Published in final edited form as:
Arch Psychiatr Nurs. 2008 April ; 22(2): 87–94.

Comparing the Efficiency of an Eight-Session Versus Four-Session Memory Intervention for Older Adults

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Abstract

Evidence that a reduced treatment achieves similar outcomes is beneficial because shorter interventions may be more cost-effective and more acceptable to participants. We examined the effects of shortening a memory intervention for elders from 8 sessions to 4 sessions. Shortening the intervention had little impact on either self-reported or performance measures of memory and daily living activities. Small to moderate effects were associated with positive change in both groups. When examining the cost-effectiveness, the 8-session intervention produced slightly greater gains in memory performance, but at a higher cost. Future studies should systematically vary key intervention components in more diverse samples.

Keywords

Intervention Evaluation; Elderly Memory; Cost-Effectiveness

Characteristics of the intervention itself are an important, but often under-investigated, component in treatment research. Yeaton and Sechrest (1981) identified three key intervention characteristics: strength, integrity, and effectiveness. Strength refers to the amount and intensity of the treatment, while integrity refers to fidelity of the treatment delivery and effectiveness refers to magnitude of the effect. The strength of a psychosocial intervention can be manipulated by changing the number and/or length of sessions, somewhat analogous to dose-response analysis in medicine. The Treatment Fidelity Workgroup of the National Institutes of Health Behavior Change Consortium has also identified dosage as a key design component to consider when assessing treatment fidelity (Bellg, et al., 2004). Studying different levels of treatment strength is particularly appropriate when there is limited previous research, practice, or theory to guide treatment delivery (Lipsey, 1990).

Evidence that a reduced treatment achieves similar outcomes is beneficial because shorter interventions may be more cost-effective and more acceptable to participants. Cost-effectiveness is defined as the efficacy of an intervention in achieving targeted outcomes in relation to its costs (Rossi, Freeman, and Lipsey, 1999). Cost effectiveness analysis has become extremely popular in health care, because resources continue to be constrained and such analysis provides guidance on how best to allocate scare health care dollars (Buerhaus, 2004). In conducting such studies, researchers often conduct sensitivity analyses, to estimate

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the consequences of varying key components (Rossi, Freeman, and Lipsey, 1999). The purpose of this study, therefore, was to investigate the efficiency of shortening a memory intervention on targeted memory and health-related outcomes among community dwelling elders. The following research question was posed: What are the changes across time in memory and functional outcomes for those who received memory classes delivered over 8-sessions compared with those who received 4 sessions?

METHODS

Recruitment

Following approval from the researchers' Institutional Review Board, study participants in the 8-session memory intervention were recruited from metropolitan Central Texas through mass media, and direct recruitment at city-run senior activity centers, churches, and community activities. Sample size was based upon a power analysis designed to determine the number of subjects needed to detect a statistically significant difference in the outcome measures. All individuals were pre-screened to meet the eligibility criteria of being 65 years of age or older, having no vision and or hearing problems that would interfere with class participation, English speaking, living independently in the community, and having reliable transportation. At the initial screening, participants gave informed consent and completed the Mini-Mental Status Examination (Folstein, Folstein, & McHugh, 1975) designed to screen out those with moderate to severe cognitive impairment. The original MMSE criterion was set at 23. However, 3 minority group participants with low educational level who had MMSE scores of 20 or above were allowed to participate because previous studies have shown that the MMSE cut off should be adjusted downward for this group (Blesa, et al., 2001), and these three individuals evidenced no other indication of dementia. Eligible participants then completed a battery of performance tests and self-report measures designed to assess memory functioning, attitudes toward memory, and activities of daily living prior to participating in the memory classes. At the conclusion of the 8 sessions, they again completed the same battery of performance tests and self-report measures.

To assess the impact of shortening the intervention, a second group of elders from the same geographic area was recruited to participate in an educational intervention with half as many sessions. Participants in the 4-session intervention were all recruited from a YMCA senior exercise class. They met the same inclusion criteria as the initial 8-session group and completed the same assessment battery at the beginning and end of their memory intervention. Because the intervention was designed to be delivered in small groups of less than 30 participants, 27 individuals were recruited to participate in the group that tested the shortened intervention.

Interventions

The same doctorally-prepared educational psychologist, who had extensive experience working with older adults, was the instructor for all classes. The classes were held in small groups of 30 or less in community locations that were convenient for participants.

Description of Primary Intervention—The Cognitive Behavioral Model of Everyday Memory built upon knowledge gained from previously developed intervention models designed to enhance older adults' memory performance. The first, Concentration and Menmonic training, emphasized relaxation training and taught one or two mnemonic strategies (Yesavage, 1983, 1984; Yesavage, Rose, & Spiegel, 1982; Yesavage & Jacob, 1984). The second, the Adult Development and Enrichment Project (ADEPT), emphasized fluid ability training (Baltes, Kliegel, Dittman-Kohli, 1988; Baltes, Sowarka, & Kliegel, 1989; Dittmann-Kohli, et al., 1991; Willis, Blieszner, & Baltes, 1981; Willis & Schaie, 1986; Willis & Nesselroade, 1990; Willis, Jay, Diehl, & Marsiske, 1992). The third, Cognitive Restructuring, emphasized “control,” individuals can exercise over their memory (Lachman, et al., 1987; Lachman et al., 1992). However, these intervention models ignored important aspects of memory training now known to influence memory performance, in particular memory self-efficacy (beliefs and confidence), and metamemory (knowledge and perceptions). In their meta-analyses, Floyd and Scogin (1997) and Verhaeghen, Marcoen, and Goossens (1992) concluded that future intervention studies should include ways to increase participants’ awareness and knowledge (metamemory), decrease their negative beliefs (memory self-efficacy), and decrease their negative memory-related affect (anxiety) because modification of negative attitudes toward cognitive aging is essential for the successful interventions.

The Cognitive Behavioral Model of Everyday Memory (CBMEM) addressed all of the above concerns, which are known to influence memory performance (Dellefield & McDougall, 1996; McDougall, 1998, 1999). It utilized a group format, which was considered preferable to individual or self-directed training since participants are a cohort experiencing similar memory-related phenomena. Participants are assumed to benefit from vicarious experience in developing solutions and strategies, and from learning through their own enactive mastery experiences (McDougall, 1999). Investigators have recommended that memory improvement training be multi-factorial. For example, training in visual imagery skills facilitates learning mnemonic strategies (Stigsdotter Neely & Backman, 1993; Stigsdotter Neely and Backman, 1995; West, 1989), and visual imagery and relaxation skills are often maintained more effectively than one or two mnemonic strategies taught in the classroom. Therefore, this study taught participants to use visual imagery and stress inoculation techniques to facilitate remembering. Derived from Bandura’s Self-Efficacy Theory (1997), the CBMEM intervention provided a unique package of cognitive skill development in exposure, repeated practice, relevant modeling from an older adult facilitator, self-modeling, cognitive skill modeling, exhortation, suggestion, and desensitization. It integrated didactic content and practical application.

Utilizing content from Fogler and Stern (1994), the CBMEM was initially presented in eight class sessions, one and one half hours per session. It had been pilot tested with another group of elders, and the results indicated a statistically significant increase in subjective and objective memory measures following the 8 sessions (McDougall, 2002). Classes met twice a week for a total of twelve hours and incorporated the following: stress inoculation and muscle relaxation, recall of names and faces, and practice of various memory strategies designed to strengthen performance accomplishment. At each session, participants were given homework, which was reviewed at the next session. A list of common problems and concerns was made, including health factors that can affect aging. The thoughts and feelings that occur when subjects forget were then discussed, and group solutions to problems and reactions to problems were identified. Participants were asked to describe memory successes and failures and to write out specific questions that they would like answered by the group. Feedback on performance accomplishments and verbal persuasion were given continually throughout the session.

Description of Short Intervention—Following delivery of the 8-session intervention, a condensed six-hour version of the same content was developed. Individuals were recruited into a class that met twice a week for 1 ½ hours, for a total of 4 sessions. While the number of sessions was shortened by combining topics and shortening the discussion period, at least half of the class time was still dedicated to feedback and practice. As with the 8-session classes, each session began with a relaxation exercise, included several exercises participants engaged in to illustrate the lectures, as well as reviews at the end of each class that included questions concerning the content of the lecture.

Description of Instruments—This study utilized multiple outcome measures of memory performance, attitudes, and beliefs toward memory, as well as instrumental activities of daily living. Connecting memory-enhancing interventions to improved functional ability presumably assists older adults to remain independent and this connection was reflected in the intervention content, as well as the outcome measurement.

Verbal memory performance was tested with the Hopkins Verbal Learning Test-Revised (HVLT-R), which assesses immediate recall, delayed recall, and recognition memory. (Shapiro, Benedict, Schretlen & Brandt, 1999). The test/retest correlation was .66 for the Delayed Recall Subscale, which was used here. Delayed Recall scores were highly correlated with the Logical Memory Subscale of the Weschler Memory Scale Revised.

Visual memory performance was determined with the Brief Visuospatial Memory Test-Revised (BVMT-R), which asks the individual to reproduce a series of geometric designs. (Benedict, Dobraski, & Goldstein 1999). BVMT scores were moderately correlated with the Visual Reproduction Subscale of the Wescler Memory Scale Revised and the Recall Trial of the Complex Figures Test.

Designed to reflect everyday memory, the Rivermead Everyday Behavioural Memory (RBMT) Test 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). A .78 correlation has been reported for test-retest reliability. Scores have been moderately related to other memory measures, such as the Ravens Progressive Matrices Test. The standardized profile score (SPS) has a possible range from 0–24 and is sometimes interpreted with regard to cut-off points for four groups of memory function: *normal* (22–24), *poor memory* (17–21), *moderately impaired* (10–16), *and severely impaired memory* (0–9).

The 85-item Direct Assessment of Functional Status (DAFS), measures performance in test time orientation, communication abilities, transportation, financial skills, shopping skills, eating skills and dressing/grooming skills (Lowenstein et al., 1989). The instrument has been validated with elders living in the community. The DAFS has high interrater and test-retest reliabilities for both patients presenting to a memory disorder clinic (English and Spanish speaking) and for normal controls.

The Memory Self Efficacy Questionnaire (MSEQ) (Bandura, 1997; Berry, West, & Dennehey, 1989) asks respondents to predict their performance level and estimate their strength and confidence in performing ten everyday tasks, such as those addressed in this intervention. In a study using community elders, McDougall (1994) reported coefficients of reproducibility for level ($r = .88$) and strength ($r = .95$). Scores on the MSEQ were shown to be related to memory performance (McDougall, 2004). In this study, the 35-item version of the MSEQ was used.

The Metamemory in Adulthood Questionnaire (MIA) assesses affect, beliefs, and knowledge of memory (Dixon, Hultsch & Hertzog, 1988). The MIA consists of 108 statements, with responses rated on a 5-point Likert scale that are compiled into seven scales. *Achievement* is the perceived importance of having a good memory and of performing well on memory tasks. High scores indicate higher perceived importance of memory. *Anxiety* is the rating of the influence of anxiety and stress on performance. The higher the score, the more the anxiety. *Capacity* is the perception of memory capacities as measured by predictive report of performance on given tasks, with high scores indicating high capacity. *Change* is the perception of memory abilities as generally stable or subject to long-term decline. Higher scores indicate perceived memory stability. *Locus* is the individual's perceived personal control over remembering abilities. Higher scores indicate an internal locus. *Task* is perceived knowledge of basic memory processes, especially the knowledge of how most people perform. The higher the score, the greater the perceived knowledge. *Strategy* is perceived knowledge of one's remembering abilities including reported use of mnemonics, strategies, and memory aids. The higher the score, the greater the use of strategies. When used with middle aged and older adults, Cronbach alpha coefficients for the seven subscales ranged from .79 to .92.

RESULTS

Table 1 shows the demographic characteristics of those who participated in the original 8-session group (n=135), compared with the 4-session group that was subsequently recruited to test the shorter intervention (n=27). The 8-session cohort was somewhat more likely to be female and Hispanic, while the 4-session group was more likely to be African-American and married. Both groups were generally highly educated and similar in age. Educational level was the only statistically significant demographic difference between the two groups. Fifty-three percent of the 8-session group had Rivermead scores that put them in the Poor memory performance category and 20% fell into the Moderately or Severely Impaired category. In the 4-session group, 52% had Rivermead scores in the Poor memory performance category, and 26% were in the Moderately Impaired Category. Average MMSE scores were also similar for the two groups.

PROC General Linear Models in SAS 8.2 was used to analyze change over time simultaneously for the two intervention groups. Although educational level was the only statistically significant difference between the two intervention groups, age, minority group status, marital status, and gender as well as education were entered as covariates to reduce variance associated with these factors in the analyses. Separate analyses were performed for each scale or subscale, resulting in 12 analyses. Table 2 shows the score differences across time for each group.

Scores on all memory performance measures improved somewhat. The change in everyday memory scores, as measured by the Rivermead, was statistically significant only in the 8-session group although the effect size on the Rivermead (computed as a d statistic) was similar for both groups (d=.29 for the 8-session group and d=.25 for the 4-session group). The increase in functional level measured by the DAFS was statistically significant for both groups, although this change was associated with a moderate effect size for the 4-session group (d=.43) and a small effect size in the 8-session group (d=.23).

Both groups increased their scores on the memory self efficacy measure (MSEQ), but only the 4-session group increase was statistically significant ($p<.01$) and showed greater change. With the exceptions of the Achievement and Anxiety Scales, scores on the MIA, a measure of self-reported metamemory, generally rose for both groups, although only 5 of these differences in the 8-session group and 2 of the differences in the 4-session group were statistically significant at $p<.05$. The accompanying effect sizes provide a more complete analysis of these differences. While the 8-session group significantly improved their MIA Scores on 4 of the 7 subscales, only two of these changes (Change and Locus) were associated with moderate effect sizes (d=.51 and .47, respectively). The increase in scores on the Change Scale was also statistically significant for the 4-session group and associated with a moderate effect size (d=.46). Scores on the MIA Achievement Scale decreased significantly for both groups, but only in the 4-session group was the change associated with a moderate effect size (d=.62).

We also examined differences between the groups at baseline and after the intervention as part of the GLM procedure. There were no statistically significant differences between the 4-session and 8-session groups at baseline, when controlling for demographic factors. The only significant difference between groups post-intervention was on the MIA Locus Scale (d=.32, $p<.05$), with the 8 session group having much higher post-test scores (i.e., more internally focused) than the 4 session group.

Cost-effectiveness analysis

Comparing the cost-effectiveness of each memory intervention is another way to evaluate the difference between them. The major expenditure for the intervention was the presenter's salary. Assuming that the intervention was delivered to an average of 10 people per group, then the cost was $ 10 per person for each class ($100 per session for the presenter divided by 10 participants). The cost per person for the 8-session classes was $80 versus $40 per person for the 4-session classes. Using the differential increase in Rivermead scores for the two groups, then the cost-effectiveness of the two programs can be computed by dividing the identified cost by the corresponding score increase (Windsor, Baranowski, Clark, & Cutter, 1994). The comparative cost-effectiveness for the average score increase was $ 89.32 for the 8-session classes versus $ 52.62 for the 4-session classes.

DISCUSSION

This study examined the effect of varying a key intervention characteristic identified by Yeaton and Sechrest (1981) and the NIH Treatment Fidelity Workgroup (Bellg, et al., 2004) – the strength of the intervention. The findings suggest that shortening the memory intervention from 8 sessions to 4 sessions did not appreciably alter the outcome. While more of the increases for the 8-session intervention group reached statistical significance, the effect sizes tended to be small to moderate for both groups (d= .01–.51 for the 8-session group and d= .002–.66 for the 4-session group). This finding is consistent with Salthouse's recent review (2006), indicating that cognitive training produces modest gains that tend to have limited generalization to related cognitive skills.

The content of both the 4-session and the 8-session interventions incorporated relaxation to desensitize participants' anxiety about memory, repeated practice to build enactive mastery experiences, and used an older adult facilitator who could model memory self-efficacy, all of which are consistent with Bandura's Self-Efficacy Theory. Interestingly, while both groups increased their Memory Self Efficacy Questionnaire scores, the shorter intervention group showed greater change. While we might assume that the longer intervention would allow more time to build self-efficacy, perhaps there is a point beyond which additional practice is no longer effective. The relative effectiveness of self-efficacy "dosage" certainly merits further investigation.

The decrease in MIA Achievement and Anxiety scores for both groups is interesting. Items on these scales measure how important it is to respondents to have a good memory and how concerned they are about their memory. Twelve (75%) of the MIA achievement questions emphasize the importance of and motivation to sustain memory function. Therefore, high achievement scores at pretest may have motivated participants to enroll in the memory intervention. Both classes provided realistic information by an older adult role model on the normative aspects of cognitive function and aging while decreasing negative control beliefs held by many individuals. This focus may explain the decrease in scores on these two self-report scales. Since the majority of participants in both groups fell into the Poor Memory Group on the Rivermead, which is a measure of every day memory functioning, decreasing anxiety about memory deficits may be particularly important for these individuals.

Both intervention groups increased significantly on the DAFS, which is a performance measure of instrumental activities of daily living. Instrumental activities become more difficult with advanced age, and this study was among the first to demonstrate that a comprehensive efficacy-based intervention targeted to improve memory beliefs and knowledge may transfer learning from the classroom to everyday function, or instrumental activities of daily living (Ball et al., 2002; Laukanen, Kauppinen, Era, & Heikkinen, 1993). In fact, the ACTIVE trials failed to show a lasting transfer effect to everyday functional ability (Willis, et al., 2006). Future research should investigate more completely the long-term relationship between memory training and functional ability.

Because all participants were recruited in the same community, the findings are not necessarily generalizable to other populations. Although multi-ethnic samples were recruited, the analysis should be replicated with more diverse groups. Both groups studied here tended to be fairly well educated, albeit many had some memory deficits. It is not clear how shortening the intervention would affect the outcomes for less educated participants or those with more significant memory impairment. While the two groups did not differ significantly on study measures at baseline, or any demographic variable except education, other differences between the groups may explain the pattern of results observed here. Consequently, the analysis should be replicated in a study where individuals can be randomly assigned to the 4-session, versus the 8-session intervention, and both interventions conducted at the same point in time rather than sequentially, as was done here.

The 8-session intervention produced slightly greater gains in memory performance, but they came at a higher cost. The comparative cost-effectiveness for the average score increase on the Rivermead memory performance measure was $ 89.32 for the 8-session classes versus $ 52.62 for the 4-session classes. This rudimentary analysis demonstrates the importance of considering both costs and outcomes when determining the optimal intervention “dosage”. A more complete cost-effectiveness analysis would include other program costs, such as advertising and materials, although many of these costs, such as advertising, would be the same for both interventions. Future analyses might also consider longer-term outcomes, such as patient care costs for those individuals whose memory eventually declines to such a point that they require medical care or institutionalization, although this would necessitate long-term follow-up of intervention participants. Another consideration is “opportunity costs” to participants, who may find a shorter intervention more attractive, because it allows them to pursue other activities in the time “saved” by the shorter intervention.

In conclusion, studies such as this one, which systematically examine the effects of varying key characteristics of psychosocial interventions, can help researchers design studies that are both efficacious and efficient. Findings from this analysis suggest that a 4-session memory intervention of the type described here is associated with outcomes that are similar to those of a longer intervention. Future studies should vary other characteristics of the intervention – the amount of practice, for example – to determine their relative efficiency. Such studies might also compare the relative benefits of a shorter intervention for those with differing levels of cognitive functioning.

Acknowledgements

Support for this research was provided by NIA Grant R01 AG15384. The authors wish to acknowledge the assistance of Vonette Austin-Wells, Ph.D., Minseong Kim, Ph.D., Philip Vaughan, MA, and Taylor Acee, MA in the preparation of this manuscript.

References

Ball K, Berch DB, Helmers KF, Jobe JB, Leveck MD, Marsiske M, Morris JW, Rebok GW, Smith DM, Tennstedt SL, Unverzagt FV, Willis SL. Effects of cognitive training interventions with older adults: A randomized trial. JAMA 2002;288(18):2271–2281. [PubMed: 12425704]

Baltes PB, Kliegel R, Dittman-Kohli F. On the locus of training gains in research on the plasticity of fluid intelligence in old age. Journal of Educational Psychology 1988;80(3):392–400.

Baltes PB, Sowarka D, Kliegel R. Cognitive training research on fluid intelligence in old age: What can older adults achieve by themselves? Psychology and Aging 1989;4(2):217–221. [PubMed: 2789749]

Bellg AJ, Borrelli B, Resnick B, Hecht J, Minicucci DS, Ory M, Ogedegbe G, Orwig D, Ernst D, Czajkowski S. Enhancing treatment fidelity in health behavior change studies: best practices and recommendations from the Behavior Change Consortium. Health Psychology 2004;23(5):443–451. [PubMed: 15367063]

Bandura, A. Self-efficacy: The Exercise of Control. NY: W. H.Freeman; 1997.

Benedict RH, Dobraski M, Goldstein MZ. A preliminary study of the association between changes in mood and cognition in a mixed geriatric psychiatry sample. Journals of Gerontology Psychological Sciences Social Sciences 1999;54B(2):P94–99.

Blesa R, Pujol M, Aguilar M, Santacruz P, Bertran-Serra I, Hernandez G, Sol JM, Pena-Casanova J. Clinical validity of the “minimental state’ for Spanish speaking communities. Neuropsychologia 2001;39:1150–1157. [PubMed: 11527552]

Berry JM, West RL, Dennehey DM. Reliability and validity of the memory self-efficacy questionnaire. Developmental Psychology 1989;25(5):701–713.

Buerhaus, P. Why cost effectiveness analysis. Paper presented at Integrating Cost-Effectiveness Analysis in Research. Symposium sponsored by the National Institute of Nursing Research, The National Institutes of Health, Agency for Healthcare Research and Quality, and The Institute for Johns Hopkins Nursing; Bethesda, MD. Aug. 2004

Cockburn J, Smith PT. The relative influence of intelligence and age on everyday memory. Journal of Gerontology: Psychological Sciences 1991;46:31–31.

Dellefield KS, McDougall GJ. Increasing metamemory in community elderly. Nursing Research 1996;45 (5):284–290. [PubMed: 8831655]

Dittmann-Kohli F, Lachman ME, Kliegl R, Baltes P. Effects of cognitive training and testing on intellectual efficacy beliefs in elderly adults. Journal of Gerontology 1991;46(4):162–164.

Dixon RA, Hultsch DF, Hertzog C. The metamemory in adulthood (MIA) questionnaire. Psychopharmacology Bulletin 1988;24(4):671– 688. [PubMed: 3249770]

Floyd M, Scogin F. Effects of a memory training on the subjective memory functioning and mental health of older adults: Meta-analysis. Psychology & Aging 1997;12(1):150–161. [PubMed: 9100276]

Fogler, J.; Stern, L. Teaching memory improvement to adults. Rev Ed. Baltimore and London: John Hopkins University Press; 1994.

Folstein MD, Folstein SE, McHugh PR. Mini-Mental State’: A practical method for grading the cognitive state of patients for the clinician. Journal of Psychiatric Research 1975;12:189–198. [PubMed: 1202204]

Lachman ME, Steinberg ES, Trotter SD. Effects of control beliefs and attributions on memory self-assessments and performance. Psychology and Aging 1987;2(3):266–271. [PubMed: 3268218]

Lachman ME, Weaver SL, Bandura M, Elliott E, Lewkowicz CJ. Improving memory and control beliefs through cognitive restructuring and self-generated strategies. Journal of Gerontology: Psychological Sciences 1992;47(5):P293–P299.

Laukanen P, Kauppinen M, Era P, Heikkinen E. Factors related to coping with physical and instrumental activities of daily living among people born in 1904–1923. International Journal of Geriatric Psychiatry 1993;8:287–296.

Lipsey, M. Design Sensitivity: Statistical Power for Experimental Research. Newbury Park, CA: Sage Publications; 1990.

Lowenstein D, Amigo E, Duara R, Guterman A, Hurwitz D, Berkowitz N, Wilkie F, Weinberg G, Black B, Gittelman B, Eisdorfer C. A new scale for the assessment of functional status in Alzheimer’s disease and related disorders. Journal of Gerontology: Psychological Sciences 1989;44(4):P114–P121.

McDougall GJ. Predictors of metamemory in older adults. Nursing Research 1994;43(4):212–218. [PubMed: 8047425]

McDougall, GJ. Cognitive interventions among older adults. In: Fitzpatrick, JJ., editor. Annual Review of Nursing Research. 17. NY: Springer Publishing; 1999. p. 219-240.

McDougall GJ. Memory improvement in octogenarians. Applied Nursing Research 2002;15(1):2–10. [PubMed: 11840404]

McDougall GJ. Memory self-efficacy and memory performance among black and white elders. Nursing Research 2004;53(4):323–331. [PubMed: 15385869]

Rossi, PH.; Freeman, HE.; Lipsey, MW. Evaluation: A Systematic Approach. Newbury Park, CA: Sage Publications; 1999.

Salthouse TA. Mental exercise and mental aging. Perspectives on Psychological Science 2006;1(1):68–87.

Shapiro AM, Benedict RH, Schretlen D, Brandt J. Construct and concurrent validity of the Hopkins Verbal Learning Test-revised. Clinical Neuropsychology 1999;13(3):348–358.

Stigsdotter Neely A, Backman L. Maintenance of gains following multifactorial and unifactorial memory training in late adulthood. Educational Gerontology 1993a;19:105–117.

Stigsdotter Neely A, Backman L. Long-term maintenance of gains from memory training in older adults: Two 31/2-year follow-up studies. Journal of Gerontology: Psychological Sciences 1993b;48B (3):P233–237.

Stigsdotter Neely A, Backman L. Effects of multifactorial memory training in old age: Generalizability across tasks and individuals. Journal of Gerontology: Psychological Sciences 1995;50B(3):P134–140.

Verhaeghen P, Marcoen A, Goossens L. Improving memory performance in the aged through mnemonic training: A meta-analytic study. Psychology and Aging 1992;7(2):242–251. [PubMed: 1535198]

West, RL. Planning practical memory training for the aged. In: Poon, LW.; Rubin, DC.; Wilson, BA., editors. Everyday cognition in adulthood and late life. Cambridge: Cambridge University; 1989. p. 573-597.

Willis SL, Blieszner R, Baltes PB. Intellectual training research in aging: Modification of performance on the fluid ability of figural relations. Journal of Educational Psychology 1981;73(1):41–50.

Willis SL, Schaie KW. Training the elderly on the ability factors of spatial orientation and inductive reasoning. Psychology and Aging 1986;1(3):239–247. [PubMed: 3267404]

Willis SL, Nesselroade CS. Long term effects of fluid ability training in old-old age. Developmental Psychology 1990;26:905–910.

Willis SL, Jay GM, Diehl M, Marsiske M. Longitudinal change and prediction of everyday task competence in the elderly. Research on Aging 1992;14:68–91.

Willis SL, Tennstedt SL, Marsiske M, Ball K, Elias J, Koepke KM, Morris JN, Rebok GW, Unverzagt FW, Stoddard AM, Wright E. ACTIVE Study Group. Long-term effects of cognitive training on everyday functional outcomes in older adults. JAMA 2006;296(23):2805–2814. [PubMed: 17179457]

Windsor, R.; Baranowski, T.; Clark, N.; Cutter, G. Evaluation of Health Promotion, Health Education, and disease Prevention Programs. Mountain View, CA: Mayfield Publishing Company; 1994.

Yeaton W, Sechrest L. Critical dimensions in the choice and maintenance of successful treatments: strength, integrity, and effectiveness. Journal of Counseling and Clinical Psychology 1981;49(2): 156–167.

Yesavage JA, Rose TL, Spiegel D. Relaxation training and memory improvement in elderly normals: Correlation of anxiety ratings and recall improvement. Experimental Aging Research 1982;8(4):195–197. [PubMed: 6762966]

Yesavage JA. Imagery pretraining and memory training in the elderly. Gerontology 1983;29:271–275. [PubMed: 6873641]

Yesavage JA, Jacob R. Effects of relaxation and mnemonics on memory, attention, and anxiety in the elderly. Experimental Aging Research 1984;10(4):211–214. [PubMed: 6399035]

Yesavage JA. Relaxation and memory training in 39 elderly patients. American Journal Psychiatry 1984;141(6):778–781.

Table 1

Background Characteristics for 8 Session and 4 Session Groups

Variable	8 session (n=135) Frequency	%	4 session (n=27) Frequency	%
Gender:				
Male	30	22	10	37
Female	105	78	17	63
Ethnicity:				
White	96	72	21	78
African-American	14	10	5	19
Hispanic	24	18	1	4
Marital Status:				
Married	45	34	10	37
Non-Married	88	67	17	63
Average Age	75yrs		76yrs	
Education Level[a]	13yrs		15yrs	
Average MMSE Score	27.99		28.70	

[a]Significantly different at p<.01.

Table 2

Comparison of Outcomes for 8-Session and 4-Session Groups

	8 Session Group (n=135)				4 Session Group (n=27)			
	Time 1 Mean±SE	Time 2 Mean±SE	pvalue	e.s.	Time 1 Mean±SE	Time 2 Mean±SE	pvalue	e.s.
HVLT-r	45.33±1.03	46.64±0.99	0.09	0.15	47.76±1.93	49.98±1.86	0.47	0.14
BVMT_r	5.39±0.32	5.44±0.75	0.94	0.01	5.77±0.57	8.19±1.64	0.13	0.30
Rivermead	18.35±0.34	19.21±0.34	0.001	0.29	18.16±0.64	18.91±0.63	0.21	0.25
DAFS	81.45±0.40	82.19±0.42	0.01	0.23	82.30±0.72	83.66±0.80	0.03	0.43
MSEQ	49.54±2.03	50.86±1.98	0.28	0.10	45.00±3.71	53.79±3.60	0.01	0.66
MIA ACH	3.91±0.04	3.86±0.04	0.03	0.20	3.90±0.07	3.73±0.08	0.01	0.62
ANX	3.18±0.07	3.16±0.07	0.45	0.07	3.03±0.13	2.98±0.12	0.55	0.12
CAP	3.04±0.06	3.08±0.06	0.18	0.12	3.10±0.11	3.08±0.10	0.79	0.05
CHG	2.51±0.07	2.74±0.07	<.001	0.51	2.53±0.12	2.73±0.12	0.02	0.46
LOC	3.58±0.05	3.77±0.05	<.001	0.47	3.44±0.10	3.53±0.09	0.22	0.24
TSK	3.84±0.04	3.92±0.04	0.01	0.26	3.84±0.07	3.84±0.08	0.99	0.00
STR	3.61±0.05	3.71±0.05	0.01	0.26	3.67±0.09	3.71±0.10	0.50	0.14

Adjusted for gender, ethnicity/race, marital status, age, and education.

HVLT_R= Hopkins Verbal Learning Test-Revised; BVMT_R= Brief Visuospatial Memory Test-Revised; Rivermead = Rivermead Everyday Behavioural Memory; DAFS= Direct Assessment of Functional Status; MSEQ= Memory Self Efficacy Questionnaire; MIA= Metamemory in Adulthood Questionnaire with Achievement, Anxiety, Capacity, Change, Locus, Task, and Strategies subscales.