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The Senior WISE study: Improving everyday memory in older adults

Graham J. McDougall Jr., PhD, RN, FAAN[*], **Heather Becker, PhD**[*], **Keenan Pituch, PhD**[**], **Taylor W. Acee, PhD**[***], **Phillip W. Vaughan, PhD**[**], and **Carol L. Delville, PhD, MSN, APRN**[*]

[*] The University of Texas at Austin, School of Nursing

[**] The University of Texas at Austin, Department of Educational Psychology

[***] Texas State University - San Marcos, Department of Curriculum and Instruction

Abstract

We tested whether at-risk older adults receiving memory training showed better memory self-efficacy, metamemory, memory performance, and function in instrumental activities of daily living than participants receiving a health promotion training comparison condition. We followed participants for 26 months. The sample was mostly female (79%) and Caucasian (71%), with 17% Hispanics, and 12% African Americans; average age was 75 years and average education was 13 years. The memory training group made greater gains on global cognition and had fewer memory complaints, but both groups generally maintained their performance on the other cognitive measures and IADLs throughout the 24-month study period. Black and Hispanic participants made greater gains than Whites did on some memory performance measures but not on memory self-efficacy. The unexpected finding that minority elders made the largest gains merits further study. This study contributed to the knowledge base of geropsychiatric nursing by providing evidence for an effective psychosocial intervention that could be delivered by advanced practice nurses.

Trial Registration ClinicalTrials.gov NCT00094731

Keywords

Memory Training; Psychosocial Intervention; Memory Performance; Instrumental Activities of Daily Living; Older Adults; Health Training; Memory Self-Efficacy

Older adults are often aware, or are made aware, of cognitive slips, euphemistically called *senior moments* (Carey, 2006). Such memory complaints have been identified as predictors of mild cognitive impairment (MCI), and they can set off a diagnostic cascade, leading ultimately to a conversion to dementia for some individuals (Comijs, Deeg, Dik, Twisk, & Jonker, 2002; Pearman & Storandt, 2004; Winblad et al., 2004; Zandi, 2004; Zeintl, Kliegel, Rast, & Zimprich, 2006). A recent U.S. study concluded that 22% of adults over the age of 71 might have MCI (Plassman et al., 2008). Since the number of new cases of Alzheimer's Disease (AD) is expected to increase 3-fold to 13.2 million by 2050, the development of preventive

Address correspondence to Dr. Graham J. McDougall Jr., The University of Texas at Austin School of Nursing, 1700 Red River, Austin, TX 78701, gmcdougall@mail.nur.utexas.edu, http://www.nur.utexas.edu/FacHome/gmcdougall/gmcdougall.html.

interventions is urgent (Hebert, Scherr, Bienias, Bennett, & Evans, 2003; Morgan et al., 2007).

Individuals' subjective evaluations of their memories may be cause for concern but numerous studies suggest their perceptions may be modifiable since memory complaints are often associated with anxiety and depression (Cockburn & Smith, 1994; Dux et al., 2008; Fiocco, Wan, Weekes, Pim, & Lupien, 2006; McDougall, Strauss, Holston, & Martin, 1999). Adults at risk for impaired episodic memory and executive function are often aged 65 years and older and have depressive symptoms (Butters et al., 2008; Herrmann, Goodwin, & Ebmeler, 2007; Carlson, Xue, Zhou, & Fried, 2009); Federal Interagency Forum on Aging Related Statistics, 2004. Additional risk factors include living alone and multiple comorbidities, which may lead to social isolation (Finkel, Reynolds, McArdle, & Pedersen, 2007; Michael, Berkman, Colditz, Holmes & Kawachi, 2002; Mendes de Leon, Gold, Glass, Kaplan, & George, 2001; Salthouse, 2003; Wilson et al., 2002).

Memory performance varies as a function of individuals' self-efficacy beliefs (Artistico, Cervone, & Pezzuti, 2003; Bandura, 1989; Berry, 1989; Berry, West, & Dennehey, 1989; Jennings, & Darwin, 2003; Lachman, Steinberg, & Trotter, 1987; McDougall, 2004). A recent study of older adults found consistent decline in memory self-efficacy with age (McDougall, 2009); chronological age in years was significantly inversely related to memory self-efficacy. Memory self-efficacy may mediate memory performance, and interventions designed to improve self-efficacy may be as important as teaching compensatory mnemonic strategies (Berry & West, 1993; Lachman, Weaver, Bandura, Elliott, & Lewkowicz, 1992; Rebok & Balcerak, 1989; West, Bagwell, & Dark-Freudeman, 2008).

Though not uniformly accepted, mental stimulation, or "use it or lose it" emphasizes that engagement in novelty and innovation may help reverse decline in cognitive function and help an individual maintain cognition (Light, 1991; Salthouse, 1991). This disuse hypothesis is driving the interest in whether brain exercises can prevent, or delay what is considered "normal" decline in memory (Boron, Willis, & Schaie, 2007; Salthouse, 2006; Salthouse, Berish, & Miles, 2002; Verghese et al., 2003). Interventions have included the plasticity-based adaptive cognitive training of the IMPACT study and computer training (Slegers, van Boxtel, & Jolles, 2009; Smith et al., 2009). A recent metanalytic review found no evidence that cognitive intervention programs slow or delay the progression of AD (Papp, Walsh, & Snyder, 2009).

Nevertheless, psychosocial interventions developed to prevent memory decline have also targeted functional ability, loneliness, isolation, physical activity, and the social and/or physical environment (Cattan, White, Bond, & Learmouth, 2005; McDougall, 2002; Oswald, Rupprecht, Gunzelmann, & Tritt, 1996; Phelan, Williams, Penninx, LoGerfo, & Leveille, 2004). The Advanced Cognitive Training for Independent and Vital Elderly (ACTIVE) trials (Ball et al., 2002; Jobe et al., 2001) found that participants in each intervention group improved their targeted cognitive abilities and maintained these gains for 5 years (Willis et al., 2006). The ACTIVE trials, however did not address the subjective aspects of memory self-efficacy and metamemory (Lachman, Andreoletti, & Pearman, 2006; Scogin, 1997; West et al., 2008).

The ability to perform independent living skills is dependent on intact executive function (Dodge, Du, Saxton, & Ganguli, 2006; Johnson, Lui, & Yaffe, 2007). As age and memory loss increase, cognitively-demanding instrumental activities such as remembering to take medications, managing money, or using the telephone, may become difficult to perform (Royall, Palmer, Chiodo, & Polk, 2005). The focus of the current study was everyday memory —the day-to-day operations of memory in real-world ordinary situations (West & Sinnott, 1991; West, Crook, & Barron, 1992). The goal was to improve everyday memory and ultimately performance of IADLs.

The Cognitive Behavioral Model of Everyday Memory (CBMEM) tested here was derived from Bandura's Self-Efficacy Theory (Bandura & Locke, 2003; Dellefield & McDougall, 1996; McDougall, 1998; McDougall et al., 1999; McDougall, 2009). We tested the hypothesis that older adults who received the CBMEM-based memory training intervention would show significantly better memory self-efficacy, memory strategies, and memory performance, and better function in IADLs than participants in a health promotion training condition at post-class (2 months after baseline) and over the remaining three assessment points: post-booster (6 months), post-class follow-up (14 months), and end of study (26 months). This paper reports the findings from baseline to post-class and from baseline to end of study.

Methods

Settings and Sample

Independent adults were recruited from a metropolitan area in Central Texas via print and TV media, as well as directly from city-run senior activity centers, churches, health fairs, and festivals. The trainings were implemented at seven sites in the community: four senior centers, a university-based wellness clinic, and two apartment complexes for low-income older adults.

Eligibility criteria included age ≥65 years, ability to speak and understand English, no sensory loss or cognitive impairment, and willingness to participate in the study for 24 months. Sensory loss was determined over the telephone or in person by self-report evaluation of hearing and vision. Visual and hearing acuity were further evaluated at the "in-person" eligibility screening by evaluator observation and by a self-report checklist developed for the study.

Ability to communication in English was assessed using a checklist designed for the study and completed by a team member at the initial screening. We asked seven questions to determine eligibility in this order: Are you able to hear conversations on the phone? Are you able to comprehend English conversations? Are you able to articulate enough to be understood? Are you able to participate in two-sided conversations? Can you decipher concrete and abstract conversational content? Are you able to make an appointment for follow-up testing? Can you repeat back the appointment time and place? If any question was answered incorrectly, the individual was deemed ineligible.

The Mini-Mental State Examination (MMSE) (Folstein, Folstein, & McHugh, 1975) was used to screen for cognitive impairment and monitor cognitive decline throughout the study. Only those with scores ≥23 were eligible to participate in the study. However, the eligibility score was reduced to ≥20 at one senior center in order to recruit Hispanics with low education. Four females and one male were recruited using this adjusted screening protocol. In addition, the Controlled Oral Word Association Test (COWAT) from the Multilingual Aphasia Examination (Sumerall, Timmons, James, Ewing, & Oehlert, 1997) and The Trail-Making Test were administered during screening (Reitan, 1958), and participants were required to pass Trails A and/or Trails B at or above the 10th percentile for their age group for inclusion in the study.

Those with AD or other dementia, Hodgkin's disease, neuroblastoma, or cancer of the liver, lung, or brain were excluded from the study. Medical eligibility was assessed verbally using a 4-item health status checklist designed for the project. Three hundred forty-six adults were recruited, but 81 did not participate: 21 did not meet inclusion criteria; 38 declined; and 22 were female spouses in a couple, who were excluded so that adequate numbers of males would be represented in the sample (Figure 1). The final sample (N=265) was 72% non-Hispanic White, 17% Hispanic, and 11% African American. The average age was 75 years. The majority of participants were female (77%). The university's Institutional Review Board approved the study.

Once participants were screened and consented, they were randomly assigned numeric codes corresponding to either the memory or health promotion training interventions. Randomization was separate for each of the sites. One hundred thirty-five individuals were assigned to memory training and 130 were assigned to health training. Eleven groups met at seven sites in the community. Both training groups participated in 12 sessions.

Memory Training—The CBMEM-based intervention consisted of eight classes and four booster sessions (McDougall, 1998, 1999, 2000, 2002). The memory training was based on the four components of self-efficacy theory: enactive mastery experience, vicarious experience, verbal persuasion, and physiologic arousal. A female septuagenarian role model taught the memory training classes. In each memory class, the first 20 minutes were dedicated to guided practice of stress inoculation that included a progressive muscle relaxation exercise with visualization. Next, homework from an earlier session was discussed. Class topics included memory and health; memory functions and mechanisms; factors affecting memory for people of all ages; memory beliefs and aging; and use of internal and external memory strategies (McDougall, 2009). During the 8-session classroom component of the memory training, 30 minutes of practice with memory strategies were allocated during each class to strengthen enactive mastery experience, the strongest component of self-efficacy. After each memory training class, participants wrote down some aspect of their learning, or an essential point from the class, such as a memory strategy. Each participant was given a plus or minus (0, 1) for the class session. Between the 8-session CBMEM, and the 4 booster sessions, a participant would have a possible score between 0 and 12. On completion of the study, participants received a memory improvement book for older adults entitled *Improving Your Memory* (Fogler & Stern, 1994).

Health Promotion Training—The comparison treatment included 18 health promotion topics that emphasized successful aging. The classes were interactive health discussions; no memory topics were presented or discussed, no homework was assigned, and no content retention tests were used. The topics were developed based on three focus groups conducted in the community with diverse older adults before the clinical trial (Austin-Wells, Zimmerman, & McDougall, 2003). The topics included alternative medicine, exercise, spirituality and health, weight management, getting the most from your doctor visit, caring for the caretaker, healing foods, drug interactions, osteoporosis, maintaining relationships, health myths, consumer fraud, nutrition, leisure activities, writing family stories, health monitoring tests for home use, and buying drugs in foreign countries. A middle-aged mature male nursing student with 20 years of experience taught the classes. Learning was not assessed in the health training classes.

Booster Sessions—In the booster sessions an additional 8 hours of classroom time were delivered to both the memory and health groups over the 3 months following the initial training. Four 2-hour sessions met weekly for 1 month. For the intervention group, the booster training sessions provided a transitional experience between classroom work on memory improvement and practical applications. The booster sessions were designed to boost learning, enhance retention, and assist with the transfer of memory strategies to everyday life. The emphasis was on practical everyday memory strategies needed for IADLs. Individuals were provided opportunities to practice strategies that could be incorporated into their everyday activities and routines in order to maintain IADLs. The health training group received training in new areas of health promotion not previously presented in their earlier 8 sessions.

Measures

All cognitive performance and self-report measures were administered at baseline, post-class (2 months after baseline), post-booster (6 months), post-classroom follow-up (14 months), and end of study (26 months). Cognitive performance was tested with the MMSE (Folstein et al., 1975), which was used as a global measure to monitor potential cognitive decline throughout the study.

Verbal memory performance was tested with the Hopkins Verbal Learning Test-Revised (HVLT-R), which assesses immediate recall, delayed recall, and recognition memory (Brandt, 1991). Test/retest correlation was .66 for the Delayed Recall Subscale, which was used in these data analyses. Visual memory performance was measured with the Brief Visuospatial Memory Test-Revised (BVMT-R), which asks the individual to reproduce a series of geometric designs (Benedict, 1997). Test/retest correlation was .72.

The Rivermead Behavioural Memory Test (RBMT), which was used to test everyday memory bridges laboratory-based measures of memory and assessments obtained by self-report and observation. The standardized profile score (SPS) has a possible range from 0 to 24 and is sometimes interpreted with cut-off points for four groups of memory function: normal (22–24), poor (17–21), moderately impaired (10–16), and severely impaired (0–9). Alpha reliability was .73 (Cockburn & Smith, 1989; Wilson, Cockburn, Baddeley, & Hiorns, 1989).

The Direct Assessment of Functional Status (DAFS) was used to assess ability to function with IADLs. The DAFS measures performance in test time orientation, communication abilities, transportation, and financial, shopping, eating, and dressing/grooming skills (Loewenstein et al., 1989, 1992). The DAFS demonstrated high interrater and test-retest reliabilities for patients at a memory disorder clinic (English- and Spanish-speaking) and normal controls. Alpha reliability was .79.

Memory self-efficacy was measured by the Memory Self Efficacy Questionnaire (MSEQ), which asks respondents to predict their performance level and estimate their strength and confidence in performing 10 everyday tasks (Berry, et al., 1989). The 35-item version of the MSEQ was used; alpha reliability was .95.

The Spielberger State-Trait Anxiety Inventory (STAI) was used to measure anxiety. The STAI was developed to differentiate the temporary condition of “state anxiety” and the chronic condition of “trait anxiety” in adults (Spielberger, Gorsuch, & Lushene, 1970). Alpha reliabilities were .85 and .89.

The Center for Epidemiologic Studies Scale (CES-D), which emphasizes somatic complaints (rated on a 4-point Likert scale), was used to evaluate depressive symptoms (Radloff & Teri, 1986). In older adults, reliability coefficients were from .85 to .91. Alpha reliability in this study was .78.

The Metamemory in Adulthood Questionnaire (MIA) was used to measure aspects of memory knowledge (Dixon, Hultsch, & Hertzog, 1988). The MIA consists of 108 statements in seven subscales, and responses are rated on a 5-point Likert scale. Within the Strategy subscale (18 items), we differentiated how often participants used both *internal* memory strategies (elaboration, rehearsal, etc.), and *external* strategies (lists, notes, etc.) to enhance their everyday memory function. Alpha reliabilities were .78 and .77, respectively. Memory complaints were measured with a revised MIA based on a conceptual item-analysis and a factor analysis of 690 older adults. The revised MIA complaint subscale consists of 21 items and captures individuals' perceptions of their memory abilities as generally stable or subject to long-term decline. A higher average item score (> 2.5) indicates greater stability and fewer complaints about failing memory (McDougall, Becker, & Arheart, 2006). Mean scores range from 0 to 5.. Alpha reliability was .91.

Statistical Analysis

Hierarchical linear models (HLM) were used to test the efficacy of the intervention (Bryk & Raudenbush, 1992). Age, education, and racial/ethnic group were included as covariates. Number of classes attended was also entered as a covariate, to control for dosage effects. Two HLM analyses were conducted for each outcome measure: one to evaluate treatment and covariate effects, including effects of ethnicity, from baseline to the end of classes, and a similar analysis to evaluate effects from baseline to end of study. The three-level analysis models included repeated measures at Level 1. At Level 2, participants were modeled within sites. Since time was included as a Level 1 explanatory variable and the treatment variable was entered in the model at Level 2 for the gains (as well as in the model for initial status), the model tested whether the "treatment" or "control" group made greater gains across time.

In the Level III model, between-site variables were identified. Because of the limited number of sites, we did not attempt to explain variation across sites, but controlled for it in the analyses. We examined relative gains from beginning to end of classes and from beginning to end of the 26-month study. Other analyses, including all five time points and allowing for a non-linear trajectory, yielded similar results. For each of the analyses in which the memory treatment effect was not statistically significant, we performed an additional HLM analysis that did not include the treatment effect or covariates. The purpose was to examine the direction and statistical significance of *overall* change over time from baseline to end of classes or baseline to end of study when the memory group did not differ significantly from the health group.

Results

Baseline Comparisons

The analytic sample consisted of 265 randomized participants: 135 in the memory training and 130 in the health promotion training (Figure 1). Eight deaths occurred during the study unrelated to the protocol. Ninety-five percent of participants completed the memory training; 87% completed the health promotion training (six or more of the eight training sessions). At the final testing, 108 and 101 individuals were in the memory training and the health promotion groups, respectively. Eighty-four percent in the memory training and 78% in the health promotion completed three or more booster sessions. The memory and health groups did not differ significantly at baseline on either the outcome measures or demographics (t-test). When sex, education, age, MMSE score, health status, and memory vs. health training group were entered simultaneously into a logistic regression as predictors of finishing the study, being female ($p = .03$) and reporting better perceived health ($p = .04$) were the only significant predictors. Cronbach's alphas ranged from .73 to .95. Means and standard deviations for outcome measures are in Table 2.

The HLM results for measures of cognitive abilities and instrumental functional abilities are shown in Table 3. At baseline, older, less educated, Black, and Hispanic participants had significantly lower scores on visual memory. Less educated, Black, and Hispanic participants also had lower baseline scores on verbal memory. At baseline, scores on the MMSE were positively associated with years of education and negatively associated with being Hispanic or Black.

Lower DAFS scores at baseline were related to being older, less educated, Hispanic, and Black. Although in preliminary univariate tests the memory and health promotion groups did not differ at baseline on outcome measures, the HLM results suggested that the memory group scored significantly higher at baseline on everyday memory than did the health promotion group.

Younger participants reported fewer memory complaints at baseline than older participants (Table 4). In addition, younger participants rated their memory self-efficacy higher than older participants did. Also, the memory training group reported significantly higher memory self-efficacy at baseline than the health promotion group. Hispanics and Blacks reported using fewer external memory strategies than Whites did at baseline. In addition, Hispanics used fewer internal strategies than Whites did.

Training Effects from Baseline to Post-Class: Performance Measures—The memory and health promotion groups did not differ significantly in gains on visual memory from baseline to post-classes (Table 3). Performance for the entire group also did not change significantly (b=−0.20, p=.50). The memory and health groups did differ significantly in gains from baseline to post-classes on the DAFS performance measure, thoughboth groups, improved on the DAFS (b = 0.23, p = .04). On verbal memory, overall performance did not significantly change from baseline to end of classes (b = 0.36, p = .10). However, the memory group showed greater gains from baseline to post-classes on MMSE scores, a measure of global cognition. On everyday memory performance, there were no significant gains for the memory group from baseline to end of classes (b = 0.14, p = .07).

Training Effects from Baseline to End of Study: Performance Measures—Overall performance on visual memory did not significantly increase or decline for the sample as a whole (b = −0.08, p = .11). Hispanic and Black participants gained more than Whites, did and individuals with less education also gained relatively more.

Participants showed no significant changes in DAFS scores from baseline to end of study (b = −0.01, p = .68). However, those with initially higher DAFS scores, and those who attended more classes gained more from baseline to end of study. Those with fewer years of education gained more on the DAFS from baseline to end of study, and Blacks gained more than Whites.

Although the memory group did not outperform the health promotion group, those with higher verbal memory scores at baseline performed relatively better from baseline to end of study. However, the overall performance of both groups, on verbal memory did not significantly increase or decline from baseline to end of study (b = 0.04, p = .19). The MMSE scores for the sample as a whole also did not significantly change from baseline to end of study (b = 0.00, p = .94).

The participants who scored higher on everyday memory in the pretest at the beginning of the study also gained more from baseline to end of study. Older participants gained relatively more than younger participants. Everyday memory performance gains did not differ significantly from baseline to end of study by treatment condition. Overall performance on everyday memory for the entire sample did not significantly change (b = 0.01, p = .69).

Training Effects from Baseline to Post-Test Classes: Self-Report Measures—Table 4 presents the HLM results for the self-report measures of memory complaints, self-efficacy, and strategies. Memory group participants reported a greater reduction in memory complaints from baseline to post-classes. Memory self-efficacy gains, however, did not significantly differ by training group (b = 0.53, p = .17). For internal strategies, scores for the sample did not significantly increase or decline (b = 0.01, p = .33). However, those who attended more classes reported greater use of internal strategies over time. Similarly, overall scores for external strategies did not change significantly (b = 0.00, p = .79). On the psychological measures of anxiety (state/trait) and depression, controlling for education, there were no significant effects of time, ethnic group, or intervention.

Training Effects from Baseline to End of Study: Self-Report Measures—Memory training participants who were younger reported a greater reduction in memory complaints than older participants. On the memory self-efficacy measure, Whites made relatively greater gains than Blacks did, but neither group changed significantly ($b = 0.07$, $p = .33$). Both groups improved their use of external and internal memory strategies over time. Internal strategies increased significantly ($b = 0.004$, $p < .01$), as did external strategies ($b = 0.004$, $p = .03$). The memory group did not make significantly greater gains than the health promotion group in strategy use.

Discussion

This study had many strengths. First, the tri-ethnic sample was recruited in the community, and volunteer participants were highly motivated and maintained their interest in the study, as evidenced by a 79% retention rate over the 26-month study. The ACTIVE trials reported 80% retention at 24-month follow-up (Ball et al., 2002). Further, the range of outcomes was comprehensive and administered at each measurement occasion. Finally, we explored differences in racial and ethnic group responses to the memory training. Study limitations included the lack of a no-treatment control group. Further, the generalizability of the findings from the minority sample is not clear.

The participants in both the memory and health promotion groups improved their use of external and internal memory strategies. This is a unique finding for an intervention that did not place any emphasis on memory strategies in the health training (Lachman et al., 1992; Lachman, Andreoletti, & Pearman, 2006). However, both groups received mental stimulation and social engagement, in part that may explain the benefits to memory. Participants may have engaged in self-study to improve memory strategies as a result of their participation in the study. Health promotion training is not a normative intervention in people’s daily lives. When this study was launched in 2001, evidence of the effectiveness of memory training with older adults was known (Floyd & Scogin, 1997; Verhaeghen et al., 1992), but, the benefits of health promotion as mental stimulation were less well known. Nevertheless, the health promotion group’s maintenance of cognitive functioning is consistent with growing scientific evidence that health promotion interventions, including physical activity, may prevent decline (Abbott, White, Ross, Masaki, Curb, & Petrovitch, 2004; Boron, Willis, & Schaie, 2007; Salthouse, 2006; Salthouse, Berish, & Miles, 2002; Verghese et al., 2003; Weuve et al., 2004).

In the analyses, race and ethnicity were covariates, which suggests that memory performance may change differently over time based on demographic characteristics. Both Hispanics and Blacks tended to make greater gains than Whites on visual memory; Blacks also performed better over time on instrumental functional abilities, though Hispanics performed worse on the memory measure in the short run. These results raise the question: Are minorities more likely to gain from health promotion or memory training interventions? Because pretest scores were included in the model as covariates, the differential changes over time for Black and Hispanic participants as compared to Whites were not due to lower pretest scores.

The participants improved on the DAFS performance measure from baseline to end of classes, but there was no significant change in scores at the end of the study. Transfer of learning or practice effects may have occurred as a result of taking the DAFS repeatedly. Even though our participants were screened out for dementia, we found that the DAFS (even excluding the eating and dressing/grooming skills subscales) had a non-normal distribution and a ceiling effect despite the fact that two-thirds of these same respondents scored in the poor or impaired ranges of a test of everyday memory performance. This pattern of results suggested that the DAFS might not be sensitive to the early deficits in functioning exhibited by older adults who are experiencing poor memory performance but are still living independently in the community.

Also, our study included four required 90-minute booster sessions at 3 months post-training for all participants. These additional sessions may have increased learning and retention through practice effects with everyday activities. The four booster sessions for the health promotion group may have increased the mental stimulation for this group (Austin-Wells, McDougall, & Becker, 2006).

Less educated, Black, and Hispanic participants had lower scores than Whites on verbal memory at baseline. In our HLM analyses, we examined the verbal memory delayed recall T-score as an outcome at Times 2 and 5. Controlling for ethnicity, age, education, and verbal memory scores at Time 1, there were no treatment effects. However, testing with Hispanic elders was often done over many days to accommodate their low literacy skills and level of frustration with the complex battery of measures. Practice effects may have been greater for Blacks and Hispanics, or the interventions may have been more effective for minority participants (McDougall et al., 2008). Since different patterns were observed for Blacks and Hispanics, future research should examine ethnic/racial groups separately and consider the moderator effects of race and ethnicity on memory training.

Following the training, we observed an improvement in global cognition; however, there was no change from baseline to end of study. The initial improvement may reflect a practice effect induced by repetition because the period between baseline testing and post-class was approximately 8 weeks. The MMSE has a documented selective bias toward episodic memory and visuospatial skills in normal elderly adults without dementia (Hill & Backman, 1995). Also, in a longitudinal analysis, Rabbitt, Diggle, Holland, and McInnes (2004) found that practice improvements were greatest between the first and second experiences with a cognitive task.

The memory group showed no greater gains in everyday memory performance, than the health promotion group. These findings contrast with the ACTIVE trial findings, in which the participants in each intervention group improved targeted cognitive abilities by an amount approximately equal to the cognitive decline that would naturally occur in older adults without dementia, and maintained these gains for 5 years (Ball et al., 2002; Willis et al., 2006).

The participants in our study did not have dementia. However, 169 (64%) individuals had measurable problems in one or more domains of everyday function, and 46 (17%) had problems that would be of serious enough concern for further neuropsychological referral and would potentially meet the criteria for mild cognitive impairment (MCI). The MCI prevalence rate in a nationally representative sample was 22% (Plassman et al., 2008). In recent studies, individuals with MCI might have received differential benefits from cognitive training (Belleville, 2008; Unverzagt et al., 2007). The issue of memory complaints deserves further discussion because these subjective concerns are often predictive of a future diagnosis of MCI (Pearman & Storandt, 2004; Purser, Fillenbaum, & Wallace, 2006; Winblad et al., 2004; Zandi, 2004; Zeintl et al., 2006). We found a reduction in memory complaints for participants in the memory group. At 26 months, they continued to report fewer complaints.

Whites made relatively greater gains than Blacks did in memory self-efficacy. We expected memory self-efficacy to improve based on evidence from previous studies with diverse older adults (Dittmann-Kohli et al., 1990; Lachman et al., 1992; McDougall, 1998, 1999, 2000, 2002; Rebok, & Balcerak, 1989; West et al., 2008). However, all previous intervention studies used different memory efficacy questionnaires. Difficulty in comprehending the MSEQ was reflected in our findings. Future studies will require further adjustment of this measure, and possibly other measures, to accommodate the literacy level of participants (Institute of Medicine, 2004; Scott et al., 2002).

In a recent study, Algase, Souder, Roberts, & Beattie (2006) elevated the urgency to prepare advanced practice geropsychiatric nurses to care for the projected 15 million older adults by 2030 with major psychiatric illness. The Cognitive Behavioral Model of Everyday Memory provides a framework for intervening with the everyday memory concerns of older adults striving for independence. Nevertheless, the findings that Black and Hispanic elderly made greater gains than Whites on some memory performance measures merits further study.

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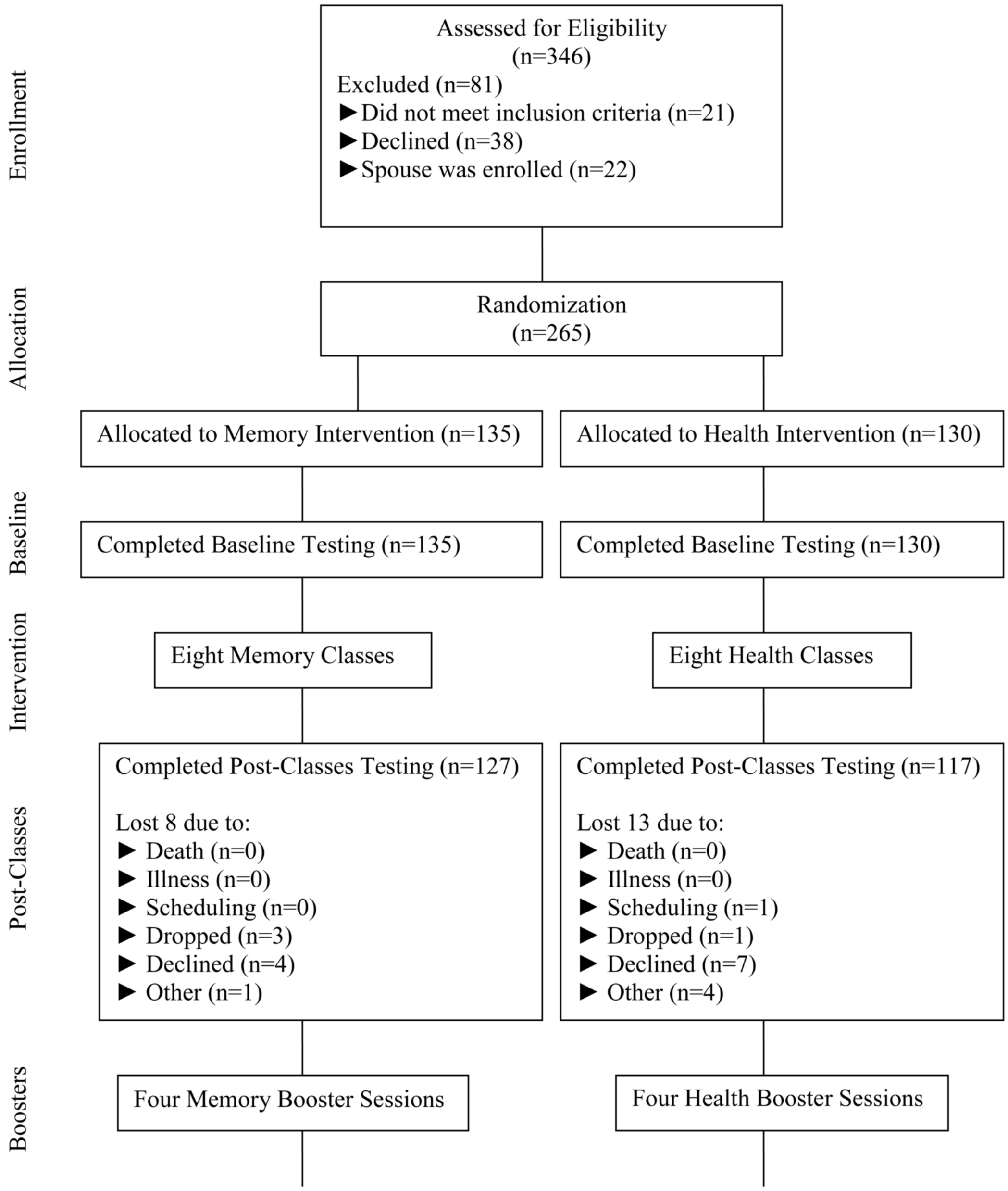

Figure 1.
Flow chart

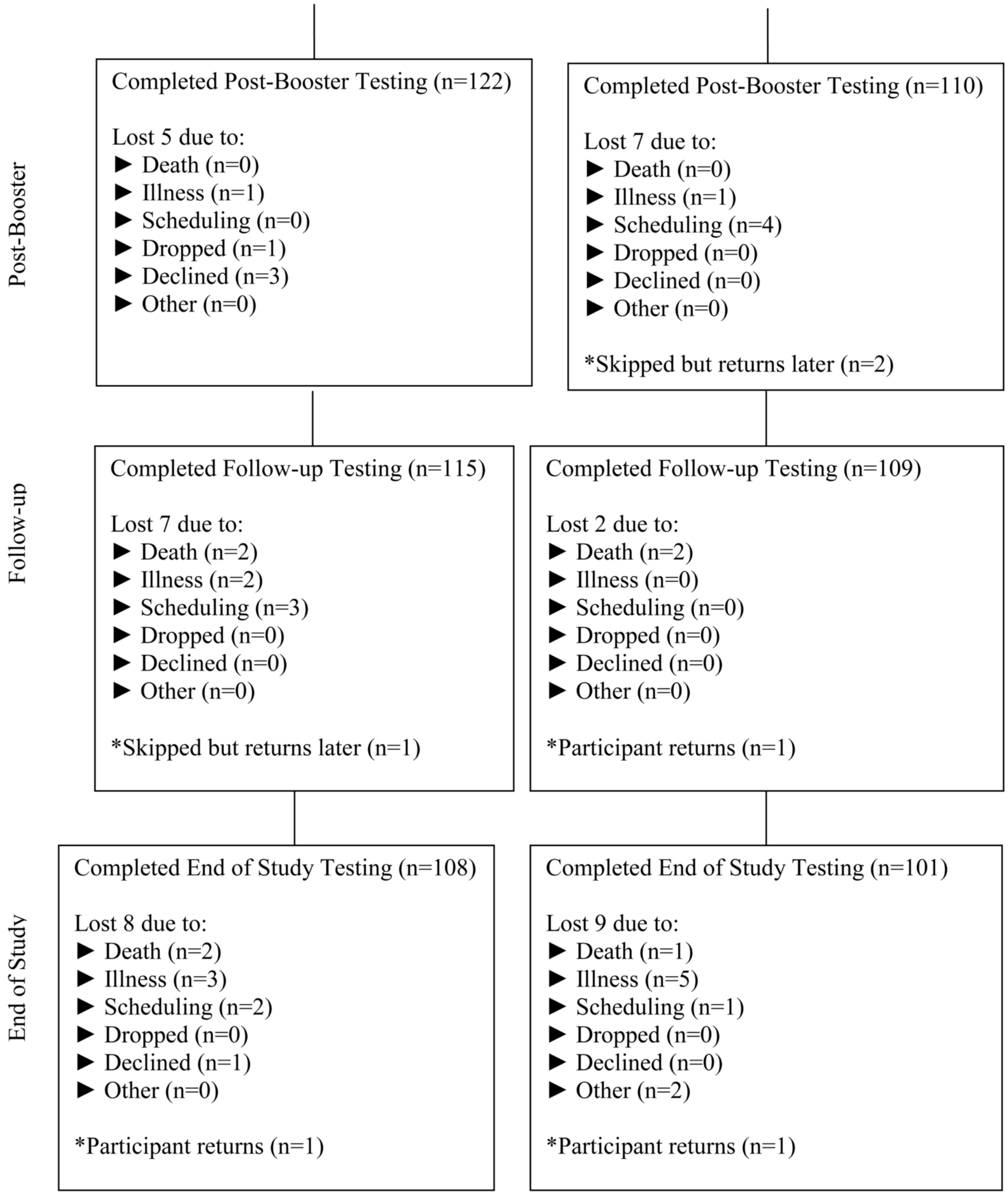

Figure 2.
Flow chart

Table 1

Demographics and Screening Measures at Baseline

		Comparison Group N=130	Intervention Group N=135
Variables	**Score Range**	**Mean ± SD N (%)**	**Mean ± SD N (%)**
Age	65–94	74.83 ± 6.22	74.69 ± 5.74
Education	0–22	13.81 ± 3.71	13.39 ± 3.9
Number of people in house	1–6	1.65 ± 1.42	1.53 ± .81
Attention	0–324	45.53 ± 36.73	44.95 ± 34.16
Cognitive Flexibility	0–630	134.91 ± 98.62	125.3 ± 74.27
Organizational Strategy	0–79	40.58 ± 11.16	41.27 ± 11.46
Depression	0–60	9.47 ± 6.87	9.13 ± 6.71
State Anxiety	20–80	29.32 ± 8.12	29.72 ± 8.18
Trait Anxiety	20–80	32.15 ± 8.55	31.90 ± 9.24
Gender			
Male		30 (23.1)	30 (22.2)
Female		100 (76.9)	105 (77.8)
Race			
White		93 (71.5)	96 (71.1)
Black		15 (11.5)	15 (11.1)
Hispanic		22 (16.9)	24 (17.8)
Marital Status			
Married		37 (28.5)	45 (33.8)
Never Married		3 (2.3)	5 (3.8)
Divorced		26 (20)	25 (18.8)
Widowed		64 (49.2)	58 (43.6)

Note. Attention = Trail-Making Test A; Cognitive Flexibility = Trail-Making Test B; Organizational Strategy = Controlled Oral Word Association Test; Depression = Centers for Epidemiologic Studies Scale (CES-D); State and Trait Anxiety = Spielberger State-Trait Anxiety Inventory.

Table 2

Descriptive Statistics from Baseline to End of Study

	Score Range	Baseline (0 Months) Mean ± SD	Post-Classes (2 Months) Mean ± SD	Post-Boosters (6 Months) Mean ± SD	Follow-up (14 Months) Mean ± SD	End of Study (26 Months) Mean ± SD
Brief Visuospatioal Memory Test						
Intervention	0–100	44.07± 13.50	43.97 ± 13.79	43.50 ± 13.02	42.21 ± 13.67	41.46 ± 14.05
Comparison	0–100	44.03 ± 15.04	43.15 ± 14.78	43.85 ± 14.44	40.83 ± 15.22	42.90 ± 16.57
Direct Assessment of Functional Status						
Intervention	0–89	83.05 ± 4.13	83.81 ± 4.30	83.27 ± 4.98	83.43 ± 5.21	82.57 ± 5.50
Comparison	0–89	81.95 ± 6.30	83.11 ± 6.00	82.66 ± 6.23	83.13 ± 5.99	82.08 ± 6.93
Hopkins Verbal Learning Test						
Intervention	0–100	49.64 ± 11.12	50.31 ± 10.08	51.49 ± 9.09	51.63 ± 10.11	50.48 ± 10.87
Comparison	0–100	47.45 ± 11.27	48.23 ± 11.98	48.41 ± 11.25	49.00 ± 12.15	48.28 ± 13.28
Mini Mental State Exam						
Intervention	0–30	28.05 ± 2.06	28.31 ± 1.82	28.49 ± 1.86	28.33 ± 2.15	28.04 ± 2.27
Comparison	0–30	27.98 ± 2.22	27.77 ± 2.33	28.19 ± 1.83	27.89 ± 2.39	27.95 ± 2.15
Rivermead Behavioural Memory						
Intervention	0–24	19.08 ± 3.44	20.08 ± 3.18	18.36 ± 4.00	20.20 ± 3.96	19.13 ± 3.93
Comparison	0–24	18.31 ± 4.60	19.07 ± 4.57	18.18 ± 4.71	19.77 ± 3.95	18.47 ± 4.78
Memory Complaints						
Intervention	1–5	2.72 ± .62	2.93 ± .60	2.94 ± .61	2.90 ± .66	2.89 ± .64
Comparison	1–5	2.76 ± .54	2.80 ± .53	2.81 ± .57	2.76 ± .63	2.75 ± .58
Memory Self Efficacy						
Intervention	0–100	49.44 ± 18.82	51.60 ± 18.29	53.17 ± 17.47	54.10 ± 18.53	52.04 ± 18.54
Comparison	0–100	46.02 ± 16.28	45.35 ± 16.88	47.51 ± 17.09	47.60 ± 19.69	47.38 ± 15.65
External Strategies						
Intervention	1–5	3.90 ± 0.56	4.01 ± 0.57	4.08 ± 0.59	4.02 ± 0.60	4.06 ± 0.54
Comparison	1–5	4.01 ± 0.59	3.97 ± 0.60	4.05 ± 0.57	4.05 ± 0.59	4.07 ± 0.61
Internal Strategies						
Intervention	1–5	3.56 ± 0.51	3.67 ± 0.59	3.74 ± 0.51	3.73 ± 0.58	3.72 ± 0.57
Comparison	1–5	3.54 ± 0.58	3.53 ± 0.59	3.66 ± 0.53	3.53 ± 0.62	3.58 ± 0.53

Note. Visual Memory = Delayed recall T score from the Brief Visuospatial Memory Test-Revised; Instrumental Activities = Direct Assessment of Functional Status; Verbal Memory = Delayed recall T score from the Hopkins Verbal Learning Test-Revised; Cognition = Mini Mental State Examination; Everyday Memory = Standard profile score from the Rivermead Behavioral Memory Test; Memory Complaints = Memory Complaints Inventory from the Metamemory in Adulthood Questionnaire; Memory Self Efficacy = Memory Self Efficacy Questionnaire; External Strategies = External strategies scale from the Metamemory in Adulthood Questionnaire; Internal Strategies = Internal strategies scale from the Metamemory in Adulthood Questionnaire.

Table 3

HLM Results for Memory Performance Measures

	Baseline		Baseline to Post-Classes		Baseline to End of Study	
	Coefficient	**SE**	**Coefficient**	**SE**	**Coefficient**	**SE**
Brief Visuospatial Memory Test-Revised						
Treatment	0.758	1.437	0.122	0.483	−0.062	0.080
Age	−0.495**	0.123	0.121*	0.051	0.022**	0.007
Education	0.811**	0.236	−0.071	0.093	−0.016	0.013
Hispanic	−8.901**	2.399	−0.612	1.002	0.336*	0.132
Black	−12.818**	2.329	0.307	0.984	0.538**	0.134
Class Attendance			0.105	0.279	0.040	0.038
Pretest			0.007	0.023	0.027**	0.003
Intercept	71.030**	10.295	−9.294	4.744	−2.992**	0.672
Direct Assessment Functional Status						
Treatment	0.952	0.523	−0.028	0.149	−0.031	0.023
Age	−0.119**	0.045	−0.008	0.015	−0.002	0.002
Education	0.490**	0.085	−0.020	0.029	−0.008*	0.004
Hispanic	−3.305**	0.862	0.189	0.302	0.016	0.039
Black	−4.842**	0.844	0.072	0.275	0.104**	0.040
Class Attendance			0.105	0.087	0.026*	0.013
Pretest			−0.001	0.020	0.011**	0.002
Intercept	85.012**	3.741	0.375	2.161	−0.890*	0.293
Hopkins Verbal Learning Test-Revised						
Treatment	1.778	1.174	0.173	0.372	−0.008	0.051
Age	−0.081	0.101	−0.039	0.037	−0.006	0.004
Education	0.594**	0.195	0.037	0.071	−0.006	0.008
Hispanic	−5.997**	2.013	−0.380	0.726	0.041	0.086
Black	−12.157**	1.967	0.156	0.700	0.168	0.090
Class Attendance			0.098	0.216	0.031	0.029

	Baseline		Baseline to Post-Classes		Baseline to End of Study	
	Coefficient	SE	Coefficient	SE	Coefficient	SE
Pretest	-	-	−0.031	0.018	0.009**	0.002
Intercept	47.193**	8.455	3.406	3.473	−0.062	0.439
Mini Mental State Exam						
Treatment	0.270	0.197	0.208**	0.079	−0.006	0.010
Age	−0.010	0.017	−0.014	0.008	−0.002	0.001
Education	0.210**	0.034	−0.033*	0.016	−0.005**	0.002
Hispanic	−0.878*	0.364	−0.327*	0.161	0.003	0.017
Black	−2.095**	0.350	0.106	0.145	0.028	0.017
Class Attendance	-	-	0.010	0.044	0.001	0.005
Pretest	-	-	0.004	0.022	0.009**	0.003
Intercept	26.086**	1.440	1.257	0.934	−0.086	0.109
Rivermead Behavioral Memory Test						
Treatment	0.847*	0.412	0.136	0.139	−0.011	0.018
Age	−0.154**	0.036	−0.012	0.015	0.000	0.002
Education	0.224**	0.069	−0.017	0.026	−0.005	0.003
Hispanic	−2.713**	0.720	0.482	0.282	−0.003	0.032
Black	−3.578**	0.696	0.089	0.268	0.037	0.033
Class Attendance	-	-	0.121	0.081	−0.002	0.010
Pretest	-	-	−0.026	0.022	0.008**	0.002
Intercept	27.517**	2.969	0.671	1.422	−0.076	0.163

* *Note*. p≤.05,

** p≤.01 Visual Memory = Delayed recall T score from the Brief Visuospatial Memory Test-Revised; Instrumental Activities = Direct Assessment of Functional Status; Verbal Memory = Delayed recall T score from the Hopkins Verbal Learning Test-Revised; Cognition = Mini Mental State Examination; Everyday Memory = Standard profile score from the Rivermead Behavioral Memory Test. Treatment was coded as 1 = received Memory Intervention, 0 = received Health Intervention; Age and Education are in years; Hispanic was coded as 1 = Hispanic, 0 = not Hispanic (White is the reference group); Black was coded as 1 = Black, 0 = not Black (White is the reference group); Class Attendance refers to the number of intervention classes attended by the participant not including booster sessions; Pretest = the baseline score on the dependent variable of interest.

Table 4

HLM Results for Memory Self-Report Measures

	Baseline		Baseline to Post-Classes		Baseline to End of Study	
	Coefficient	**SE**	**Coefficient**	**SE**	**Coefficient**	**SE**
Memory Complaints						
Treatment	−0.014	0.068	0.050**	0.019	0.006**	0.002
Age	−0.017**	0.006	−0.003	0.002	−0.001**	0.000
Education	0.011	0.011	0.002	0.004	0.000	0.000
Hispanic	0.123	0.111	0.007	0.037	0.000	0.003
Black	−0.171	0.110	−0.010	0.033	−0.004	0.003
Class Attendance			0.010	0.011	0.000	0.001
Pretest			0.010	0.017	0.002	0.002
Intercept	3.836**	0.483	0.072	0.187	0.039*	0.018
Memory Self Efficacy						
Treatment	4.033*	2.082	0.308	0.651	0.035	0.077
Age	−0.611**	0.179	−0.090	0.063	−0.008	0.007
Education	0.571	0.349	−0.028	0.118	0.015	0.012
Hispanic	−0.669	3.533	−1.083	1.253	−0.209	0.124
Black	−2.209	3.475	−0.772	1.055	−0.307*	0.126
Class Attendance			−0.114	0.376	0.030	0.045
Pretest			−0.001	0.019	−0.006**	0.002
Intercept	83.913**	14.918	8.419	5.926	0.567	0.657
External Strategies						
Treatment	−0.068	0.067	0.026	0.020	0.005	0.003
Age	−0.001	0.006	0.001	0.002	0.000	0.000
Education	−0.006	0.011	−0.003	0.004	0.000	0.000
Hispanic	−0.487**	0.114	−0.021	0.042	0.005	0.004
Black	−0.259*	0.111	0.019	0.036	0.004	0.004
Class Attendance			0.019	0.012	−0.001	0.001
Pretest			−0.029	0.019	0.001	0.002

	Baseline		Baseline to Post-Classes		Baseline to End of Study	
	Coefficient	SE	Coefficient	SE	Coefficient	SE
Intercept	4.262**	0.479	−0.051	0.190	−0.025	0.019
Internal Strategies						
Treatment	0.109	0.062	0.027	0.019	0.004	0.002
Age	−0.003	0.005	0.002	0.002	0	0
Education	0.015	0.011	0.004	0.004	0.001	0
Hispanic	−0.321**	0.109	0.022	0.038	0.004	0.004
Black	−0.13	0.107	0.036	0.032	0.001	0.004
Class Attendance			0.022*	0.011	0	0.001
Pretest			0.02	0.02	0	0.002
Intercept	3.572**	0.451	−0.413*	0.18	−0.012	0.02

* *Note.* p≤.05,

** p≤.01 Memory Complaints = Memory Complaints Inventory from the Metamemory in Adulthood Questionnaire; Memory Self Efficacy = Memory Self Efficacy Questionnaire; External Strategies = External strategies scale from the Metamemory in Adulthood Questionnaire; Internal Strategies = Internal strategies scale from the Metamemory in Adulthood Questionnaire. Treatment was coded as 1 = received Memory Intervention, 0 = received Health Intervention; Age and Education are in years; Hispanic was coded as 1 = Hispanic, 0 = not Hispanic (White is the reference group); Black was coded as 1 = Black, 0 = not Black (White is the reference group); Class Attendance refers to the number of intervention classes attended by the participant not including booster sessions; Pretest = the baseline score on the dependent variable of interest.