were high (M = 65.09, SD = 2.80). Thirty-four participants or 76% of the sample scored a 66 out of a possible score of 80. Pearson correlations were calculated for the study variables. Health literacy scores with education and cognition (.30), memory performance groups (normal vs. poor, .25), and performance-based instrumental activities (.50) were associated significantly.

**Discussion:** The development of a broader assortment of health literacy instruments would improve the ability of researchers to both compare studies and build on the knowledge and results of others.

**Key Words:** health literacy • memory performance • older adults • performance-based instrumental activities

---

Health researchers and professionals are increasingly focusing on how health literacy is related to patient outcomes (Peterson et al., 2011; Yamashita & Kart, 2011). Among certain groups, such as older people, minority populations, and recent immigrants with limited English skills, low health literacy is a more widespread problem (Nielsen-Bohlman, Panzer, & Kindig, 2004). Health care costs can be four times higher for individuals with low literacy skills than for those with sufficient health literacy, attributable mainly to higher rates of hospitalization and...
Memory, Health Literacy, and Activities of Daily Living

Memory performance often occurs in individuals of ages 65 years (Salthouse, 2003), and this can contribute to depression and loss of independence (Mendes de Leon, Gold, Glass, Kaplan, & George, 2001; Smith, Petersen, Ivnik, Malec, & Tangalos, 1996). Declining memory and cognitive abilities may also have a substantial impact on the ability of older people to successfully navigate the healthcare system and to comprehend the health information they receive.

Studies have shown that older individuals with low levels of education are likely to have limited health literacy (Baker, Williams, Parker, Gazmararian, & Nuess, 1999; Scott, Gazmararian, Williams, & Baker, 2002; Wolf, Gazmararian, & Baker, 2005, 2007). Low health literacy is not, of course, limited to people with low general literacy; even people with strong literacy skills may have difficulties with health information because of jargon, complicated language, and the context of interactions with healthcare providers (Hayes, 1998; Nielsen-Bohman et al., 2004). This low health literacy may contribute to many disparities that affect these populations, which range from higher rates of diabetes, hypertension, and heart failure among minority groups (Gerber, Cho, Arozullah, & Lee, 2010; Morrow et al., 2006; Wallace, Carlson, Malone, Joyner, & DeWalt, 2010) to an increased incidence of neural tube defects among Mexican-born immigrants (Vele et al., 2006).

More emergency room visits (Cuban, 2006; Weiss, 1999). Given the costs associated with low health literacy, currently estimated to account for $69 billion of the nation’s healthcare budget, health literacy merits further study (Nielsen-Bohman et al., 2004). The prevalence of low and marginal health literacy measured with the Rapid Estimate of Adult Literacy in Medicine (REALM) and the Test of Functional Health Literacy in Adults was estimated around 20% from a review of 85 studies that included 31,129 subjects (Paasche-Orlow, Parker, Gazmararian, Nielsen-Bohman, & Rudd, 2005).

In addition to the concern about health literacy in the United States, there is increasing recognition that many of the country’s growing numbers of older adults have memory impairment and cognitive problems. Cognitive aging researchers have shown that a decline in memory performance often occurs in individuals of ages 65–85 years (Salthouse, 2003), and this can contribute to depression and loss of independence (Mendes de Leon, Gold, Glass, Kaplan, & George, 2001; Smith, Petersen, Ivnik, Malec, & Tangalos, 1996). Declining memory and cognitive abilities may also have a substantial impact on the ability of older people to successfully navigate the healthcare system and to comprehend the health information they receive.

Studies have shown that older individuals with low levels of education are likely to have limited health literacy (Baker, Williams, Parker, Gazmararian, & Nuess, 1999; Scott, Gazmararian, Williams, & Baker, 2002; Wolf, Gazmararian, & Baker, 2005, 2007). Low health literacy is not, of course, limited to people with low general literacy; even people with strong literacy skills may have difficulties with health information because of jargon, complicated language, and the context of interactions with healthcare providers (Hayes, 1998; Nielsen-Bohman et al., 2004). This low health literacy may contribute to many disparities that affect these populations, which range from higher rates of diabetes, hypertension, and heart failure among minority groups (Gerber, Cho, Arozullah, & Lee, 2010; Morrow et al., 2006; Wallace, Carlson, Malone, Joyner, & DeWalt, 2010) to an increased incidence of neural tube defects among Mexican-born immigrants (Vele et al., 2006).

The concept of health literacy is broader than it might first appear if health literacy involves much more than whether or not an individual can walk out of a visit to the doctor understanding what the provider said or successfully read the information on a medicine bottle. Zarcadoolas, Pleasant, and Greer (2006) described four primary dimensions of health literacy: fundamental literacy, scientific literacy, civic literacy, and cultural literacy. Other facets of health literacy have been noted, including media literacy (Bernhardt & Cameron, 2003) and physical or mental impairment (Bernhardt, Brownfield, & Parker, 2005). Nevertheless, health literacy was associated with cognitive function across multiple cognitive domains in Caucasian older adults (Barnes, Tager, Satariano, & Yaffe, 2004). The field is evolving quickly to incorporate new factors that contribute to the ability of an individual to obtain, understand, and act on health information. In particular, older adults may face special memory and cognitive challenges that can limit their health literacy and, in turn, their ability to live independently.

The ability to live independently is a concern for many older adults, because functional status decreases with age and is an important determinant of independent living. Typically, functional status is divided into activities of daily living (ADLs), defined as self-care habitual activities (ambulating, feeding oneself, washing, toileting, dressing, and communication), and the activities that are related to independent daily living known as instrumental ADLs (IADLs; money management, shopping and meal preparation, using a telephone, taking medications, work and social activities, and the performance of household chores; Burton, Straus, Hultsch, & Hunter, 2006). Successful completion of IADLs requires sequencing of tasks, judgment, and organizational abilities (Bell-McGinty, Podell, Franzen, Baird, & Williams, 2002). Cognitive and memory decline is associated with declines in IADLs and occurs well before the loss of the ability to perform ADLs (Njegoivan, Man-Son-Hing, Mitchell, & Molnar, 2001).

Important predictors of functional capacity include physical disabilities, sensory impairment, medical conditions, and perceived health status (Cahn-Weiner, Malloy, Boyle, Marran, & Salloway, 2000). Emotional status (depression), motivation, social factors of education, and social economic status are also reported to influence the performance of IADLs (Marcopolos, McLain, & Guiliano, 1997). Finally, cognitive ability, as measured by the Mini-Mental Status Examination (MMSE), has been reported as a predictor of IADL performance (Bertrand, Willis, & Sayer, 2001).

Only a few studies have been focused on memory problems among cognitively intact community dwelling older adults. In a study of 27 community-dwelling older adults, executive function and depression accounted for 43% of the variance in IADL scores (Cahn-Weiner et al., 2000). Bell-McGinty et al. (2002) compared 6 community-dwelling older adults, 9 older adults living in long-term care, and 35 older adults who were referred from the community for neuropsychological testing (n = 50) to examine the ability of a common test of executive function to predict physical function. Multiple regression showed that the Trail Making Part B and the Wisconsin Card Sorting Test predicted IADL ability among individuals without dementia. The authors also reported that a decrease in executive capacity resulted in a decrease in the ability to manage finances and medications. Health literacy is particularly important for managing medication.

Adults over age 65 years make up 14% of the population in the United States but use over 30% of all prescription medications.
prescription medication a week, 40% take at least five different medications, and 12% are taking more than 10 types of medications a week (Gurwitz et al., 2003). Several tests of IADL ability include medication management as a component; however, most are self-report tests that require only memory recall of the procedure. For example, in the Physical Functioning Inventory, participants are asked how they would obtain medications and whether they have any difficulty in taking them (Whetstone et al., 2001). The Everyday Problems Test asks participants to solve problems based on a medication label, telephone use, meal preparation, shopping, money management, transportation, and managing a household (Burton et al., 2006). The Timed IADL Test requires participants to identify and read the label on a medication bottle correctly within a limited space of time (Edwards et al., 2005). Similarly, in use of the Direct Assessment of Functional Status (DAFS) Scale, a labeled medication bottle is presented, and the participant is asked to identify items on the label (Loewenstein et al., 1989).

The purpose of this study was to determine if an association existed among health literacy, memory performance, and performance-based functional ability in community-residing older adults.

**Methods**

**Design**

A selected group of participants from a randomized clinical trial returned for a sixth testing (16) approximately 20 months after the original study ended (McDougall et al., 2010). The hypothesis tested in the parent study SeniorWISE (Wisdom Is Simply Exploration) was that at-risk older adults who participated in a memory training intervention would show significantly better affective and cognitive outcomes than the individuals in the health training intervention at postclass (2 months after baseline), and these benefits would be maintained over the remaining four assessment points: postclassroom (2 months), postbooster (6 months), postclassroom follow-up (14 months), and end of study (26 months).

**Sample**

The sample for this pilot study consisted 45 individuals. The participants were screened for cognitive impairment, and the presence of dementia was an exclusionary criterion for enrollment in the parent study. Health literacy was evaluated in this study. Memory performance on the Rivermead Behavioral Memory Test (RBMT) of subjects at Time 5 in the SeniorWISE study (24 months into the study) was used as a basis for enrollment into this pilot study (Cockburn & Smith, 1989). Following institutional review board approval, 105 participants, split evenly into those who previously scored in the normal (≥22) or impaired (≤16) category on the RBMT, were selected from the final SeniorWISE sample and mailed a recruitment letter. Of those contacted, 60 agreed to participate (response rate = 57%), and 45 eventually completed the study. Among those, 34 were women and 11 were men; 3 were African Americans, 36 were Caucasians, and 6 were Hispanics. Furthermore, 14 were in the impaired category and 31 were in the normal category. Their average age was 77.11 years, and their average number of years of education was 15.33 years. The MMSE was used in this study to assess concurrent validity of the Direct Assessment of Functional Status-Extended (DAFS-E). Approximately 20 months had passed on average from the previous testing.

**Measures**

**Design**

Designed to reflect everyday memory, the RBMT bridges laboratory-based measures of memory and assessments obtained by self-report and observation. It has been shown to be appropriate for older adults and relatively resistant to moderate sensory impairment and self-reported anxiety and depression (Cockburn & Smith, 1991). The RBMT was designed to reflect everyday memory performance and served as the memory performance measure. The components included remembering of a name (first name and surname), a hidden belonging, an appointment, picture recognition, a brief news article (immediate and delayed), face recognition, a new route (immediate), a new route (delayed), a message, orientation, and date. A standardized profile score with a range from 0 to 24 provides cutoff points for four groups of memory function: normal (22–24), poor (17–21), moderately impaired (10–16), and severely impaired (0–9).

Memory performance on the RBMT of subjects at Time 5 in the SeniorWISE study (24 months into the study) was used as a basis for enrollment into this pilot study (Cockburn & Smith, 1989). Participants’ previous RBMT scores were used to assess the criterion validity of the DAFS-E.

The REALM was used to assess participants’ health literacy (Davis et al., 1993). The REALM is used to assess a person’s ability to read common medical words and terms for body parts and illnesses. The test comprises 66 words, and scores can range from 0 to 66. Participants get a point for every word they pronounce correctly. Reliability and validity evidence is published in the REALM administration manual (Davis et al., 1993). Strong test–retest reliability was established on a group of 100 adult inmates at a penal institution (.99). Inter-rater reliability was also found between six research assistants for scoring the instrument (.99). Validity was established by correlating the REALM with three reading tests. Correlations ranged from .88 to .97.

The revised DAFS-E was used to assess participants’ instrumental activities and served as the primary focus of this study. The DAFS-E assessed participants’ performance in the following domains: communication skills, financial skills, shopping skills, and medication skills. There are 55 items in the DAFS-E, 20 of which are in the medication skills domain.

**Results**

The full SeniorWISE study findings have been published elsewhere (McDougall et al., 2010). At Time 5 of the parent study, the mean differences between variables in the impaired versus the normal memory performance groups were significantly different (p < .01). Age was 75.88 years versus 72.52 years; education was 12.21 years versus 14.99 years. The mean MMSE scores were 27.79 and 29.16, and the memory scores in the impaired and normal groups were 28.00 and 29.03, respectively.

In this sample, health literacy scores measured with the REALM were on the high end of the scale (M = 63.09, SD = 2.80). Thirty-four participants or 76% of the sample scored 66 (Figure 1; also see Supplemental Digital Content 1, which illustrates the health literacy histogram in
Forty-two individuals scored in the high school equivalent category of 61–66. Three individuals scored 60 or below, which categorized them as seventh or eighth grade equivalent range. These scores were consistent with the years of education for those three individuals, but not for the remaining 11 individuals in the memory-impaired group.

Pearson correlations were calculated for the study variables (Figure 2; see also Supplemental Digital Content 2, which illustrates correlations with health literacy in color, http://links.lww.com/NRES/A67). Health literacy correlations with the demographic variables of education (.19) and age (−.15) were nonsignificant, although education and cognition (.30) were associated significantly. Health literacy was associated significantly with RBMT memory performance groups (normal vs. poor; .25) and DAFS-E scores (.50).

**Discussion**

Although the original intent of this project was to investigate the impact of a memory intervention on the cognitive functioning of older adults, it was a fortuitous result that both treatment and control conditions actually improved on cognitive outcomes. This is particularly important when one considers a broader conception of health literacy, which includes whether individuals have the requisite cognitive abilities to process and recall the health information they receive.

Subjects in this study showed improvements in their cognitive ability, memory, functional abilities, and use of memory strategies over the course of the study; some of the results varied based on the characteristics of the participants before the study began (e.g., higher verbal memory scores at baseline led to greater improvements in verbal memory) or demographic characteristics of the participants (e.g., older subjects made greater gains in visual memory over the course of the study). It is also worth noting that some of the results, such as improvements in functional abilities, persisted only through the end of classes.

Interestingly, the REALM did not detect the manner in which these older adults’ health literacy improved. Health literacy was associated significantly with memory performance groups (normal vs. poor) and DAFS-E scores. Skill development in one dimension (e.g., memory performance) can help build skills in another, and inadequate skills in one dimension can be compensated for by superior skills in another or by creative strategies to overcome such deficiencies (McCray, 2005; Zarca, 2006). Older individuals with low levels of education have been found to be likely to have limited health literacy (Scott et al., 2002; Wolf et al., 2005, 2007); however, in the current study, education was not related to health literacy scores.

It would seem that simply making health a topic on which older adults focused on several times per week—whether in the context of memory training or health promotion discussions—enhanced...
their ability to deal with health issues (e.g., through improvements in their functional abilities) and to recall and process information (e.g., through improvements in memory and use of memory strategies).

The results highlight a current area of much-needed research in the health literacy field—the development and validation of instruments that can assess dimensions of health literacy not operationalized by established measures. Development of a broader assortment of health literacy instruments would improve the ability of researchers to both compare studies and build upon the knowledge and results of others. The REALM was considered a robust measure of health literacy; however, Shea et al. (2004) found large and conflicting differences between African American and Caucasian older adults’ health literacy scores with similar education.

This research points to several particularly interesting avenues for future studies. It would be helpful to further investigate the manner in which each of these interventions improved the health literacy of older adults, using measures of health literacy, preferably measures of health literacy that can detect the kinds of improvements likely to result from the interventions. Other work could test the impact that these types of interventions have on the health outcomes of older adults, further strengthening the links between health literacy and health status. Also, because some study findings did not persist beyond the end of intervention classes, it would be useful to refine the frequency of classes required to maintain consistent improvements in health literacy levels. Finally, it is important to delve more deeply into the disparities that exist between White and minority older adults regarding cognitive and memory abilities and develop targeted strategies to help bridge those gaps.

The cross-sectional nature of this study with a small sample resulted in limited findings. Nevertheless, the strength of this study was the measurement and validation of health literacy with other robust cognitive function and performance-based functional ability measures with community-living older adults.

Support for this research was provided by National Institute of Aging Grant R01 AG 15384 and additional pilot funding from the Center for Health Promotion and Disease Prevention Research in Underserved Populations at the School of Nursing (NINR SP01 NR005051) at the University of Texas at Austin. The authors have no conflicts of interest to disclose.

Corresponding author: Graham J. McDougall, Jr., PhD, RN, FAA, FGSA, School of Nursing, the University of Texas at Austin, 1700 Red River, Austin, TX 78701-1499 (e-mail: gmcdougall@mail.nur.utexas.edu).

References


