Aging Neuropsychology and Cognition
2001, Vol. 8, No. 4, pp. 256–268

1382-5585/01/0804-256$16.00

Improving Memory Knowledge, Satisfaction, and Functioning Via an Education and Intervention Program for Older Adults

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ABSTRACT

Many healthy older adults are concerned about memory change and are interested in learning techniques for enhancing memory function in their everyday lives. A memory education and intervention program was developed and administered to 36 community-dwelling older adults. Pretest–posttest change scores showed significant improvement on measures of knowledge (i.e., general facts about memory, memory strategies), metamemory (i.e., satisfaction with memory, self-rated memory ability), and objective memory performance (i.e., everyday prospective memory) in comparison to 24 demographically matched control participants. Findings support the effectiveness of memory education and training in improving everyday functioning, particularly for older adults whose memory concerns result from inadequate knowledge about memory and aging.

The aging process is accompanied by changes in several types of memory ability, including the ability to remember information and events that happened a few hours or days ago (i.e., recent or short-term memory) and the ability to remember to do things in the future (i.e., prospective memory; Craik, Anderson, Kerr, & Li, 1995). Although, these memory changes are a normal part of aging, the extent and impact of the changes can be significant. On standardized tests of recent memory, on average, healthy older adults in their 70s and 80s remember half as much information as younger adults in their teens and 20s (Delis, Kramer, Kaplan, & Ober, 1987; Wechsler, 1997). Such a decrease in memory ability can be associated with a wide range of consequences in everyday life, ranging from frustration or embarrassment at being unable to recall the name of an acquaintance to serious health risks associated with forgetting to take medications or attend medical appointments. Thus, memory interventions that would minimize the occurrence of everyday memory difficulties could have significant effects on general satisfaction with life as well as the ability to function independently.

As reviewed subsequently, it is clear that older adults can learn new mnemonic and behavioural memory strategies and that these strategies improve memory performance. Most approaches to memory improvement in older adults have focused on formal mnemonic techniques to improve performance on laboratory-based memory tasks. For example, instruction in the use of mnemonics such as the method of loci and the peg-word system results in improved memory for lists of concrete nouns and for word pairs (reviewed in Verhaeghen, Marcoen, & Goossens, 1992). Despite clear evidence that these techniques improve laboratory-based memory task performance, they are not readily applicable to most everyday memory tasks, and participants often do not continue to use them beyond the setting in

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Accepted for publication: April 23, 2001.

which the strategies were taught (Scogin & Bienias, 1988). Additionally, many mnemonic strategies require considerable effort to apply and are seldom used even by memory researchers who are presumably aware of their potential benefits (Park, Smith, & Cavanaugh, 1990). Because of the mounting evidence that traditional mnemonic training results in improved memory performance that is neither highly generalizable nor long lasting, it has been argued that this approach cannot be legitimately recommended for most people (Herrmann, Rea, & Andrzejewski, 1988). Rather, there is a need to provide training in memory strategies that are specific to everyday memory tasks, such as remembering appointments and learning names of new people (Andrewes, Kinsella, & Murphy, 1996; Herrmann et al., 1988).

There is relatively less research addressing the effectiveness of memory interventions emphasizing everyday memory tasks using less effortful strategies (Mohs et al., 1998). There are several theoretically-based strategies, however, that would appear to be especially useful for everyday memory tasks in the older-adult population. First, external memory aids, such as calendars, lists, and notes, are applicable to a wide range of prospective memory tasks, such as remembering appointments, medications, and tasks to be done. The usefulness of external memory aids has been demonstrated in patients with significant memory problems (Kapur, 1995), and by subjective report in healthy older adults (Intons-Peterson & Newsome, 1992). Another memory strategy, the spaced retrieval technique (Landauer & Bjork, 1978), is a method of repeatedly retrieving information to be remembered over increasingly longer intervals of time. Empirical studies have indicated that this is a powerful technique applicable to remembering many different types of information in a variety of populations (Cull, Shaughnessy, & Zechmeister, 1996; McKitrick, Camp, & Black, 1992; Rea & Modigliani, 1988; Schacter, Rich, & Stampp, 1985). Although, this technique has not been specifically applied to the healthy aging population, it is likely to be an excellent strategy, because it capitalizes on immediate memory (which does not change markedly with age) to improve recent memory (which changes with age; Craik et al., 1995) and because of the evidence that retrieval practice in general can improve later recall in this population (Kausler & Wiley, 1991). Another type of memory strategy involves using semantic techniques, such as forming semantic associations, using visualization, and organizing information to be remembered. Generally, processing new information semantically as opposed to phonetically results in improved memory for that information (Craik & Tulving, 1975). Similarly, memory performance improves when specific instructions to organize the information are provided (Bäckman & Larsson, 1992). Teaching older adults to use this type of approach to memory tasks may be particularly useful because they do not tend to use semantic strategies spontaneously, although they do benefit from semantic processing (Craik, 1977).

It becomes evident that it is necessary to address issues in addition to memory training to maximize the benefit received from memory intervention programs. There are many widely held myths about aging, including the idea that aging produces global and inevitable reductions in memory performance. However, the provision of factual information about memory and aging can result in modified negative beliefs (i.e., an increased sense of control over memory; Turner & Pinkston, 1993), and positive beliefs about control over memory are related to better objective memory performance (Cavanaugh & Poon, 1989). Similarly, programs aimed specifically at cognitive restructuring (Caprio-Prevette & Fry, 1996; Lachman, Weaver, Bandura, Elliott, & Lewkowicz, 1992) and other aspects of personal growth (e.g., interpersonal skills and relaxation; Zarit, Gallagher, & Kramer, 1981) produce equivalent changes in memory performance to programs emphasizing memory skills training. Finally, maximal improvement in memory functioning is obtained when group discussions allowing participants to share memory concerns and coping strategies are included within memory-skills training programs (Flynn & Storandt, 1990).

Providing the theoretical support for the effectiveness of everyday memory strategies as well as the added contributions of educational information, a program with two primary components, education and memory intervention, was

designed for healthy older adults. Regarding education, factual information was presented to dispel myths and to increase general knowledge about memory and aging. Regarding memory intervention, training in the use of specific memory strategies (i.e., external memory aids, spaced retrieval, and semantic association) was provided. Group discussions were integrated into each of the training sessions. In contrast to other programs reported in the literature, the practical, everyday memory needs of the participants were emphasized. Accordingly, the primary focus was on interventions for everyday memory tasks (e.g., remembering appointments or names of new acquaintances) rather than laboratory memory tasks (e.g., learning paired associates or word lists).

METHOD

Participants

All participants were community-dwelling older adults recruited via media advertisements and public lectures. The Memory and Aging Program (MAP) is an ongoing memory education and intervention program at Baycrest Centre for Geriatric Care. Program participants were individuals who enrolled in this program. Control participants were recruited specifically for the control condition and were drawn from the same sources as the program participants. Thus, participants were self-selected to the experimental and control conditions. As described subsequently, ascertaining of minimal pre-existing group differences, participants were matched for demographic characteristics and baseline memory performance.

To screen out participants with possible memory impairment, brief cognitive testing was conducted using two measures: (a) The modified version (Welsh, Breitner, & Magruder-Habib, 1993) of the Telephone Interview for Cognitive Status (TICS; Brandt, Spencer, & Folstein, 1988) was administered. Participants were required to obtain at least 30 out of 50 possible points, a cut-off score recommended by Welsh and colleagues (1993). (b) On a 10-item word-list memory task, participants were required to recall at least two items following a 30 s distraction interval. This cut-off score was derived from scores ($M = 4.8$, $SD = 1.6$) obtained by an independent sample of 24 older adults (Troyer & Craik, 1995) who were screened both for cognitive decline using the Mini-Mental State Examination (MMSE; Folstein, Folstein, & McHugh, 1975) and for medical problems that could affect cognition. Repeated testing on this memory task was one of the outcome measures and was described in more detail subsequently. Participants were also excluded if they did not complete either pretesting or posttesting. In order to include a representative sample of older adults, the presence of medical or health conditions did not serve as exclusionary criteria unless they resulted in poor scores on the cognitive screening measures. Altogether, 4 program and 4 control participants scored below the cut-off scores on one or both of the cognitive screening measures; 11 program and 3 control participants missed one of the testing sessions; and 3 program and 1 control participant met both exclusionary criteria. The final samples consisted of 36 program participants and 24 control participants.

Demographic characteristics and scores from the screening measures for the program and control groups are presented in Table 1. There were no significant differences between groups in age, $t(58) = 0.60$, education, $t(58) = 0.07$, sex, $\chi^2(1, n = 60) =$

Table 1. Demographic Characteristics and Screening Measures.

	Program participants ($n = 36$)		Control participants ($n = 24$)	
	M	(*SD*)	*M*	(*SD*)
Age	72.6	(9.1)	71.1	(10.0)
Education	13.6	(2.7)	13.7	(3.5)
Percent Female	81%		71%	
Word-List Recall	4.7	(1.4)	4.8	(1.6)
Modified TICS	37.1	(4.2)	37.5	(3.7)

Note. TICS: Telephone Interview for Cognitive Status. There were no significant group differences on any of these variables.

0.76, word-list recall performance, $t(58) = 0.22$, or modified TICS, $t(33) = 0.31$, all $ps > .10$.

Program

The MAP consisted of five weekly 2 hr sessions (for a total of 10 hr) and included education, intervention, and assessment. All sessions were conducted by the author. The program was conducted in 5 groups, with 9–15 participants in each group. The education and assessment components were conducted with each group as a whole; for the intervention component, participants were assigned to smaller groups of 4–7 participants each.

The content and activities of the five sessions are outlined in Table 2 and included the following: *Week 1*. After a welcome and general introduction to the program, all factual and self-report instruments (described subsequently) were administered. This required approximately 20 min of the 2 hr session. Next, via lecture, information was presented about the demographics of aging (e.g., changes in the proportion of seniors in society over the past several decades, changes and gender differences in life expectancy) and typical age-related physical changes (e.g., common health problems, physical changes in the brain). Cognitive abilities and their relation to aging were introduced. For each type of cognitive ability discussed, participants were provided with a definition, engaged in an exercise utilizing that ability, and were informed whether and how the ability changed with age. The abilities discussed during this week included cognitive speed, immediate memory, recent memory, remote memory, and prospective memory. All performance tasks used to evaluate the program (i.e., memory tasks described subsequently) were administered during this session. *Week 2*. Discussion of cognitive abilities continued and included attention, knowledge, and problem solving. Health issues relevant to memory and aging, such as those concerning medications, menopause, mood, and medical disorders such as dementia and thyroid disease, were discussed. As well, lifestyle issues that may affect age-related changes, including participation in physical exercise and cognitively-demanding activities, were reviewed. *Week 3*. Five types of memory strategies were described: paying close attention, writing down information, organizing information to be remembered, repeating new information using the spaced retrieval technique (Landauer & Bjork, 1978), and making information meaningful via visualization, semantic association, and elaboration. Subsequently, memory interventions were carried out. For this session, the interventions included learning how to remember new names and numbers using these strategies. Interventions were conducted via a combination of large-group lectures (i.e., information about how to use the strategy and the situations in which it might be useful), small-group discussion (i.e., brainstorming how the strategies could be applied to their everyday lives), and hands-on practice (e.g., learning the names of other class participants using semantic associations, learning a new telephone number using spaced repetition). At the end of the session, participants were given assignments for practicing the strategies daily. *Week 4*. Assignments from the previous week were discussed, and participants received guidance regarding any difficulties they experienced using the strategies. Memory intervention continued in the same manner as Week 3, and included learning how to remember appointments, lists, past events, and locations of items using the previously presented memory strategies. Again, daily practice assignments were given. *Week 5*. Assignments from the previous week were discussed. Next, participants engaged in an interactive review of the information and skills presented via education and intervention in the preceding four sessions. Finally, at the end of the session, all assessment instruments were re-administered. Throughout the sessions, participants were encouraged to ask questions and discuss their experiences with the class.

For the control condition, 5 groups containing 4–7 participants each were involved. Similar to the program participants, control participants completed the questionnaires and memory tasks used for program evaluation on two occasions separated by four 4 weeks, as shown in Table 2. Controls did not receive any other educational, intervention, or assessment components of the program, and were not involved in any other memory-related programs or research projects at the time of their participation.

Goals

The goals of the program were focused on the dual purposes of education and memory intervention. Successful education was expected to result in: (a) increased knowledge about memory and aging in general; (b) a larger toolbox or repertoire of memory strategies with which the participants were familiar; and (c) as a result of increased knowledge, increased reassurance and satisfaction with memory for participants experiencing normal age-related changes. Successful memory intervention was expected to result in (a) improved self-reported everyday memory functioning and use of memory strategies; and (b) improved objective memory performance.

Table 2. Schedule of the Program and Control Conditions.

Week	Program condition	Control condition
1	*Welcome and introduction*	*Welcome and introduction*
	Assessment: Factual and self-report instruments	*Assessment*: Factual and self-report instruments
	Education: Demographics, physical changes, cognitive abilities I	
	Assessment: All performance tasks	*Assessment*: All performance tasks
2	*Education*: Cognitive abilities II, health and lifestyle issues	
3	*Education*: Overview of memory strategies	
	Intervention: Remembering names and numbers; homework assigned	
4	*Intervention*: Remembering appointments, past events, and locations of items; homework assigned	
5	*Review*: Education and intervention components	
	Assessment: all instruments	*Assessment*: all instruments

Instruments

To examine the success at reaching these goals, a number of objective tests and subjective self-report questionnaires were administered as pretests during the first session and as posttests during the final session.

Aging Quiz

A 16-item multiple-choice factual quiz was designed to cover the major content areas presented in the program. Each item contained two, three, or four possible answers; overall chance performance level was 4.8 correct responses. Three forms of the quiz were created in order to allow pretesting, immediate posttesting, and eventual long-term follow up. Each form covered the same content areas but contained slightly different questions. The three forms were of equivalent difficulty; when administered as pretests, there were no significant differences in scores, $F(2, 54) = 1.14$, $p = .327$. The use of each quiz for pretest or posttest was counterbalanced across participants.

Strategy Repertoire

This questionnaire provided a measure of the number and quality of memory strategies that were familiar to the participants. Six memory situations requiring the application of a memory strategy (e.g., learning the name of a new acquaintance, learning a new telephone number, remembering events that happened in the past) were presented via questionnaire. Participants were asked to list the strategies that would be useful for each situation. Responses were scored in terms of the number and quality of the strategies listed. Two points were awarded for each strategy that was effective, specific to the situation, and required self-reliance (e.g., visualize the name, keep a journal); one point was awarded for strategies that were less effective, nonspecific, or involved reliance on others (e.g., pay attention, ask someone else); no points were awarded for ineffective strategies and for responses that were not memory strategies (e.g., memorize the information, look up a number in the telephone book). This measure was not available when the initial participants were tested; 26 program participants and 11 control participants completed the questionnaire.

Multifactorial Memory Questionnaire (MMQ)

The MMQ (Troyer & Rich, in press) consists of three questionnaires tapping different aspects of metamemory, as described subsequently. Previous research with each scale (Troyer & Rich, in press) indicated evidence of content validity (i.e., classification of questionnaire items into their respective scales by memory experts), factorial validity (i.e., factorial loadings of each item onto their respective scales), 4-week test–retest reliability, intratest reliability (i.e., internal consistency using Cronbach's alpha), convergent construct validity (i.e., correlations with related metamemory scales and tests of objective memory function), discriminant construct validity (i.e., low correlation with tests of attention), and independence from demographic variables (i.e., age, education, and sex) and mental status, among 115 older adults.

MMQ-Contentment
This self-report questionnaire was used to assess satisfaction with one's own memory ability. The scale includes 18 items encompassing a broad range of possible emotions (e.g., confidence, concern, embarrassment, and irritation) and perceptions of one's own memory (e.g., comparison to peers, presence of a serious memory problem). Participants rated the degree to which they agreed with each statement on a 5-point Likert scale, and possible scores ranged from 0 to 72.

MMQ-Ability
This questionnaire was used to assess self-reported everyday memory functioning. Twenty different everyday memory mistakes (e.g., forgetting to run an errand, not being able to recall a name) were rated on a 5-point scale based on the frequency with which they occurred over the past 2 weeks. Items were scored such that higher scores indicate better self-reported memory ability (i.e., fewer memory mistakes), with possible scores ranging from 0 to 80.

MMQ-Strategy
This questionnaire was used to assess self-reported use of 19 different memory aids and strategies (i.e., writing on a calendar, repeating information, creating a rhyme). Participants indicated the frequency with which each strategy was used over the past 2 weeks on a 5-point scale, and possible scores ranged from 0 to 76.

Word-List Recall
A word list was used to test objective memory performance. Ten unrelated words were projected individually on a screen and were simultaneously read aloud by the presenter at the rate of 3 s per word. After presentation of the final word, as a distracting task, participants wrote numbers backwards from 100 for 30 s. Free recall was tested by instructing participants to write down as many words as they could remember in any order. The score was the number of words correctly recalled. Three different versions of the test were created, with equivalent difficulty level demonstrated at pretest, $F(2, 57) = 1.16$, $p = .321$. The use of each version as pretest or posttest was counterbalanced across participants.

Name Recall
This was used as an objective test of everyday memory performance. Two 3-part fictional names (i.e., first, middle, and last names) were presented orally and via slide projection for 10 s. Participants were instructed to try to remember the names. After 5 min of interactive lecture, participants were asked to recall the names. Possible recall scores ranged from 0 to 12, with 2 points given for each of the six name components. Partial points were given for names that were close but incorrect (e.g., Mary rather than Maria) and for names that were correct but in the wrong position (e.g., Henry John Pitts rather than John Henry Pitts). Three different versions of the test were created, with equivalent difficulty level demonstrated at pretest, $F(2, 57) = 2.63$, $p = .081$. The use of each version as pretest or posttest was counterbalanced across participants.

Telephone Call Task
This was used as an everyday test of prospective memory. Participants were asked to telephone the course instructor at two different specified times and dates (e.g., Monday at 10:30 A.M. and Wednesday at 12:00 noon) and to leave a message with two items of information (i.e., name and telephone number). Participants were allowed to use any memory aid or strategy they wished to use. Points for each of the telephone calls were awarded for the time the call was made (i.e., 2 points if within 10 min, 1 point if 10–60 min late, 0.5 points for more than 60 min late, 0 points if the call was never made) and for the information reported (i.e., 1 point each for name and code number), for a total of 8 possible points for the two phone calls. This task was administered at both pretest and posttest. The times and dates selected for pretest or posttest was counterbalanced across participants.

Data Analyses

Percent change scores were calculated and used for data analyses. Percent change scores were selected over raw scores in order to allow comparisons across the various measures which differ in the total number of possible points. As well, calculating change scores for individual participants allows one to make direct references about changes at the level of the individual rather than the group. To calculate change scores, each pretest score was subtracted from each posttest score and the result was divided by the pretest score. The resultant score thus represents the improvement in performance as a percentage of original, pretest performance. Missing data were estimated by substituting the mean from the appropriate group (i.e., program or control group) and session (i.e., pretest or posttest). This was necessary for the Age Quiz ($n = 2$), MMQ-Ability ($n = 1$), Word-List Recall ($n = 2$), Name Recall ($n = 2$) and the Telephone Call Task ($n = 5$).

To determine whether there were baseline group differences, a preliminary multivariate analysis of

variance (MANOVA) with one between-groups variable (i.e., program versus control) was performed on pretest scores for the seven dependent variables available for all participants (i.e., all of the outcome measures described above, with the exception of Strategy Repertoire), and a *t*-test analysis was performed on pretest Strategy Repertoire scores. Equivalent pretest scores would provide justification for using percent change scores to compare the groups. For the main analysis, to determine the overall effectiveness of the program, MANOVA was used to examine group differences in change scores on the seven dependent variables available for all 60 participants. In order to determine the specificity of the effects, and consistent with the directional hypotheses, the MANOVA was followed by a series of one-tailed *t* tests on the eight individual outcome measures. To determine the meaningfulness of the results obtained, effect sizes (i.e., *d*; Cohen, 1988) were calculated for pretest versus posttest changes among program participants and for change scores among program versus control participants. According to Cohen, a *d* of 0.2 corresponds to a small effect size, 0.5 corresponds to a medium effect size, and 0.8 corresponds to a large effect size.

RESULTS

Planned Analyses

A preliminary MANOVA on pretest raw scores of the seven outcome measures available for all 60 participants indicated that, as expected, the main effect of group was not significant, $F(1, 58) = 1.52$, $p = .223$. Similarly, Strategy Repertoire pretest scores did not differ between groups, $t(35) = 0.81$, $p = .422$. Thus, baseline test performance was equivalent between groups, thus demonstrating that pre-existing group differences on memory measures were minimal, if any, and providing justification for using percent change scores to compare the groups in subsequent analyses.

Percent change scores for the eight outcome measures are presented in Figure 1. As expected, MANOVA with 7 dependent variables indicated a significant overall group difference in change scores, $F(1, 58) = 6.14$, $p = .015$, with larger change scores among program than control participants. There was no overall difference in change scores between the dependent variables, $F(6, 348) < 1$, nor was there a significant group-by-dependent-variable interaction, $F(6, 348) < 1$.

T-test analyses indicated significant group differences in change scores for both measures of factual knowledge, including the Aging Quiz, $t(58) = 2.69$, $p = .005$, and Strategy Repertoire, $t(35) = 3.99$, $p < .001$. Significant group differences were also obtained for two of the self-report measures, including MMQ-Contentment, $t(58) = 2.55$, $p = .007$, and MMQ-Ability, $t(58) = 2.25$, $p = .014$, but not for MMQ-Strategy, $t(58) = 0.97$, $p = .168$. On the objective memory tests, there was a significant group difference in change scores on the prospective Telephone

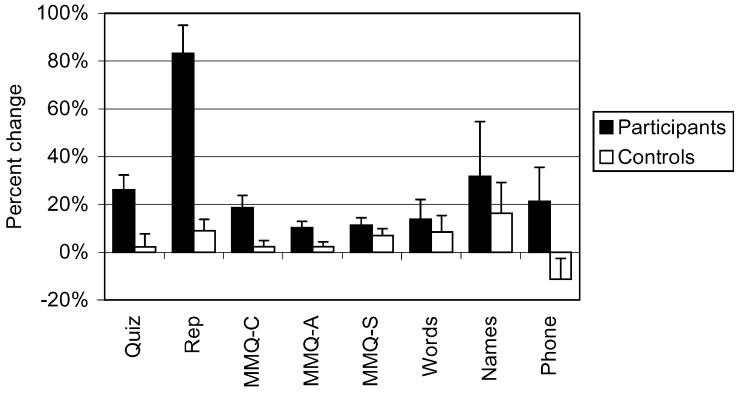

Fig. 1. Pretest–posttest change scores on outcome measures. Bars represent the standard error of the mean. Rep = Strategy Repertoire; MMQ = Multifactorial Memory Questionnaires; C = Contentment scale; A = Ability scale; S = Strategy scale.

Call Task, $t(58) = 1.74$, $p = .044$, but not on Word-List Recall, $t(58) = 0.46$, $p = .325$, or Name Recall, $t(58) = 0.51$, $p = .305$.

Effect sizes are presented in Table 3. Generally, examinations of effect sizes indicated group differences on more measures than did significance tests. A comparison of the size of pretest versus posttest score differences among program participants addressed the overall effectiveness of the program (left column of Table 3). Large effect sizes were obtained for the measures of factual knowledge. Small effect sizes were obtained for all three of the self-report measures and for one objective memory test (i.e., Word-List Recall). However, an examination of pretest / posttest changes only in the program participants could be artificially inflated by general effects of the therapeutic environment or of test practice. A comparison between program and control participants in the size of the change scores addressed the specific effectiveness of the intervention above and beyond these general effects (right column of Table 3). Medium to large effect sizes were obtained for the measures of factual knowledge. Small to medium effect sizes were obtained for the three self-report measures. A medium effect size was obtained for one of the objective memory tests (i.e., Telephone Call Task).

Exploratory Analyses

Some of the planned analyses revealed unexpected findings. To explore the reasons for these findings, several follow-up analyses were performed. Effect sizes obtained from these exploratory analyses are provided at the bottom of Table 3.

Because MMQ-Strategy contains numerous memory aids and strategies, some of which were not emphasized in the program, further analyses were conducted using five questionnaire items tapping strategies especially targeted in the program. These strategies included writing notes and reminders, writing information in a notebook, spaced repetition, organization, and visualization. Subscores and percent change scores were calculated. Change scores obtained by the program participants ($M = 0.34$) were 2–3 times higher than those obtained by control participants ($M = 0.12$), and this difference was statistically significant, $t(58) = 1.81$, $p = .038$. Medium effect sizes were obtained for pretest versus posttest differences among program participants and

Table 3. Effect sizes (Cohen's *d*) for changes in outcome measures.

Measure	Pretest vs. posttest (Program participants)	Program vs. control (Change scores)
Planned analyses		
Quiz	0.94***	0.74**
Strategy Repertoire ($n = 35$)	2.05***	1.94***
MMQ-Contentment	0.38*	0.77**
MMQ-Ability	0.39*	0.63**
MMQ-Strategy	0.43*	0.27*
Word-List Recall	0.21*	0.13
Name Recall	0.19	0.15
Telephone Call Task	0.14	0.52**
Exploratory analyses		
MMQ-Strategy (5 items)	0.69**	0.50**
Name Recall ($n = 56$)	0.31*	0.20*
Telephone Call Task ($n = 45$)	0.41*	0.64**

Note. MMQ = Multifactorial Memory Questionnaire. $N = 60$ unless otherwise noted. Exploratory analyses were performed using only targeted items from the MMQ-Strategy and after excluding participants with perfect pretest scores on Name Recall and Telephone Call Task.
* small effect size; ** medium effect size; *** large effect size.

change scores for program versus control participants.

Although Word-List Recall was clearly a difficult task, with no participants obtaining perfect scores, the other two objective memory tests were not. Four participants obtained perfect scores at pretest on Name Recall, and 15 did so on the Telephone Call Task. Because this restricts the range of possible percent change scores (i.e., these participants could not obtain positive change scores), analyses were performed on these data after excluding participants with perfect pretest scores. On Name Recall, program participants obtained numerically higher change scores ($M = 0.37$) than control participants ($M = 0.16$). Although, this difference was not statistically significant, $t\ (54) = 0.66$, $p = .257$, small effect sizes were obtained for pretest versus posttest differences among program participants and for change scores for program versus control participants. Similar but stronger findings were obtained on the Telephone Call Task after removing participants with perfect pretest scores. Program participants obtained higher change scores ($M = 0.35$) than control participants ($M = -0.11$) and, similar to the original analysis, this difference was significant, $F(43) = 1.90$, $p = .032$. A small effect size was obtained for pretest versus posttest differences among program participants, and a medium effect size was obtained for change scores by program versus control participants.

DISCUSSION

Evidence was obtained for the general effectiveness of the memory education and intervention program in targeting everyday memory difficulties among older adults using memory strategies that are practical and less effortful than those that are typically taught in memory training programs. An examination of the overall pattern of change on a variety of outcome measures showed larger pretest–posttest improvements by individuals participating in the intervention program than by control participants receiving the same tests over the same time period without the intervention program.

More specifically, each of the previously described goals regarding education was clearly met. First, general knowledge regarding memory and aging increased, as indicated by a 26% increase in scores between pretest and posttest on a general measure of factual knowledge by program participants. Greater change scores were obtained by program than control participants on this measure. Second, the toolbox of memory strategies available to participants increased, as indicated by the 83% pretest–posttest improvement on a measure of knowledge of memory strategies by program participants. Larger change scores were obtained by program than control participants. This was by far the largest effect of the program. Third, reassurance for participants experiencing normal age-related changes was provided by the program, as indicated by a 19% pretest–posttest improvement on a self-rating scale of memory-related affect and perception. Presumably, this reassurance was a result of being educated about the types of memory change that are normally expected as one ages.

The goals regarding memory intervention were partially met. First, self-reported memory performance improved as a result of the intervention. Program participants felt that their day-to-day memory functioning improved throughout the course of the program, as indicated by 10% higher self-ratings of memory ability. Use of memory strategies improved somewhat. The overall change in scores on a measure of self-rated strategy use did not differ between program and control participants; however, the use of a subset of strategies that were especially targeted by the program showed a statistically significant pretest–posttest increase of 33%. Thus, there was a specific match between the strategies taught in the program and those that increased in frequency of use. Second, regarding actual memory performance, there was a significant 21% pretest–posttest improvement on a naturalistic prospective memory task. This finding is significant, given that the specific aims of the program were to improve everyday memory performance and, of the three memory tests administered, the prospective memory test was perhaps the most analogous to a real-life memory task. On the two other memory tests, mean change scores were consis-

tently in the predicted direction (i.e., 14–32%), and change scores were numerically higher among program than control participants, although the differences were not statistically significant. When participants obtaining perfect pretest scores were excluded from the analyses, however, the magnitude of these effects increased, indicating that the lack of significant changes on objective memory tasks was due at least in part to measurement difficulties.

Although the findings were generally consistent with the original expectations, a few were not. Somewhat surprisingly, as described above, the effect of the intervention on objective memory performance was inconsistent. There are several possible explanations for this finding. It is possible that these memory tests did not mimic everyday memory situations sufficiently and thus did not lend themselves to the application of the strategies taught in the program. Perhaps, memory tests more closely mimicking everyday situations would be a better test of the participants' ability to apply these everyday memory strategies. For example, a word-list recall task comprising a list of grocery items, with items presented as a group rather than individually, would allow more opportunities for organizing and repeating the list. Similarly, a name recall task performed in a social setting – with a name presented with a face, and with a delay period filled with casual conversation – may allow greater use of visualization, association, and repetition strategies. Another possible reason that smaller effects were found on these tests is level of difficulty. As previously mentioned, several participants obtained perfect pretest scores on Name Recall and the Telephone Call Task, thus precluding the possibility of obtaining positive change scores. When these participants were removed from the analyses, a broad range of effect sizes were consistently obtained. Thus, larger improvements on these outcome measures may have been obscured in the initial analyses because of a restricted range in possible change scores. The significant improvement on the telephone task is notable, however, given that older adults tend to perform quite well on naturalistic prospective memory tests even without any memory intervention (Moscovitch, 1982).

The present pattern of greater effects of the memory intervention program on subjective than objective memory functioning is the opposite of the pattern indicated by a recent meta-analysis (Floyd & Scogin, 1997). It is possible that other studies found greater effects on objective memory tests because they tended to use formal mnemonics which improved laboratory-based memory tasks such as list-learning but were not applicable to everyday memory situations such as name learning that are included in subjective memory measures. In the present program, training in applied memory strategies did not result in markedly improved performance on objective memory tasks performed in class, but these strategies may have been applied successfully to everyday memory tasks, thus increasing subjective memory functioning. As well, subjective memory functioning may have been particularly sensitive to the effects of the present program because, in addition to memory training, the program involved education, reassurance, and self-assessment. These latter components may have modified participants' expectancies (Floyd & Scogin, 1997), as reflected in the measures of subjective memory function.

Apparently, the program participants increased their knowledge of possible memory strategies considerably, as reflected in an 83% increase in scores on Strategy Repertoire. The increase in the frequency with which they reportedly used these strategies in their everyday lives, however, was smaller (11%), though significant. It is possible that the 2 weeks to which MMQ-Strategy refers was insufficient time to detect such behavioral changes. Perhaps, there is a low base rate of situations requiring the application of some of these strategies (e.g., new names may not be encountered every week) and a longer observation time would be required to detect increased strategy use. Alternatively, it is possible that participants needed more training using these strategies than was provided during the two intervention sessions. Perhaps participants would have been more likely to apply these strategies if they had more in-class experience using them.

There was a consistent tendency for test scores to increase between pretest and posttest among control participants, indicating slightly improved

functioning over time in the absence of participation in the intervention program. There are several possible reasons for this finding. On some tests, such as the objective memory tests, this may be due in part to practice effects. Despite receiving different versions at pretest and posttest, previous exposure to the testing situation itself may have resulted in slightly improved scores. It is also possible that pretesting may have increased participants' awareness of possible memory strategies, thus increasing posttest scores on Strategy Repertoire and increasing reported use of memory strategies on MMQ-Strategy. On the self-report tests, it is also possible that scores improved because of unintended therapeutic effects of the control group testing situation. Control participants were noted to discuss and sympathize with each other regarding their impressions and experiences with their memory ability. To minimize this, the experimenter attempted to redirect conversation as much as possible until after the final testing session. Nevertheless, some degree of reassurance by other participants may have resulted in improved memory satisfaction and self-reported ability. Interestingly, in contrast to the other outcome measures, scores *decreased* on the Telephone Call Task between pretest and posttest among control participants. This may reflect a tendency for the task to become less salient, and therefore more poorly remembered, once it became familiar. Given this trend toward decreased scores among control participants, the slight improvement among program participants on this task is even more meaningful.

There are several limitations to the generalizability of the findings obtained in this study. First, the lack of random assignment of participants to the experimental and control conditions raises the possibility that pre-existing group differences contributed to the greater improvement of the program participants relative to the control participants. However, any group differences, if present, were apparently minimal, as participants were carefully matched according to demographic characteristics and baseline memory performance. Second, the relatively small sample size may have precluded finding small but significant effects of the training program. Third, as mentioned previously, the use of memory tests that more closely resemble everyday memory tasks would provide a better estimate of the effectiveness of the training for improving everyday memory functioning. Finally, the fact that individuals with perfect pretest performance on the objective memory tests were excluded from some analyses indicate that the exploratory findings are most applicable to individuals whose initial memory ability is at or below average.

In conclusion, evidence was obtained for the overall effectiveness of this memory education and intervention program in increasing knowledge, satisfaction, and everyday memory functioning among older adults. Because of noted improvements on the measures of knowledge, this type of intervention seems particularly suitable to individuals whose memory concerns result from inadequate knowledge about memory and aging. This is a unique contribution to the literature on memory training programs, most of which focus primarily or exclusively on teaching specific mnemonic strategies. Future research will address the long-term effectiveness of the gains obtained by the end of the program and additional methods for examining changes in objective memory performance.

ACKNOWLEDGEMENT

Thanks to Morris Moscovitch for input regarding the design of the intervention program, development of outcome measures, and comments on the manuscript. Thanks also to Guy Proulx and Fergus Craik for assistance with program design; Norman Park for suggestions regarding additional outcome measures; Kelly Murphy for comments on the manuscript; and Cara Mirabelli, Samantha Dworsky, Katy Kamkar, and Kimberly Kane for assistance with data collection and entry.

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