Remembering to age successfully: evaluation of a successful aging approach to memory enhancement

Author
Hohaus, Lydia

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Remembering to age successfully: evaluation of a successful aging approach to memory enhancement

Lydia Hohaus
School of Psychology, Griffith University, Brisbane, Australia

ABSTRACT

Background: Memory enhancement programs that can significantly improve actual memory performance and subjective perceptions of everyday memory in elderly people are rare. This study was designed to evaluate a new memory enhancement program incorporating principles of successful aging, designed to enhance subjective and objective everyday memory in community-dwelling old people.

Methods: Two matched groups of 20 healthy community-dwelling elderly adults were assessed on measures of objective and subjective memory performance before and after participating in a memory enhancement or active control condition.

Results: Planned multivariate analysis of variance (MANOVA) on change scores showed that participants in the memory enhancement program improved significantly on both objective and subjective measures. Specifically, greater improvement was demonstrated on a verbal paired associates task, story recall, face recognition, contentment with memory, and use of memory strategies.

Conclusions: Although a fully randomized design was not used, the results are promising, suggesting that memory training incorporating principles of successful aging can enhance memory performance in healthy old people, objectively and subjectively.

Key words: memory enhancement, old people, everyday memory, memory training, mnemonics

Introduction

Decades of memory research clearly demonstrate that elderly adults have the cognitive plasticity to benefit from memory training (Ball et al., 2002; Verhaegen...
et al., 1992), yet one of the most common and distressing complaints of normal aging remains actual or perceived memory loss (Balota et al., 2000; Floyd and Scogin, 1997; Ronnlund et al., 2005). Many elderly people feel frustrated, embarrassed and helpless as they experience memory lapses, which could be prevented (Troyer, 2001; West et al., 2000), and reinforce negative stereotypes of aging (Best, 1992; Hess, 2005). Hence, a major challenge for contemporary research is to identify ways in which memory-enhancement techniques can be learnt, practiced and maintained by elderly individuals as required in their daily lives (Jennings and Darwin, 2003; Rebok et al., 1997; Woolverton et al., 2001).

The theory of successful aging developed by Baltes and Baltes (1990) proposes three interacting processes conducive to successful aging: Selection, Optimization and Compensation (SOC). When applied to memory enhancement, this model may provide old people with simple but helpful guidelines and goals (Hess, 2005). For example, Optimization may encourage elders to challenge and extend themselves to learn and practice a wide range of different memory strategies. This should increase their repertoire and help to ensure that information is more deeply processed and therefore more readily retrieved as required (Brown and Craik, 2000).

SOC may also serve to motivate old people to develop new specific goals (Hess, 2005). For example, remembering the faces of new acquaintances, being able to learn and remember new associations and remembering the content of articles and stories may all be perceived as everyday cognitive challenges, which can be enhanced through mnemonics (Rebok et al., 1997; West et al., 2000), while facilitating social participation (Best, 1992). This is consistent with earlier approaches to successful aging that emphasize competent cognitive and social performance (Rowe and Kahn, 1987).

Although, to the author’s best knowledge, successful aging was not directly incorporated in a memory enhancement program prior to the development of this program in 2001, the dominant theory underlying memory improvement research, namely plasticity (Verhaegen et al., 1992), is also a fundamental proposition underlying the SOC model (Baltes and Baltes, 1990).

To date, however, the history of memory-enhancement programs has been mixed. Attempts to assess the efficacy of programs have been limited and the practical benefits of programs left in doubt due to at least two major weaknesses.

First, although Verhaegen et al. (1992) concluded that memory programs are effective and memory training generally has a moderate effect size, they point out that the majority of the studies included in their meta-analysis (i.e. 70%) did not include control groups. When control groups have been used, however, they have rarely controlled for the benefits that result from the cognitive and social stimulation memory-enhancement groups provide (Mohs et al., 1998), despite
the well-known cognitive benefits of group participation (Best, 1992; Schaeffer and Poon, 1982).

Second, memory performance has been assessed in two major but often exclusive ways: subjectively, through self-report measures of meta-memory, and objectively, with memory tests (Floyd and Scogin, 1997; Troyer, 2001). Often only one of these types of assessment is used, and when both are used, particular types of memory training (e.g. method of loci) are only successful with one type of memory assessment (e.g. memory tests of list-learning). Typically, when objective measures are improved, through what often appear to elderly people to be highly artificial laboratory techniques, elderly individuals are not able or willing to generalize these techniques to other tasks (Stigsdotter-Neely and Backman, 1995) or to their everyday lives. Hence, when asked if their memory performance has been improved through self-report measures, even participants who have made marked improvements in the laboratory consistently report no subjective improvement (Hess, 2005; Woolverton et al., 2001). Indeed, Verhaegen et al. (1992) have argued that the successful results of their meta-analysis of memory training only pertains to memory performance on “classical episodic tasks.” They also contend that “Nothing can be inferred about the impact of mnemonic training on everyday memory performance or on meta-memory” (p. 250). The largest cognitive intervention trial with elderly people conducted to date, the ACTIVE study, which focused on three cognitive domains including memory, has also provided clear evidence for the efficacy of memory training but appears to have relied entirely on “objective measures” of “verbal episodic memory” (Ball et al., 2002). As expected, improvements in memory performance were demonstrated, to the extent that normal age-related memory declines may have been reversed, but no evidence of training effects on everyday function could be detected (Ball et al., 2002).

In their meta-analysis of the effects of memory training on subjective measures, Floyd and Scogin (1997) surmised that memory programs incorporating educational material that could promote more realistic understanding of aging and its effect on memory processes were most effective. Since then, several studies have reported memory programs incorporating a strong educational component (Troyer, 2001). Typically, however, although these studies may have elderly people reporting moderate to high levels of subjective memory improvement, when any objective measures are used, little objective memory improvement is demonstrated (e.g. Mohs et al., 1998).

A pilot study using only subjective measures demonstrated that previous participants in this new memory enhancement program incorporating successful aging principles reported very high levels of subjective memory improvement (Hohaus, 2002). The major purpose of the present study was to demonstrate that this new program also facilitates improvement on objective memory measures.
Hence, it was hypothesized that, when compared to an active control group, the memory enhancement training group would demonstrate greater improvement on both objective and subjective memory measures.

**Method**

**Participants**

Healthy community-dwelling elderly people who wanted to improve their memory were recruited through advertising in newspapers, and posters and brochures located in the offices of seniors’ groups, to participate in one of two programs: The Optimizing Memory Program (Memory training) or the Use It or Lose It (Active control) Program. Resources were not sufficient to run a fully randomized controlled trial, hence 20 participants were recruited for the treatment condition, and then an additional 20 participants, who were matched (Lipsey and Cordray, 2000) for gender balance (15 females, five males), baseline memory performance, pre-morbid intelligence estimated from the National Adult Reading Test (NART; Nelson, 1982), depression rating using the Geriatric Depression Scale (GDS; Brink *et al.*, 1982), subjective health ratings and years of education, were recruited to participate as controls. All participants were screened for cognitive impairment with the Telephone Interview for Cognitive Status – modified version (TICS-m; Welsh *et al.*, 1993). Participants who did not meet the recommended cut-off score of 30 out of a possible 50 on the TICS-m and two items on the memory subscale were excluded from the study. Participants were also excluded if they had participated in prior memory training or had significant health problems. Two participants were not able to complete the final assessment, one due to illness and another due to a death in the family, leaving 19 participants in each group.

The participants were aged 56 to 84 years (mean = 70.72, S.D. = 7.42), education ranged from 6 to 21 years (mean = 12.4, S.D. = 3.7), and estimated pre-morbid IQ ranged from 87 to 128 (mean = 113.6, S.D. = 10.2). Subjective health ratings ranged from 2 to 5 (mean = 3.8, S.D. = 0.7) (where 5 was the highest possible score), depression scores ranged from 0 to 14 on the GDS (mean = 5.2, S.D. = 3.9) and the range on the TICS-m was 30 to 44 (mean = 36.6, S.D. = 3.2).

**Programs**

The Optimizing Memory Program is a memory training and educational program developed to facilitate everyday memory performance in healthy old people. It comprises 3-hour sessions delivered at weekly intervals over 5 weeks. All sessions were led by the author and co-facilitated by postgraduate clinical
Remembering to age successfully

Each week a major educational theme is addressed, specific memory strategies are introduced, relevant experiential exercises are conducted in small groups, and home exercises are given. For example, in week 1, the educational theme is “Memory and successful aging.” A 1-hour lecture is given, followed by a 30-minute refreshment break. Simple memory strategies particularly helpful for remembering new people are then taught and practiced in small groups for 1 hour. The whole group then meets for a summary of the major concepts and techniques introduced and home exercises are provided. In week 2 the educational theme is “Understanding how memory works,” week 3 focuses on “Normal memory changes and aging,” week 4 on “Managing stress, bereavement and other influences on memory,” and the final week provides an overview of “Strategies for improving memory.” In addition, techniques that assist memory training (Verhaegen et al., 1992), such as relaxation, paying attention and visualization, are introduced and practiced each week. Throughout the program, participants are encouraged to develop specific memory goals in their everyday lives and to report their success.

The Use It or Lose It Program was developed as an active control condition designed especially to control for cognitive and social stimulation provided in the treatment condition, with no memory training or educational content specific to memory improvement, similar to the video control condition used by Mohs et al. (1998). A stimulating BBC series entitled “The Brain Story” was shown and discussions about these videos were facilitated. These sessions were conducted by postgraduate clinical psychology students under the author’s supervision. The program’s highly structured content was largely determined by the videos. These comprised: “How the brain works” in week 1, “How we make sense of our world” in week 2, “The evolution of the mind and the role of language” in week 3, “The development of the brain and memory” in week 4 and “Consciousness” in week 5. Each session began with brain-teasers, followed by relaxation or stretching exercises. The video would then be shown for approximately 1 hour, followed by a 30-minute refreshment break. This was followed for about 1 hour by facilitated discussions in small groups about the main themes identified in the videos and relevant experiential exercises designed to increase understanding of the concepts raised. Before the end of each session all participants came back together to share conclusions and participate in a more general discussion.

Measures

The test battery comprised a brief telephone cognitive screen, an assessment interview and a questionnaire package.

Cognitive Screen

The 12-item TICS-m (Welsh et al., 1993) was used to screen for cognitive impairment. The TICS-m has a maximum score of 50 with a recommended
cut-off of 30 indicating cognitive impairment. The original TICS was reported as a valid and reliable indicator of cognitive impairment, and is highly correlated to the Mini-mental State Examination ($r = 0.94$, Brandt et al., 1988). The modified version, including a 10-item memory question and the delayed memory question, has proved to be a more sensitive predictor of cognitive impairment than the original (Welsh et al., 1993).

**ASSESSMENT INTERVIEW**

The assessment tests were administered in a fixed order. Although subtle order effects may have appeared, this was not considered problematic as the primary purpose of the research was to compare groups on change scores.

The interview began with the 30-item version of the GDS (Brink et al., 1982) with a Yes/No response format, designed to screen for depressive symptoms in old people. The level of depression is rated according to the total number of depressed responses, where 0–10 is normal, 11–20 is mild depression and 21–30 is moderate to severe depression. This measure is reported to show high internal reliability and to correlate highly with other measures of depression.

Next, total immediate verbal memory for unrelated pairs of words was assessed with the Verbal Paired Associates 1 (VPA 1) subtest of the Wechsler Memory Scale III (WMS III; Wechsler, 1997). This measure has excellent split-half reliability and very good content and concurrent validity, correlating highly with other measures of verbal memory (Lezak et al., 2004). Test–retest reliability after a mean interval of 36 days on VPA 1 (immediate total score; Wechsler, 1997) was also very good, indicating that this measure could be reliably readministered after 5 weeks.

Everyday memory performance was then assessed using the face-recognition task and a story paragraph recall task from the Rivermead Behavioral Memory Test–Extended (RMBT-E; Wilson et al., 1999). The face-recognition task involves correctly identifying 15 faces when shown a total of 30 faces after a filled delay. The paragraph story task comprises listening to a short passage of prose that is read aloud and then recalling as much of the story as possible. According to the authors, the RMBT-E is a reliable, discriminating and sensitive measure of everyday memory functioning, suitable for use with normal elderly people (Wilson et al., 1999). Participants were randomly assigned to a version of the RMBT-E measures for the first interview, and given the alternate form in the second interview.

An estimate of IQ was obtained by administering the NART (Nelson, 1982) at the end of the first interview. Responses were rated using the pronunciations given in the Australian Macquarie dictionary rather than those given in the NART manual to ensure that the measure was applied appropriately in the Australian context (Willshire et al., 1991). The NART is reported to be highly
reliable and has proven to be a reliable predictor of Wechsler Adult Intelligence Scale (WAIS) full-scale IQ scores (Nelson, 1982).

**QUESTIONNAIRE PACKAGE**
A demographic and health questionnaire required participants to indicate gender, age, years of education and an overall subjective health rating, relative to a perfect state of health. The health rating scale was a five-point Likert scale (1 = very poor, 5 = very good).

Subjective everyday memory was assessed with the Multifactorial Memory Questionnaire (MMQ; Troyer and Rich, 2002), which consists of three scales designed to assess Contentment with memory, perceived memory Ability (Forgetfulness), and the use of specific memory Strategies. The scales have 18, 20 and 19 items, respectively, and are all scored with a five-point Likert scale. (For ease of administration the original rating scale on the ability (forgetfulness) scale was reversed, hence higher scores indicate more forgetfulness or less perceived memory ability.) The MMQ is ideal to assess efficacy of memory intervention in old people as it is relatively short and assesses three primary facets of subjective everyday memory performance. Troyer and Rich (2002) provide good evidence for its reliability and validity.

Program satisfaction was assessed at the end of each program with a single item using a five-point Likert scale, with 1 = not at all satisfied and 5 = extremely satisfied.

**Procedure**
After completing the TICS-m telephone interview, participants completed the assessment interview. Three assessors were trained by the author to ensure identical standards of presentation. All participants were interviewed within 2 weeks of the start and conclusion of the program. Each interview was videotaped to ensure reliable scoring. The first questionnaire package was distributed at the pre-assessment interview and the second package was distributed at the conclusion of each program.

**Data analyses**
Change scores were calculated for each dependent variable, as these scores were expected to be most sensitive to intra-individual change (Woolverton *et al.*, 2001). To protect against both Type 1 and Type 2 errors, two specific directional hypotheses were tested separately with planned multivariate analyses of variance (MANOVAs) (Tabachnick and Fidell, 2001). Supplementary analyses were conducted to confirm assumptions and assess possible clinical significance.
**Results**

An \( \alpha \) level of 0.05 was used to determine significance and a series of MANOVAs were conducted using the Statistical Package for Social Sciences (SPSS) version 12. Data screening had previously identified three outliers on the subjective measures. Modification of exceptionally high scores to those within a unit of the next score (Tabachmick and Fidell, 2001) led to distributions within the normal range. Analyses were conducted with and without these corrections as reported below.

**Pretest demographic variables**

The two groups were compared on five demographic variables: age, years of education, subjective health ratings, estimated IQ score, and cognitive status or depression. A \( 2 \times 5 \) MANOVA showed no significant differences between the groups.

**Objective memory performance**

Table 1 shows the means, standard deviations and between-group results for the three measures of objective memory performance. Overall, the \( 2 \) (group) \( \times 3 \) (Objective memory) MANOVA showed a significant group effect \([F(3, 34) = 5.657, p < 0.01]\). As Table 1 shows, each of the objective memory measures showed significant group differences: VPA 1 \([F(1, 36) = 5.656, p < 0.05, d = 0.910]\), the Face Recognition test \([F(1, 36) = 4.478, p < 0.05, d = 0.656]\) and the Story Recall Test \([F(1, 36) = 5.757, p < 0.05, d = 0.505]\). In each case the means indicate superior performance by the Optimizing Memory group. The estimated effect sizes ranging from \( d = 0.5 \) to \( 0.9 \) indicate moderate to strong effects of memory enhancement training. An additional MANOVA was conducted and confirmed that there were no significant differences between groups at pretest.

**Subjective memory performance**

Table 1 also shows the means, standard deviations and the \( 2 \) (group) \( \times 3 \) (Subjective Memory) MANOVA results for the three subjective memory measures. Overall, the MANOVA showed a significant group effect \([F(3,34) = 18.674, p < 0.001]\), while the between-effects analyses showed superior subjective ratings on two of the three memory scales: Contentment with Memory \([F(1, 36) = 16.738, p < 0.001, d = 1.114]\) and Use of memory strategies \([F(1, 36) = 33.598, p < 0.001, d = 1.374]\) by the Optimizing Memory group. Table 1 also shows the results of the MANOVA conducted on the pretests of the subjective memory measures, confirming no significant between group differences at pretest. (It should be noted that there was a significant group
effect overall: $[F(3, 36) = 3.282, p < 0.05]$. However, this was not considered problematic because, as can be seen in Table 1, in each case the pre-test means favour the control group, who may have a trend to have started the training more contented, less forgetful and equipped with more memory strategies, although none of these reached significance on the individual between-subjects effects, and the main analyses were conducted on change scores.) The effect sizes ranging from 0.4 on the non-significant Forgetful measure to $> 1$ on the other two measures indicate a moderate effect on Forgetfulness and very strong effects on Contentment and Strategies of the memory enhancement program.

Simple correlation analyses were also conducted to confirm that the objective measures were not correlated with the subjective measures at pre-test, and could be analyzed separately as planned. As expected, no significant correlations were obtained between any of the objective and subjective measures, but measures within each category were moderately correlated. Story recall and verbal paired associates were moderately correlated ($r = 0.418, p < 0.01, N = 40$), and face recognition approached significance with verbal paired associates ($r = 0.3,$

**Table 1. Objective and subjective memory performance**

<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>SCORE</th>
<th>OPTIMIZING MEMORY MEAN (S.D.)</th>
<th>CONTROL PROGRAM MEAN (S.D.)</th>
<th>MANOVA BETWEEN F(1, 36)</th>
<th>ESTIMATED EFFECT SIZE “d”</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre-</td>
<td>17.20 (8.4)</td>
<td>14.75 (8.78)</td>
<td>0.828</td>
<td>0.289</td>
</tr>
<tr>
<td></td>
<td>Post-</td>
<td>25.84 (6.07)</td>
<td>17.74 (8.87)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Change</td>
<td>8.00 (7.02)</td>
<td>3.21 (5.27)</td>
<td>5.656*</td>
<td>0.910</td>
</tr>
<tr>
<td></td>
<td>Pre-</td>
<td>11.36 (2.09)</td>
<td>11.47 (2.44)</td>
<td>0.126</td>
<td>0.113</td>
</tr>
<tr>
<td></td>
<td>Face recognition</td>
<td>12.53 (2.55)</td>
<td>11.21 (2.48)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Change</td>
<td>1.16 (2.36)</td>
<td>-0.26 (2.16)</td>
<td>4.478*</td>
<td>0.656</td>
</tr>
<tr>
<td></td>
<td>Pre-</td>
<td>8.58 (3.33)</td>
<td>8.37 (3.23)</td>
<td>0.065</td>
<td>0.083</td>
</tr>
<tr>
<td></td>
<td>Post-</td>
<td>10.40 (3.82)</td>
<td>7.95 (3.41)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Change</td>
<td>1.82 (3.40)</td>
<td>-0.42 (2.21)</td>
<td>5.757*</td>
<td>0.505</td>
</tr>
<tr>
<td></td>
<td>Pre-</td>
<td>35.40 (13.60)</td>
<td>42.45 (11.60)</td>
<td>3.112</td>
<td>0.543</td>
</tr>
<tr>
<td>MMQ</td>
<td>Post-</td>
<td>51.40 (9.34)</td>
<td>46.17 (10.01)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Change</td>
<td>16.00 (11.08)</td>
<td>4.72 (3.89)</td>
<td>16.738***</td>
<td>1.114</td>
</tr>
<tr>
<td></td>
<td>Pre-</td>
<td>33.05 (12.55)</td>
<td>30.85 (7.34)</td>
<td>0.458</td>
<td>0.215</td>
</tr>
<tr>
<td>MMQ</td>
<td>Post-</td>
<td>25.55 (10.08)</td>
<td>27.55 (6.36)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Change</td>
<td>-7.50 (12.64)</td>
<td>-3.56 (4.28)</td>
<td>1.583</td>
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<tr>
<td></td>
<td>Pre-</td>
<td>31.30 (9.43)</td>
<td>35.33 (8.21)</td>
<td>2.504</td>
<td>0.490</td>
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<tr>
<td>MMQ</td>
<td>Post-</td>
<td>46.90 (8.26)</td>
<td>34.61 (9.92)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Change</td>
<td>15.60 (9.71)</td>
<td>-0.72 (7.32)</td>
<td>33.598***</td>
<td>1.374</td>
</tr>
</tbody>
</table>

VPA 1 = Verbal Paired Associates 1; MANOVA = multivariate analysis of variance; RMBT-E = Rivermead Behavioural Memory Test–Extended; MMQ = Multifactorial Memory Questionnaire.

*p < 0.05, ***p < 0.001.
The subjective memory measures were moderately correlated with each other ($r = 0.331–0.562$, $p < 0.05$, $N = 40$).

A $t$-test for independent samples was also conducted to confirm that participants in both groups were equally satisfied with their program. No significant difference was found [Memory: mean = 3.75, S.D. = 0.44; Control: mean = 3.79, S.D. = 1.39; $t(37) = −0.12$, $p > 0.05$].

Post hoc analyses were also conducted to clarify whether improvements were made by the control group on any of the measures. These suggested that the control group may have improved significantly on the Paired Associates task [$t(18) = 2.66$, $p < 0.05$], and did improve on the MMQ contentment measure [$t(18) = 5.15$, $p < 0.001$] and the MMQ forgetfulness measure [$t(18) = −3.52$, $p < 0.01$].

Finally, an analysis of the potential clinical significance of the findings was conducted. Using the criteria recommended by Jacobson and Truax (1991), the changes reported by the memory training group in Contentment (Reliable change index (RC) = 3.29) and Strategies (RC = 3.47) were clinically significant.

**Discussion**

The results clearly support the first hypothesis demonstrating significantly greater improvement in objective memory performance on face recognition, story recall and memory for pairs of unassociated words for the participants receiving memory training. This suggests that the memory enhancement program was effective in improving performance, and that this improvement was not simply an artefact of familiarity with assessment procedures nor the result of more general cognitive and social stimulation. As the estimated effect sizes suggest, the memory enhancement program had a moderate to strong effect on these aspects of memory performance, consistent with the mean effect size ($d = 0.66$) reported by Verhaegen et al. (1992) for objective measures after mnemonic training, and suggesting that the improvements were not merely statistically significant, but substantial. Had a less stringent and cognitively stimulating control condition been used, such as delayed-training control (Ball et al., 2002), the effect of the memory training may have appeared even stronger. Although these findings were not clinically significant, this is probably a reflection of the relatively small objective memory loss demonstrated by this healthy sample of elderly people (Hess, 2005) and/or the insensitivity of the objective memory measures (Mohs et al., 1998) rather than a limitation of the program. On the verbal paired-associates measure, for example, although performance in the training group improved from 53% to 78%, approaching ceiling, improvement was still not clinically significant.
With regard to subjective memory performance, as expected after memory training, participants were significantly more content with their memory performance and reported using many more memory strategies than the active control group, even though the control group may have had a slight advantage on both of these measures at pre-test. According to the criteria of Jacobson and Truax (1991), these findings were also clinically significant. Indeed, compared with previous work by Floyd and Scogin (1997) on meta-analysis of studies of subjective functioning, where the mean effect size was small \((d = 0.19)\), the effect sizes obtained in this study on two major indices of subjective memory, contentment and strategies \((d = 1.1–1.4)\), were extraordinarily high. This suggests that this memory-enhancement program may be one of the most highly performing programs ever reported on at least two subjective memory measures. This may be due to the unique combination of several factors in the new program. First, the heavy emphasis during each session on education about memory and aging should have led to a more realistic understanding of normal age-related memory changes and expectations (Woolverton et al., 2001). Second, the opportunity to discuss memory lapses, practice mnemonic techniques, and discuss successful applications in small groups may have helped participants to develop and achieve more realistic performance goals (Best, 1992; Verhaegen et al., 1992) and to change their self-perceptions (West et al., 2003). Third, the unique feature in this program involving the integration of successful aging principles with memory training may have helped to motivate participants to optimize their memory performance (Hess, 2005) and encourage them to overcome some of those obstacles that elderly people often experience (Jennings and Darwin, 2003). The clinical significance of these findings suggests that the primary memory problem experienced by healthy elderly people may be perceptual rather than actual memory loss (Hess, 2005) and that this can be substantially remediated.

The memory training group, however, did not report superior improvement on the subjective measure of forgetfulness. Although the mean change scores for the two groups, and the moderate effect size \((d = 0.4)\), suggest that a trend in the expected direction could be detected in a larger sample, with better power, it appears that there may have been a weak-moderate effect on forgetfulness simply through the knowledge and benefits that elderly people experienced by participating in the active control group activities. Both groups improved, and although on average the training group improved twice as much as the control group, this difference was not statistically significant. It may be that any significant improvements made by the cognitively stimulated control group were captured most accurately in the subjective measure of forgetting. Mohs et al. (1998), who used different subjective measures, obtained very similar results. While their measures of contentment and strategies showed significant advantage
for memory training, their subjective measure of forgetting showed no greater improvement than their active control group. As subjective memory measures and, particularly, measures of forgetfulness, may not be good predictors of actual cognitive performance (Kliegel *et al.*, 2005), this may not be a cause for concern, but is puzzling, and implies that perceptions of forgetting may be particularly difficult to change.

In addition to the methodological limitation of sample size, three other limitations may have combined to prevent a superior significant effect on subjective forgetting from emerging. First, the subjective measure requires participants to consider the past 2 weeks when responding, hence at post-test, the period considered may have started as early as 2 weeks prior to the conclusion of the program, when participants had just completed three of five sessions, which is only 60% of the program. Second, a key component of the memory enhancement program home exercises includes monitoring daily memory lapses. This may have heightened awareness of lapses. Hence, while less forgetting may in fact occur, a larger proportion of lapses may be remembered and reported. Third, time may be required to fully integrate the techniques taught, before their benefits become pronounced. Hence, more time may simply be required to demonstrate emerging differences between groups on forgetting.

Overall, the findings of this study are very promising. Despite the small sample size, in view of the moderate to large effect sizes demonstrated, the findings suggest that elderly people have the plasticity to improve their actual memory performance, the way they perceive their memory performance and the strategies they can use, through brief memory education and training. Incorporation of the SOC model of successful aging (Baltes and Baltes, 1990) may further extend benefits previously reported for memory training and encourage elderly people to perceive the application of memory strategies as a challenging opportunity for further growth and development. This interpretation is consistent with a more contextual perspective of memory enhancement emerging, in which the effect that the goals that elderly people may have, such as successful aging, are considered (Hess, 2005). Although replication of these findings with a larger fully randomized sample and follow-up would be optimal, the current findings imply that if memory improvement is perceived as a vehicle for successful aging, elderly people may be more willing to practice new techniques and strategies, and be more content with their memory performance. Consistent application of effective memory strategies may in turn facilitate the more general goal of successful aging.

**Conflict of interest**

None.
Acknowledgments

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References


